Computer Supported Cooperative Work (2026) 35:5
https://doi.org/10.1007/s10606-025-09534-0

RESEARCH

Bridging Work of Intermediaries: A Qualitative Study on how Five Intermediary Firms Implement Interoperability in Cross-Boundary Infrastructures of Consumer Markets

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Received: 27 March 2025 / Accepted: 10 December 2025
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Abstract. Managing private life and household affairs requires considerable work for consumer households, sometimes in cooperation with private companies or public administrations. In their role as consumers/citizens, people must perform work such as monitoring and managing supplies and contracts, comparing and purchasing offers, submitting insurance claims, or renewing passports. While some CSCW studies have examined intra-household coordination work, this study investigates the emerging role of intermediary firms that perform inter-organizational work on behalf of, and driven by, consumers in areas such as finance, insurance, utilities, healthcare, and general administration. Employing qualitative methods, we combined interviews and artifact analysis with five intermediary firms across different sectors and conducted a week-long field study with one of them. In doing so, our study sheds light on intermediaries' largely hidden role in bridging inter-organizational cooperation in consumer markets. We show to what extent this work involves predominantly human, manual bridging efforts. All five intermediaries face (common) social-level conflicts in their newly formed work arrangements, as well as technical-level conflicts within the infrastructures of the market. We analyzed these conflicts alongside breakdowns they mitigate through coping strategies. Our findings suggest that while some conflicts—whether socially or technically caused—can be resolved by intermediaries, others must be bridged using concepts of 'adversarial interoperability' or 'backward interoperability'. Hence, when designing CSCW systems of organizations interacting with consumers, we should also consider the role of intermediaries, their work practices, and the conflicts identified in this study.

Keywords: Intermediary, Consumer work, Consumer informatics, Empirical study, Financial practices, Insurance practices, Boundary-spanning work, Infrastructure, Infrastructuring, Adversarial interoperability, Backward interoperability

Published online: 07 April 2026

1 Introduction

'Our clients are [...] exclusively private individuals [...] who need [help with] administration in the private domain because they are overwhelmed [...], ill [or] tired of it [...]' (Participant/Intermediary 5).

'[There are] two options: do it yourself or have it done' (Participant/Intermediary 1).

Running a private household is permeated by daily administrative, secretarial, and managerial tasks that require considerable work. Consumers must constantly anticipate needs, monitor supplies, compare offers, decide between (purchase) options, and conclude, terminate, or change term contracts (Daminger 2019). This need for household coordination has been underestimated for a long time, until feminist and sociological discourses advocated for its equitable distribution and recognition, highlighting especially the invisible nature of cognitive household work of women. Recently, the topic has received growing attention in research (Bianchi et al. 2012; Coltrane 2000; Daminger 2019; Dethier et al. 2024c; Emens 2015, 2021).

At the same time, the nature of this domestic work is changing due to the ongoing digitalization of economic goods and services, which requires consumers to manage a growing number of contractual agreements and adapt continuously to rapidly changing digital apps and services (Dethier et al. 2024a). Research shows the vulnerability of humans acting in traditional and digital markets, as they are generally influenced by principal-agent conflicts (Jensen and Meckling 1976) and negative market effects such as power asymmetries between providers and consumers (Kenning et al. 2021; Mau et al. 2023; Oehler 2006, 2011, 2021a), information asymmetries (Akerlof 1978) as well as dark patterns in digital user experience design (Krauß et al. 2024) or fake reviews (Walther et al. 2023, 2024), etc. To take it to the extreme: Trends such as the platform economy and 'everything-as-a-service' (XAAS, Duan et al. 2015; Riasanow and Krcmar 2020)) further intensify the need for continuous monitoring, comparison, and decision-making on product offerings and term contracts on a daily basis (Dethier et al. 2024a). For consumers, especially those in the midst of life or maybe living in larger dual-income households with children, this consumer work (Dujarier 2016) can become a stressful 'second shift' (Hochschild 1989).

In response to the effects outlined above, new and increasingly relevant service models have emerged that offer to assist consumers in their contractual relationships as well as civic obligations. This support varies by industry and spans across services such as flight compensation management, document management, contract monitoring, termination and switching, as well as product consultation (Boden et al. 2024; Dethier 2020). Such service providers, which we characterize

as 'intermediaries'[1] (cf. Bailey and Bakos 1997), can be either personal agents working in offices or digital offerings serving consumer-driven needs, such as,

- ensuring that one always has the best energy tariff for electricity, gas, or water (Intermediary 1),
- taking care of financial wealth and future (Intermediary 2),
- managing personal health and, for instance, getting appointments with medical specialists (Intermediary 3),
- doing paperwork with invoices, contract documents, etc. (Intermediary 4),
- submitting applications to authorities or simply paying your bills if one can no longer do it himself (Intermediary 5).[2]

Apart from having to pay for the service, consumers must also relinquish some autonomy over their household obligations to the intermediaries, who then perform professional work on their behalf. From a CSCW perspective, this leads to an interesting cooperative work arrangement, where intermediaries build a bridge between the private household members, their interests and obligations on one side, and multiple (private or public) organizations on the other side. By intermediaries' 'bridging work', we refer to a set of practices aimed at connecting these actors and their infrastructures with each other. This involves coordinative efforts to achieve interoperability across heterogeneous components within the infrastructures of the market, referring to the ability of people, groups, and organizations to collaborate effectively, both organizationally and technically.

So far, we know little about this type of work in private contexts, as well as its mediation in the context of technical infrastructures (Pipek and Wulf 2009). Neither companies, public organizations nor consumers have much experience in cooperating with such intermediaries, who perform more than just brokering of products. This bridging work requires new work arrangements and infrastructuring that is currently not considering customer/citizen interaction involving third parties. Furthermore, businesses might even try to resist the involvement of intermediaries (cf. Chircu and Kauffman 1999; Jensen and Meckling 1976), which promise to act in the consumer's interest, thus cutting into the profit of the service providers.

Our study seeks to shed light on this so far understudied field of cooperative consumer work, considering inter-organizational 'boundary-spanning work' (Levina and Vaast 2005) and its technical mediation towards consumer-facing organizations. We aim to investigate intermediary models and interoperability

[1] Unlike in German, the English term intermediary is often strongly characterized by the role of a broker. In German, as well as from the Latin origin of the word, an intermediary is more of a middleman, a mediator, someone in the middle. We would like to follow this rather German/Latin definition of the term, as we have not found a better—popular—term in English.

[2] Intermediary 1 to intermediary 5 took part in our study.

concerns, which pose unique characteristics for this field. We will show how five selected intermediaries face challenges we identified within our long-term partnership with them in bridging cooperation not only between two market parties but also different cooperation and communication infrastructures used, which can be characterized as 'infrastructuring work' (Lee and Schmidt 2017; Pipek and Wulf 2009).

Therefore, the aims of this study are to:

- uncover the often-invisible, administrative work performed by intermediaries on behalf of consumers in their interactions with organizations, as well as the resulting professional practices,
- analyze the cooperative work arrangements and its interaction with technical infrastructures,
- and discuss best practices and improvements within these infrastructures.

Using qualitative research methods, including interviews and artifact analysis with five founders of intermediary businesses (intermediary 1 to intermediary 5) and a week-long field study with participant observation with one of these firms (intermediary 5), our sample comprises research on common challenges in Germany.

2 Related Work

While research in computer-supported cooperative work (CSCW) has traditionally focused on workplaces (Blomberg and Karasti 2013; Schmidt 2000), the digitization of everyday life has also led to an increased interest in consumer work and resulting cooperation in consumer markets (Dujarier 2016; Verne and Bratteteig 2016). Human–computer interaction (HCI) and CSCW-related works already emphasized its complex, messy, competency-demanding, ubiquitous, and often invisible nature, particularly in the context of financial practices (Ferreira et al. 2015; Pritchard et al. 2015; Snow and Vyas 2015; Vines et al. 2011, 2014), domestic ordering systems (Dethier et al. 2024a; Sannon et al. 2020; Vyas et al. 2016), and bureaucratic tools (Dethier et al. 2024b), as well as the volatile interplay between ongoing digitalization and household practices (Perry and Ferreira 2017).

However, examining intermediaries that support the consumer work of private households introduces a novel perspective for CSCW, whereas previous CSCW and HCI research has largely focused on boundary-spanning activities. Therefore, in this section, we present related work that situates our study within the context of consumer work in private households (Section 2.1), which can be supported by various intermediary services (Section 2.2). Finally, we outline well-documented

conflicts and breakdowns in boundary-spanning activities that occur on different levels—both social and technical (see Section 2.3).

2.1 Consumer Work in CSCW, HCI, and IS Research

Originating in the social sciences, interdisciplinary research communities have, for decades, examined physical household labor and its equitable distribution between male and female household members (Benin and Agostinelli 1988; Bianchi et al. 2012; Coltrane 2000; DeVault 1987; Hochschild 1989; Mederer 1993; Twiggs et al. 1999).

Within this discourse, a currently trending field of household labor investigation focuses on its cognitive dimension (Daminger 2019), emphasizing its often invisible yet pervasive nature. This form of work weighs heavily on those who act as the 'captain of the household' (Ciciolla and Luthar 2019), carrying the mental load of coordinating daily life. This cognitive work, also referred to as 'household management' (Beeton 2020; Hochschild 1989; Mederer 1993) or 'life admin' (Emens 2015, 2020) is described as a time-consuming, unpaid, sometimes stressful activity. It involves continuously anticipating needs and inventories, monitoring contracts, identifying and evaluating options, and deciding between them (Daminger 2019). Authors such as Emens (2015, 2020) describe this work as office-like, secretarial, and managerial activities performed by individuals at their domestic workplace. From a CSCW perspective, these coordinative practices are particularly interesting to study, as they encompass the administrative, often highly bureaucratic, and organization-directed duties of running a household (Verne and Bratteteig 2016).

Household studies in CSCW and HCI reveal that consumers develop artful coordination mechanisms to manage their households, as shown in research conducted by Ferreira, Kaye, Perry, Snow, Vines, Vyas, and many others in domestic contexts (Dethier et al. 2024a; Ferreira et al. 2015; Kaye et al. 2014; Perry and Ferreira 2017; Pritchard et al. 2015; Sannon et al. 2020, 2020; Snow and Vyas 2015; Vines et al. 2011, 2014). These studies find that intra-household coordination involves a wide spectrum of arranged artifacts, spaces, responsibilities, competencies, and technologies in collaboration with household members (Vyas et al. 2016). It also involves extensive, ongoing articulation work with household members, as Timmermans and Freidin (2007) demonstrate in their study of mothers implementing medical treatments while monitoring and anticipating the needs of children with asthma.

When observing these intra-household systems from the outside, some activities appear as forms of self-fulfillment during leisure time, while others are influenced or triggered by the external market system and the organizations operating within it (cf. Luhmann 1988). In this context, Dujarier (2016) identifies 'organizational work' as one of three categories of consumer work, referring to activities that consumers undertake to manage their consumption-related

issues with interacting organizations. In economics, efforts to engage with one's consumption are typically summarized under the term 'transaction costs' (Williamson 1989), which, however, overlooks the labor-intensive coordination tasks and complex work arrangements in which consumer households are involved (Dethier et al. 2024a; Pollak 1985). These tasks include managing contracts for goods and household services, handling taxes and other official matters, dealing with insurance and personal health, managing accounting and financial assets, and processing or archiving related documents (Daminger 2019; Emens 2015). In particular, the administration of taxes, other governmental matters, and the management of term contracts are perceived as mentally burdensome and challenging by the German population. Young adults and individuals with lower educational levels report the highest mental workload when accomplishing such consumer work (Dethier et al. 2024c).

While CSCW literature primarily has focused on intra-household coordination, it has rarely examined household-to-organization cooperation in the context of technology and infrastructure. Information Systems (IS) researchers, such as Mitchell and Searls (Mitchell et al. 2008), have long advocated for the establishment of 'vendor relationship management systems' as counterparts to customer relationship management (CRM) systems. They argue that such systems could support cooperative consumer work through a 'set of tools' and thus improve market mechanisms from a technical perspective. In doing so, it may be possible to mitigate negative market effects, reduce the burden on private households, and more effectively meet consumer needs.

However, consumers already use various tools to support their consumer work tasks, such as search engines and generative AI tools for accessing knowledge, communication media such as email and telephone, and computers and smartphones alongside traditional paper-based tools. In addition, consumers often employ specialized tax software to cooperate with tax authorities or use customer service and comparison portals as infrastructures for interacting with providers and manage contractual arrangements (Dethier et al. 2024b).

2.2 The Emerging Field of Intermediary Work

In Germany, which serves as the focus of our study, several brokerage portals such as Check24, Clark, and Verivox[3] have been established in recent years. They enable consumers to compare and purchase services offered by different vendors online, thereby reducing search costs, facilitating comparisons, and allowing products to be digitally ordered. These intermediaries are perceived as potentially lowering transaction costs for consumers (Clement et al. 2019 pp. 158–159).

[3] https://www.check24.de; https://www.clark.de; https://www.verivox.de, last access 10.03.2025.

Industry-driven intermediation. These online brokerage portals have digitally transformed a longstanding industry-driven tradition of intermediation as part of the 'market-making' strategies of service providers (Bailey and Bakos 1997; Chircu and Kauffman 1999; Spulber 1996). They are well-established intermediaries in consumer markets primarily mediating products within a specific industry, such as in real estate, insurance, or stock brokerage, and earning income through brokerage fees. In this paper, we refer to these brokering activities as 'industry-driven intermediation'. As shown in Fig. 1, these actors are highly visible and well-recognized by organizations as middlemen between the organizations and consumers. However, industry-driven information and comparison portals, whose business models primarily rely on the brokerage of products, may also lead to adverse effects when principal-agent conflicts arise between the interests of consumers and those of the platform operators (Oehler 2021b).

Consumer-driven intermediation. Building on this development, a variety of business models have emerged that promise to assist consumers by always securing the best deals, claiming refunds or compensation, optimizing financial assets, and more. Driven by consumers' interests, needs, and obligations, this kind of intermediation takes over parts of consumers' transaction costs/household labor

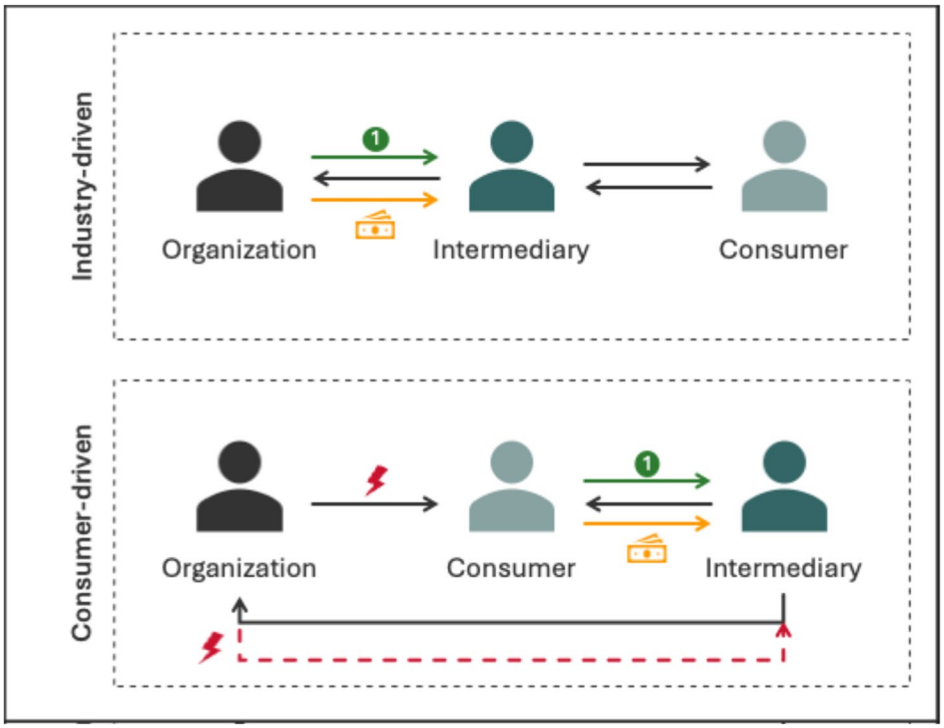

Fig. 1 Industry-driven versus consumer-driven intermediation

by representing their interests and obligations on the one hand, and by interacting with (private or public) organizations on the other (Mau et al. 2023, pp. 79–94).

Examples for that latter type of intermediation are financial technology (FinTech) providers such as 'Finanzguru' promise consumers simplified management of term contracts by automatically identifying them through bank transactions and recommending optimizations. In the field of legal technology (LegalTech), providers like 'Rightnow' promise to assist consumers claiming their passenger rights in cases of flight delays or cancellations. With the health data manager Vivy, consumers have been able to centrally collect and manage their medical data from doctors and healthcare facilities for several years, prior to the introduction of the official 'digital patient record' by Germany's Ministry of Health[4] (Boden et al. 2024, pp. 85–133; Mau et al. 2023, pp. 79–94). Their services are framed as being primarily driven by a mandate from consumers, with the promise of supporting consumers' tasks. Business models in this field are highly diverse, ranging from indirect compensation through brokerage commissions (as in industry-driven intermediation) to direct payments from consumers (e.g., per working hour) (cf. Table 1).

In our investigation, we will focus on such newer forms of 'consumer-driven intermediation', showing that such intermediation work is often invisible to other companies, occurring 'behind' or in the background of consumers (see Fig. 1). This invisibility to organizations may lead to unintended conflicts within these work arrangements. Furthermore, by placing consumers' needs and interests at the center of their actions, consumer-driven intermediation—acting in place of the consumers—may also encounter conflicts of interest with organizations during cooperation. Foundational insights from economics on consumer markets highlight negative market effects that hinder the ideal—or, as economists would term it, 'efficient'—satisfaction of all market actors' interests, potentially leading to market failures (as discussed above concerning principal–agent conflicts, power and information asymmetries, transaction costs, etc.). Some actors with whom intermediaries must cooperate may, due to their business models, attempt to influence consumers' purchasing decisions in ways that conflict with consumer interests (cf. Jensen and Meckling 1976). These resulting conflicts of interest may further impede cooperative arrangements involving intermediaries.

An open question remains as to how these intermediaries can (efficiently) perform their services when they themselves must cooperate with consumer-facing organizations—even in the presence of conflict (cf. Easterbrook 1996).

[4] https://finanzguru.de; https://www.rightnow.de; https://vivy.com, last access 10.03.2025. We have only given examples from the literature of those who did not take part in our study in order to guarantee our participants (intermediary 1 to intermediary 5) anonymity. Their descriptions can be found in Sect. 3.2. Additionally, these examples show how such intermediaries can assist with monitoring, claiming, and documentation tasks, while at times possibly relying on business models adverse to consumers' interests (e.g. data driven or brokerage business models).

Table 1 Overview of the intermediaries interviewed. (Interview form: F2F = on-site interview; VC = video conference)

Intermediary ID	IF	Industry	Time in the market	Number of employees	Number of customers	Business model
I1	VC	Energy supply	-[a]	-[a]	-[a]	Brokerage commission
I2	F2F	Insurance & financial advisory (Branch)	13 years	15	≈ 2.000	Brokerage commission
I3	VC	Health management	3.5 years	11	120 users from 60 companies	Paid by an employer for its employees
I4	VC	Document management	> 10 years	15	> 100.000	Freemium
I5	F2F	General administration with focus on older consumers	21 years	13	≈ 100 (active)	€/h

[a]To protect the anonymity of the participating company, the respective values are not presented and have been redacted in the transcripts

2.3 Conflicts and Interoperability in Cross-Boundary Work Arrangements

Cross-boundary cooperation (Gasson 2006; Tushman and Scanlan 1981), along with its associated conflicts and resulting breakdowns, has been extensively studied in CSCW for several decades (Abraham and Reddy 2013; Avram et al. 2009; Easterbrook 2012; Lee and Schmidt 2017; Olson and Olson 2014; Symon et al. 1996).

Easterbrook (2012) frames it as a '[…] phenomenon in interactions both between individuals, and between groups of individuals' describing it as '[…] the opposite to "cooperation"'. In this context, Bardram (1998) argues that breakdowns should not be seen '[…] as a problem but as an important resource in design', as they allow researchers to observe 're-coordination'/coping strategies that actors develop to mitigate them (Abraham and Reddy 2013; Easterbrook 1996).

In their studies on remote collaboration, Olson and Olson (2014) propose a socio-technical perspective to structure the wide variety of conflicts in distributed work, categorizing them as occurring on either a social or a technical level. The latter, the technical level, refers to the design of appropriate cooperation infrastructures and the media used within them. Moreover, Olson and Olson note that many barriers to collaboration are social rather than technical and, while not unmanageable, are often overlooked because people are less aware of these issues and therefore less likely to address social-level conflicts.

Conflicts on a social level. On the social level, the previously derived conflicts stem from the differing interests of the actors involved and the systemically induced invisibility of consumer-driven intermediaries. CSCW studies describe such socially induced conflicts (Dahrendorf 1958) as arising from potentially incompatible or opposing goals, objectives, values, and aims (Easterbrook 2012, 1996; Putnam 1987), often triggered by competition for scarce resources, or, in other words, benefits and incentives (Easterbrook 1994; Grudin 1988; Olson and Olson 2014; Pondy 1967). In pursuing their respective goals, objectives, or values within inter-organizational activities, each cooperating actor exercises a certain degree of independence within the shared work arrangement (Schmidt and Simone 2000). To address such conflicts, coordinative efforts are required to achieve interoperability among people, groups, and organizations.

Furthermore, studies indicate that socio-structural conflicts can emerge in functional relationships when the procedural alignment with interacting (social or technical) systems is neglected. These systemic issues may, for example, disrupt the 'flow of information' (Pondy 1967); (see also Avram et al. 2009). As a result, conflicts may arise from '[…] an error of communication or of perception by either party, or a difference in understanding of the situation' (Easterbrook 1996).

Conflicts on a technical level. Conflicts and breakdowns in cross-boundary work arrangements also manifest in the technical infrastructures that

intermediaries rely on to cooperate vis-à-vis different parties. Duckert et al. (2025) describe that infrastructure and work itself influence each other. While work occurs within a local context (such as households or intermediary firms), in practice it is often co-determined by the infrastructure and influenced by (invisible) independent entities embedded within it, such as people, artifacts, systems, and more (ibid.).

Intermediaries seek to integrate into, or position themselves as, cooperation infrastructures, building a bridge between consumer households and organizations (and their systems), thereby creating interoperability between actors and their information systems. Consequently, intermediaries develop what Suchman (1996) describes, 'artful integrations' into the infrastructure of the market—elements that CSCW research seeks '[…] to bring […] forward into the light'. In doing so, intermediaries' employees utilize a subset of tools within a heterogeneous infrastructure landscape (cf. Hüllmann 2022).

Regarding the use of various tools, HCI research has developed influential theories on media appropriateness, such as 'media richness theory' (Daft and Lengel 1986) or 'social information processing theory' (Fulk et al. 1987) along with subsequent developments focusing on symbolism (Trevino et al. 1987), synchronicity (Dennis et al. 2008; Dennis and Valacich 1999), social presence (King and Xia 2007; Rice 1993), and other factors influencing media use (Ishii et al. 2019; Robert and Dennis 2005; Sitkin et al. 1992). All of these theories aim to predict which characteristics media used in cooperative infrastructures should possess to identify the most suitable medium—a task that is challenging to generalize across countless diverse situational contexts (cf. Suchman 1987). Nevertheless, these media-related theories remain highly relevant for designing effective CSCW systems (Kies et al. 1998).

Finally, over time, an intensive scholarly discourse has led to an understanding that many different cross-boundary work arrangements are shaped by the complex interplay of technical and social factors (cf. Olson and Olson 2014). Work arrangements and infrastructures must therefore be conceptualized as an interwoven picture of actors and systems that have evolved over time, rather than being reduced solely to market mechanisms or media use. This multi-perspective view provides a compelling empirical lens for investigating the work of consumer-driven intermediation.

3 Methodology

To investigate the bridging work performed by intermediaries, we employed a qualitative multi-method approach. This allowed us to consider both social and technical perspectives as we uncovered the work practices of the five intermediaries we studied. In doing so, we examined them on two analytical levels (cf. Olson and Olson 2014):

- commonalities in work arrangements and associated social perspectives, and
- interactions with infrastructures from a technical perspective.

From a socio-technical standpoint, these two levels are inseparably interconnected, mutually influencing one another and together shaping the resulting work practices of the intermediaries. Within our multi-method approach, we aim to capture the shared understanding of this 'community under observation' at both levels, along with their patterns of interaction, cooperation, artifact sharing, and the use of 'specific technologies' (Kies et al. 1998). To achieve this, we followed an iterative two-step research process:

(1) In the first step, we conducted five qualitative interviews with founders of intermediary companies (cf. Crabtree et al. 2000; Rohde et al. 2017), who all also have first-hand experience with the type being required, as they built these companies themselves from the ground up. In these interviews, we asked participants to elaborate on their businesses and relationships, to narratively describe and explain concrete work practices, and to present related artifacts. This approach enabled us to gain insights into both analytical levels.

The interviews followed a semi-structured guideline covering topics such as (I) business models, (II) perceived customer pain, (III) cooperation work with consumers and (IV) with organizations, (V) digitalization and automation, routines, and (VI) challenges. Whenever possible, alongside the interviews, we collected and analyzed various work artifacts, including advertising materials, client-related documents (both physical and digital), binders, and apps.

(2) Following up on the interviews, we sought in a second step to deepen our understanding and interpretations from the interview study through direct field observations. To capture work practices more directly and in situ, one of the authors conducted a one-week participant observation in one of the five firms, acting as an intern to gain deeper insights into the cooperative work practices of the intermediaries in real-world settings (Kies et al. 1998). For this fieldwork, we selected a firm operating across multiple industries to observe work practices that are comparable to those of the other intermediaries (see Chapter 3.2).

During the observation, detailed field notes were taken in five- to fifteen-minute intervals, supplemented by photographs of the observed activities and artifacts. The notes included verbatim quotes whenever possible, which were finalized and revised at the end of each day. During the observation, the researcher participated in meetings, self-performed internal and

external-directed tasks, and engaged in informal discussions with employees (Boden et al. 2009). Here, the researcher sought to minimize interventions in order to avoid disrupting ongoing work practices.

The results on the two different levels on analysis are first described separately in this paper, leading to joint discussions and conclusions. We only present findings that we could comprehend by both the interviews and the fieldwork. However, in the presentation of infrastructuring practices, data from the field observations predominate as they provide a greater level of detail as quotes from the interviews.

3.1 Sampling and Participants for the Interviews

As part of the recruitment phase of our research process, we contacted ten German firms from different industries to request whether we could investigate their work practices as part of our study. Five of them responded and agreed to participate in the interviews, with one also granting us access for field observations. Through prior research projects in adjacent contexts with these participating five intermediaries, we had already established trusted relationships—either through personal contacts or through our research institution—which facilitated access and enabled a trustful research cooperation. The five participating intermediaries vary in their business model, industry and size of the customer base, providing a diverse sample for our interviews (see Table 1).

All interview participants are the founders of small startups or branches. Their ages ranged from 34 to 67, with a median age of 36. Four were male, and one was female.

We selected founders, as they possess a certain level of abstraction over the entire firm, as well as detailed knowledge of all basic practices, processes, and products from the beginning of their founding. Because of the relatively small size of the firms, our participants not only hold a managerial perspective but also engage in day-to-day operations as senior employees with the most client experience. At Intermediaries 1 and 2, we learned from the interviews that the founders still manage their own clients, while at the other firms, the founders were the first employees and had previously performed the same tasks now handled by their staff. All the founders are frequently hands-on involved or consulted by other employees on how to handle specific client issues or for background information on particular clients, as they accumulate knowledge across the entire firm. Furthermore, over the years, they have gained experience through trial and error, learning what works and what is feasible or accepted by consumers, partners, and both private and public organizations.

As we interviewed only one person per organization, we acknowledge the potential risk that this could make otherwise heterogeneous organizations appear homogeneous. However, our analysis focuses on fundamental commonalities and

differences between intermediaries interacting with organizations, rather than on internal workplace conflicts within a single intermediary.

Due to the partly large number of customers that each of these companies represents (ranging from hundreds to hundreds of thousands) and the many years of experience (three to 21 years), this sample accumulates a very large number of consumers and their resulting consumer work. It thus also forms a broad spectrum of consumer-driven needs, interests, and experiences with many cooperating organizations. This helps to capture and understand a variety of dynamics within the inter-organizational marketplace. Furthermore, while the five intermediaries in our study have different business models, ranging from traditional brokerage commissions over monthly subscription fees and freemium app models to a payment per working hour, they all share a common customer promise of serving primarily or exclusively the interests of their clients following a consumer-driven approach.

Through our well-established rapport with the companies, the interviews were conducted in a trustful and candid environment, facilitating open dialogue about sensitive issues such as undisclosed business models and collaboration hurdles with other organizations. For example, we were able to have honest discussions about principal-agent conflicts (Akerlof 1978; Jensen and Meckling 1976), even among intermediaries. To ensure confidentiality, identities were pseudonymized (see Table 1), and certain passages in the interview transcripts were redacted. This precaution was essential in the competitive but also trust-based market landscape, which could lead to potential risks if identifiable details were disclosed.

3.2 Field Description

In the following, we provide an overview of the different intermediaries involved in our study, in order to help the reader to understand the context of the following findings.

Intermediary 1 in the energy sector. Intermediary 1 (I1) assists consumers in always having the best energy tariff. A client of I1 first specifies the characteristics that a tariff must match, such as lowest price, sustainability, regionality, etc. Then, within the spectrum of these characteristics, the firm continuously searches for the best deal and either (a) regularly makes recommendations to the consumer via email with an offer to change the tariff, or (b) adjusts the tariff automatically using a pre-signed power of attorney. The standard business transactions for I1 include comparison, commissioning, tariff changes, contract termination, and providing information about contract updates (e.g., price increases). I1 receives a brokerage fee from the energy supplier when facilitating a tariff change or commissioning a new contract. However, I1 assures consumers that this payment is accepted solely as a standard industry practice, enabling the company to offer its consumer-driven service free of charge.

Intermediary 2 in insurance and financial advisory. Intermediary 2 (I2) is a branch headed by our participant, who works as a freelance financial advisor and independent insurance broker. He employs 14 staff members who assist him in advising consumers on their financial affairs. I2 earns revenue through commissions from brokering financial products. As a representative of the insurance industry, I2 places orders for financial products on behalf of consumers, while also promising to support them—both before and after the conclusion of contracts—with inquiries, insurance claims, and the modification or termination of contracts.

Intermediary 3 in health management. Intermediary 3 (I3) is a startup that partners with employers to support the health management of their employees and their family members through so-called 'employee assistance programs' (Walsh 1982). The employer pays for the service on a monthly subscription basis, allowing employees, as users of the services, to receive support from I3 for health challenges or preventive care. If an employee in the role of a consumer experiences a physical or mental illness, the intermediary provides advice and guidance on how to address the issue. One of I3's most common business activities, alongside the initial assessment of diffuse symptoms, is assisting consumers in securing specialist doctor appointments or therapy placements, as well as supporting them with health insurance claims and billing. In practice, I3 arranges appropriate appointments for consumers and communicates relevant medical or health-related information, as obtaining specialist care or therapy in Germany is often very difficult—particularly for individuals with mental health conditions.

Intermediary 4 in document management. Intermediary 4 (I4) is a digital startup that offers an app for managing personal paperwork and related documents. The founder's vision is to improve cooperation between providers and consumers through the use of boundary objects, beginning with the digitization of paper-based artifacts. I4 seeks to achieve a fully digital simplification of service processes, enabling organizations and consumers to cooperate on equal terms. The company follows a freemium business model, providing a free app with basic features that users can upgrade via a subscription plan to access additional premium functionalities.

Intermediary 5 in general administration focusing on older consumers. Intermediary 5 (I5) is the oldest of the firms we observed and has no specific industry focus, but primarily supports older consumers with general administrative tasks, similar to a 'family office' for wealthy families (Dunn 1980). I5's 13 employees manually manage paperwork across various sectors, including energy, (health) insurance, finance, and document management. Its services primarily involve handling all correspondence, organizing and archiving documents, processing insurance claims, preparing financial overviews, carrying out financial transactions, assisting with tax preparation, and managing living wills, powers of attorney, and estate administration. The firm's most frequent activity is

claiming reimbursements for health services for privately (additionally) insured consumers.

We selected I5 for the one-week in-depth participant observation due to our longstanding collaboration, trustful relationship, and, most importantly, its broad range of working contexts across various industries as a general administration service provider for its clients. Additionally, I5 is the longest-standing firm among all participating intermediaries, offering the broadest variety of services. Hence, the practices we observed there cover a very broad range and, at the same time, can be expected to be rather stable and established. Unlike sector-specific intermediaries, I5 primarily serves older consumers—many of whom are physically or mentally impaired—across all areas of private administration. This creates thematic overlaps with all other participating intermediaries (I1–I4). Because many of I5's customers have particularly limited autonomy, it was possible to observe the extent to which intermediaries can support consumer work, even up to a nearly autonomous execution.

3.3 Data Analysis

After completing the data collection, all interviews were transcribed and reviewed by the authors. Field notes were taken during the observation and completed at the end of each day. The two types of data were analyzed side by side through a comparative coding process.

Throughout the study, approximately five hours of interviews—each lasting about one hour on average—were conducted, alongside roughly 35 h of fieldwork distributed over typical seven-hour observation days. The fieldwork resulted in 39 pages of detailed field notes. Additionally, 20 photographs were taken during the interviews and fieldwork.

To consistently analyze the interview transcripts and field notes, identify common patterns, and develop themes, we used thematic analysis for both types of data (Braun and Clarke 2012). Drawing on prior studies on consumer work, we focused on work artifacts, procedures, and collaborative efforts as key analytical topics (cf. Dethier et al. 2024a). We also applied an analytic lens from material culture theory (Lueger and Froschauer 2022), treating artifacts as embodiments of practice, through which knowledge, skills, and meanings are materialized and made observable.

Within our iterative, two-step research process, one researcher first analyzed the interviews, developing a coding system from the insights gained. The emerging themes and patterns were then applied to the field notes, and the coding system was refined accordingly. This iterative process alternated between interviews and field notes to ensure robust theory development across the two data sources. Photographs and other materials visually enriched the analysis, supporting a deeper understanding of the material aspects of the practices examined.

Several joint interpretation workshops (Heinze et al. 2020) were conducted to discuss interpretations, theme naming, and develop documentary accounts of the examined work practices. These sessions enabled all authors to align their understanding of the context and work practices, ensuring a unified interpretation (Crabtree et al. 2000) of the intermediaries' cooperative work.

4 Findings

4.1 Understanding the Cooperative Work Arrangements

In the following, we first present the insights regarding the cooperative work arrangements, which are primarily derived from the interviews conducted across the different intermediaries, but are enhanced by our deeper understanding from the fieldwork as outlined in our two-step research approach above. As we will show, when an intermediary integrates into the consumer-to-organization cooperation, a newly formed working arrangement must first be (1) articulated and established. Within this arrangement, we identified (2) common conflicts and breakdowns, as well as (3) the coping strategies used to mitigate them.

4.1.1 Establishing and Articulating Work Arrangements

According to our study participants, the consumer work that is handled generally arises from a series of contractual relationships or civic obligations with multiple private or public organizations. Consequently, heterogeneous relationships result from the diversity of consumer needs and the resulting complex relationship landscape: large vendors versus small enterprises, commodity products versus solution-oriented services, differing industries and their regulations, public versus private institutions, etc. As I4 stated: 'So, there is not just one private individual, there is not just one company […]. They all have different challenges and approaches'. For both intermediaries and consumers, this heterogeneity presents a challenge to maintain an overview and achieve harmonization, as I1 describes:

> 'We have a rather large number of providers here, all of whom have slightly different processes and it is not enough just to squeeze this into five processes and then the issue is over; instead, if we add up all the contract processes alone, we end up with a very high number of different contract processes'.

I5 also highlighted the complexity of determining whom to contact, even for a single topic:

> 'You can't call an insurance company today and clarify everything with one person. You have your own contact person for every single piece of the

puzzle. There is the care insurance company, there is the health insurance company, [etc.]. You can only ever handle everything in facets, and that makes life difficult for people' (I5).

Entering the new work arrangement. When intermediaries enter such a complex relationship landscape as a third party from the outside, they must establish themselves within a new working alliance (see Fig. 2). To do so, intermediaries like I2, I3, and I5 first carry out an inventory to gain an overview of the existing contractual relationships within the respective industry sector, helping to bring structure to each client's complex situation. I5, for instance, collects postal mail, as many of its customers accumulate large amounts of unanswered correspondence at home: '[It] also happens that people have piles of paper, have collected them for years, [and] have no overview at all [such as] […] piles of payment warnings' (I5). From there, I5 identifies which tasks must be addressed immediately, such as settlements with health insurance companies or responses to incoming requests. From I5's perspective, they primarily collect and organize, for example:

'Invoices, letters from the tax office, for electricity, water, house, utility costs, documents that we [...] gladly file are health care powers of attorney, living wills, [...] passports copies, copies of ID cards, [...] bank statements, but it depends on the customer to what extent they are willing […] to give us access'.

I2, as a financial advisor, creates an overview of the current financial obligations and financial products that could be optimized, changed, terminated, or might be missing—such as essential health, life, pension, or property insurance. 'If we are honest, probably only 20 percent of customer folders are neatly sorted before they come to us. 80 percent are really messy'[5] (I2). I2 continues that:

'[...] sometimes there are also evidence documents that are needed in the event of an insurance claim [but] [...] you have a folder full of [...] 500 sheets of paper, [...] which of those 500 pages are really relevant? In most cases, maybe 20–30–40 pages'.

If desired, I2 and I5 create a so-called 'emergency folder' by collecting and organizing documents that contain the most important records such as birth certificates, marriage and divorce certificates, church documents, copies of ID cards and passports, important contacts, CVs, term contracts, passwords (at I5, see Fig. 3a-b), pension plans, health, long-term care, accident, life and property

[5] [originally, he said 'bird wild' instead of 'really messy' but this translation would make no sense].

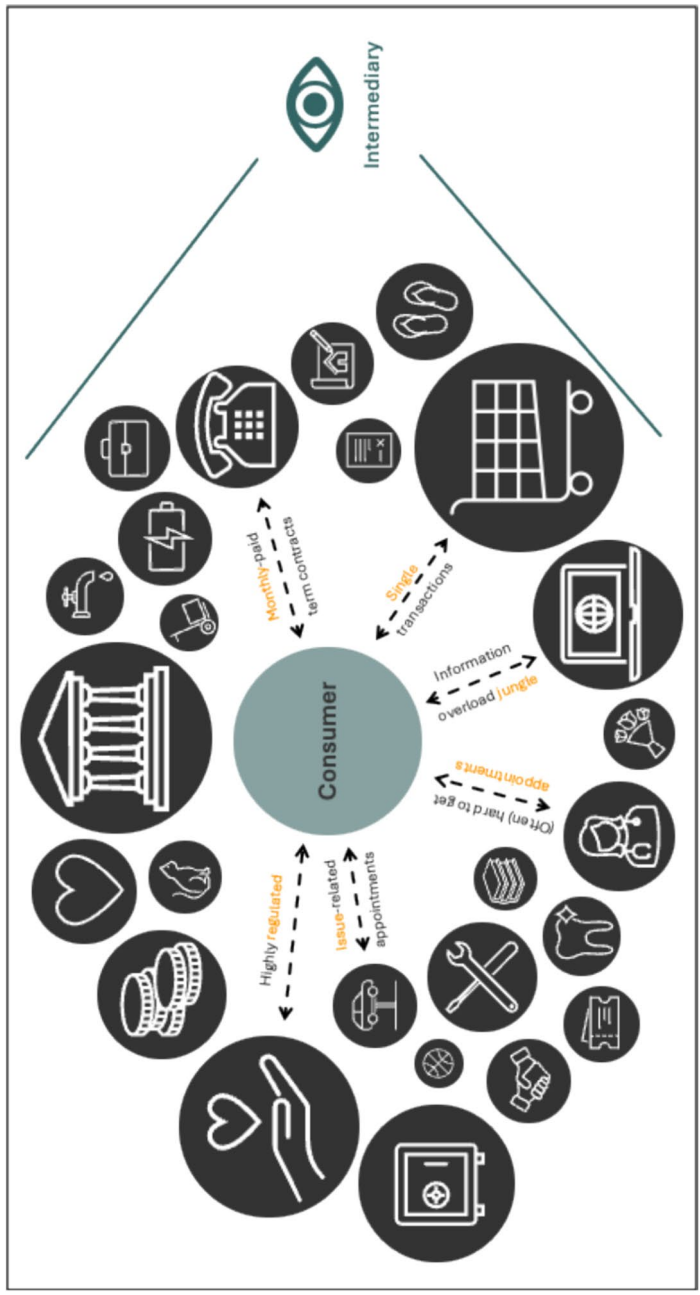

Fig. 2 Allegorical illustration of the messy, heterogeneous relationship landscape with an intermediary as an outside third-party

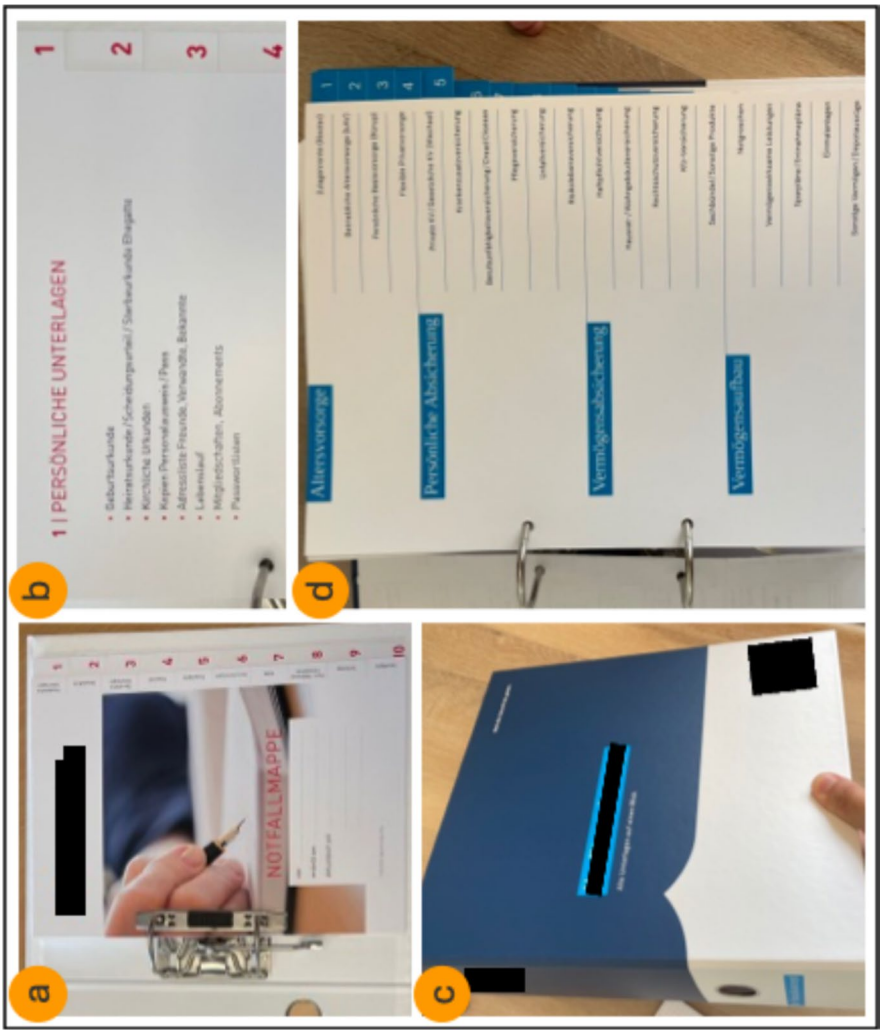

Fig. 3 'Emergency folder' at I5 **a**, **b** and I2 **c**, **d**

insurance, as well as other financial plans and assets (at I2, see Fig. 3c-d). Both intermediaries call it an 'emergency folder' because, in the event of a crisis—such as a house fire, an unexpected hospital stay, or the death of the respective person—all essential documents can be accessed at once. What is considered an important document varies slightly between I2 and I5. The term 'emergency folder', however, serves as a catchy label by appealing to consumers' general desire to be prepared for emergencies.

Here, I2 (and also I4 in general) provides their clients with a free app for handling such documents by themselves, getting them automatically sorted by the software, and sharing them digitally with third parties. With their document app, I4 states that they provide a '[…] peace-of-mind feeling. So that you know you have a structure [with your documents]'.

The heterogeneity and the high volume of paper-based artifacts result in highly manual, labor-intensive tasks that are challenging to automate, digitize, and systemically integrate, as I3 notes: 'Until the end of last year, I would have said that we were 80 percent manufactory. […] Now we are perhaps at 65, 70 percent, as can be seen from the personnel cost ratio […]'. This is also due to the often extensive human-to-human interaction, which entails a significant amount of articulation work.

Articulating the work arrangement. As we have explained above, we found that acting on behalf of a client requires a particular articulation of the current work arrangement. I5 essentially sums it up: 'We usually communicate with powers of attorney. […] We usually attend the appointments with powers of attorney'.

To articulate their 'rightful' role as intermediaries, I2 asks the customer to sign all actions before sending them out. In contrast, I1, I3, and I5 have their work arrangement authorized by a power of attorney statement in advance. At I1, this is done by signing specialized general terms and conditions online: '[You just] make a tick. 'I accept the terms and conditions' […] We write […]: 'I [as a consumer] hereby authorize […]'. This is easier to negotiate as a paper-based, and notarized (general) power of attorney that I5 requires for their work. Here, I5 either uses a template from the German Federal Ministry of Justice (see Fig. 4) or asks their clients to create individual documents at a notary, exclusively issued in paper format. In practice, I5's articulation work is carried out '[…] either by telephone or, if that is not possible, by email, by sending the power of attorney and then receiving information in this way'.[6]

Such notarized general powers of attorney, as utilized at I5, have no legal limitations within the work arrangement. Instead, I3 perceives some restrictions in its work constellation, as some actions must ultimately still be carried out by the consumers themselves. As I3 describes: 'We cannot take the step. We can't issue

[6] Reference: https://www.bmj.de/SharedDocs/Downloads/DE/Formular/Vorsorgevollmacht.pdf?__blob=publicationFile&v=6; Version from January 2023; last access 10.03.2025.

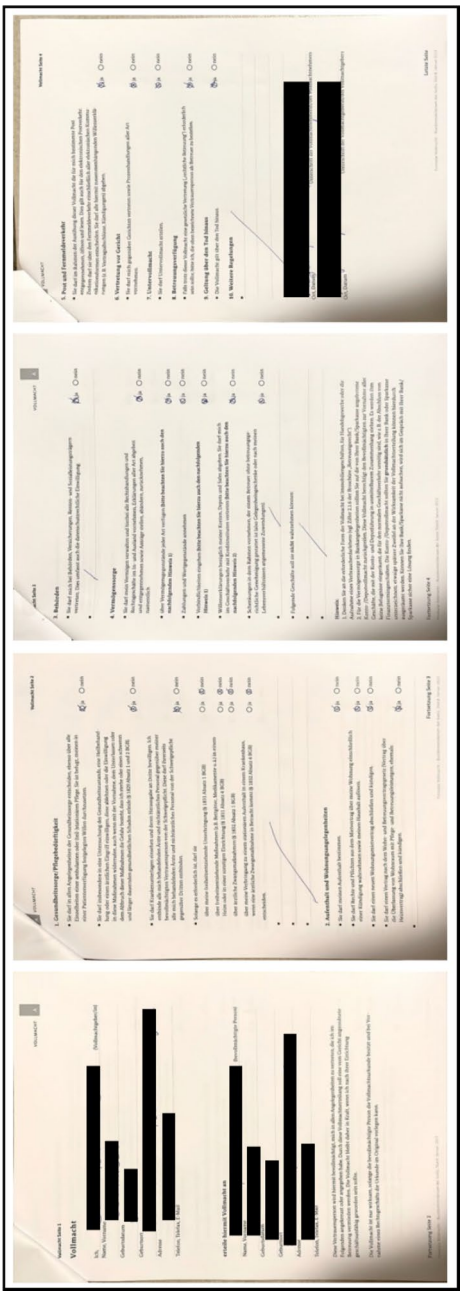

Fig. 4 Record of a power of attorney at I5 based on the template of the Federal Ministry of Justice of the Federal Republic of Germany

the transfer ourselves, but we can make the process as easy as possible. In other words, we inform [the consumer] beforehand. […] What do you have to say there to get it?'.

4.1.2 Challenges of (Not) Being 'Man in the Middle'

Equipped with a negotiated and articulated working arrangement, the idea is that the intermediary—as the name suggests—positions itself between a consumer and an organization (either within a specific industry or in general) and acts as an interface for both, as visualized schematically in Fig. 5a.

However, the complex and heterogeneous relationship landscape of providers, combined with the variety of communication infrastructures, makes this positioning challenging. By intervening in the one-to-many (1:N) relationship, intermediaries encounter obstacles arising from communication channels and systems designed to interact directly with consumers, without accounting for their role. Hence, 'simply' positioning themselves as middlemen is a major challenge, as the following two examples illustrate (see Fig. 5b-c). Even though well-established through their brokerage activities, I1 and I2, operating as recognized intermediaries within their industries, are often excluded from organizational communication directed toward consumers: '[…] if there is correspondence that is only available by postal mail [that goes directly to the customer], there is no possibility of obtaining the information' (I1).

Example 1: health care billing. I5 regularly mediates in the medical billing process on behalf of the consumer, coordinating between the billing doctor, the paying insurance company, and any supplementary insurers. This often also involves further organizations, such as medical supply stores, pharmacies, appointment platforms, the consumer's bank, or even the tax authority. The process includes several work steps, such as:

(1) checking the invoice (e.g. plausibility, already paid or not, due date, etc.),
(2) submitting it to one or more insurers (by postal mail, email, or via an online portal) including medical prescriptions (see Chapter 4.2.2 below),
(3) tracking and following up on the reimbursement,
(4) checking the reimbursement (sometimes repeatedly until it arrives),
(5) clarifying any issues with the reimbursement (this happens often) with insurers and the billing doctor, and
(6) transferring the invoice amount to the biller via the client's bank account.

In this context, I5 stated that this is:

> '[…] exactly what is left undone. [The clients] receive payment reminders from the doctor. We also have clients where [they have] stacks of reminders from all kinds of medical institutions because [they] simply don't manage to get the money [reimbursed]'.

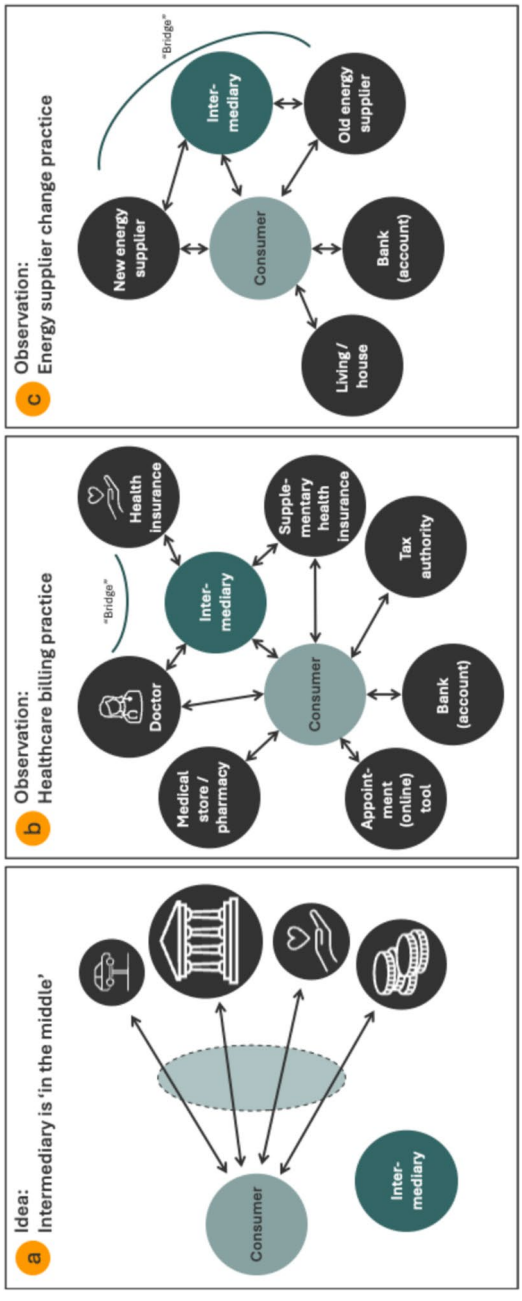

Fig. 5 Idea **a** versus empirical findings **b**, **c** of being 'in the middle'

In this way, as shown in Fig. 5b, the intermediary bridges cooperation between the biller (doctor) and the bill payer (insurance company) and thus performs the consumers' work.

However, within the flow of cooperation/communication, I5 is neither recognized as an intermediary nor acknowledged as actor on its own, since all responses from the organizations are addressed directly to the consumer (e.g. via postal mail or email). Instead, as Fig. 5b implies, the consumer remains at the center of all communication, requiring the intermediary to step in and coordinate case-specific exchanges between the consumer and multiple interacting organizations. This includes managing the initial invoice from the doctor as well as handling issues, answers, and reimbursement statements from the insurance company in reply to requests submitted by the intermediary (either under its own sender identity or via the customer's account on online portals).

As I5, despite its long-standing history, is still a relatively unknown player in this industry, they explained that they must invest considerable effort to establish themselves and articulate their role towards the organizations. They usually exchange confidential patient data during healthcare billing practices and therefore the formal power of attorney is often essential for their work and must frequently be presented multiple times to the same organization.

Example 2: energy supplier change. I1 aims to ensure that consumers always have the best energy tariff and therefore completely takes over transaction costs in the transition process from an old to a new energy supplier (see Fig. 5c). In doing so, they continuously monitor the market rates for their clients. When it comes to a contract change,

(1) the new supplier must be commissioned,
(2) the old supplier must be terminated,
(3) the current (water, electricity, or gas) meter reading and the meter ID must be transmitted to both the old and the new supplier,
(4) the amount of the monthly advance payment aligned with the consumer's consumption and other recipient-specific details, must be negotiated, and
(5) the order status must be continuously monitored until the process is complete.
(6) If an issue arises, I1's employees must fix it.

As a standard business model in this sector, I1 is less frequently required to articulate its role in the work arrangement than I5. Nevertheless, I1 still faces the major challenge that some suppliers ignore or block their inquiries or termination requests, and customer communications such as price increase notifications do not reach them.

To resolve such conflicts and establish themselves as intermediaries toward an organization, our participants employ specific practices and special artifacts, as discussed above. The goal is to create a lasting work arrangement in which all

communication is directed entirely to the intermediary, who is authorized to act on behalf of the person, as observed in our fieldwork: '[One employee] create[s] a letter for a client's pharmacy so that the invoices are sent to [I1] and not to the client' (Fieldnotes Wednesday).

However, this requires the intermediary to be accepted by the organizations, which must acknowledge this arrangement in their customer relationship management (systems). We found that this was often not successful. As we have discussed with the participants, the interviewed intermediaries frequently perceive that they are (either intentionally or unintentionally) ignored by the organizations, despite their articulation of the newly formed work arrangement. The intermediaries reported that organizations often resist cooperating with them, leading to conflict situations. For instance, our interviews revealed a notable perception among the intermediaries, with three explicitly stating, that some organizations deliberately sabotage collaboration:

> '[...] Not every [energy] provider appreciates that we exist [...] and therefore don't make life easy for us. [...] Classically, you have very much a game of cat and mouse [in the cooperation]. They bet on inertia, and we are canceling out inertia. [...] And depending on how the partner understands us, [they] make it easier or less easy for us [...]. So, a partner or a provider who doesn't like us won't provide us with an [application programming interface (API)], and then it's up to us to communicate this in other ways. And nobody can prevent us from carrying out an action in the interests of the [consumer] but can only make it a little more difficult [...]' (I1).

This often leads to silent breakdowns, as it sometimes occurs at I5 that an insurer does not receive a reimbursement claim or requests additional information that has already been provided, with the issue only becoming apparent when the intermediary follows up. Similarly, at I1 or I2, for example, a termination during a contract change was not accepted and therefore not processed, with I2 stating that '[t]here is a certain regularity to it, and maybe even a systematic approach with one insurer or another'. Furthermore, digital interfaces (APIs) or access to cooperative systems are often not provided, which complicates and slows down cooperation.

In the following, we will analyze the coping strategies of the intermediaries that have to deal with such (perceived or real) breakdowns in the cooperation arrangement.

4.1.3 Coping Strategies I: Redirection and Onsite Work

As a first coping-strategy category, we found that the intermediaries seek to redirect the communication coming from the organizations that is meant to go directly to the consumer:

Redirection by authority. At I5, it is common practice to establish a forwarding order with the postal authority, a supervisory governmental entity that can control message traffic (exclusively) in the postal system. Postal mail that would normally be sent directly to the consumer's address is redirected to the intermediary's office. 'We work a lot with postal mail forwarding requests so that the mail no longer gets lost and doesn't end up in a corner somewhere […] but actually arrives here and can be processed promptly.' (I5). These forwarding orders are originally intended for situations where consumers move and not all organizations have their new address.[7] However, this service is only available for the postal system and does not extend to emails, phone calls, or other communication media (see Fig. 6).

Redirection by consumer. Furthermore, when possible, the consumer is requested to forward incoming mail or other needed information from their home to the intermediary. I1 advises clients to forward everything they receive to them via email: '[…] simply take a photo of everything that comes from the provider in case of doubt and then pass it on'. In some cases, the intermediary may need to receive not only messages but also information that can only be accessed on-site at the customer's home, such as a photo of the water meter within the apartment. To professionalize this forwarding strategy, I2 has integrated an upload function into its client app or provides a link to cloud storage so that their clients can share documents with them: 'They are simply photographed via an app and immediately deposited with us—we call it the advisory folder—our digital customer folder, so to speak. […]' (I2).

Redirection via platform. At I3, for example, the team shares doctor's appointments through brokerage platforms: 'So, we basically appear like a doctor's office, […] with our own clients, patients, calendar and can send appointments from the calendar'. To this end, I3 is trying to establish new partnership models with platform organizations.

On-premise work. Some parts of consumer work still require tasks to be completed on site at the consumer's home. That means consumers, their relatives, or the intermediary must be physically present to carry out certain actions. As I1 explains: 'There are actions that we cannot do […] that have to do with your own four walls' (I1). In this case, all interviewed intermediaries except I5 ask their customers to do work onsite. But at I5, their customers are often no longer able to do this due to their (usually age-related) limitations, so I5 employees visit their customers regularly: 'Yes, there must be someone on site who visits the lady regularly'.

4.1.4 Coping Strategies II: Utilizing Awareness

The second coping-strategy category we identified is the development of a certain awareness regarding organization- and industry-specific processes, which intermediaries build through their long-standing experience:

[7] https://www.deutschepost.de/de/n/nachsendeservice/haeufige-fragen.html, last access: 10.03.25.

Fig. 6 Mail at I5 that was re-directed by mail forwarding order (the yellow sticker is added by the post authority for redirection)

‘[...] Provider-related communication[:] In some cases, we also do not know exactly when what is being communicated. Keyword: price increase. We know rough patterns. We still actively ask [our clients] when the probability is very high […]’ (I1).

Here, we noted several aspects:

- **Awareness of patterns.** Anticipating correspondence that will reach consumers allows intermediaries to proactively address potential issues, as illustrated by I1’s comment about expected price increases above. This also ensures that consumers are prepared and informed about possible outcomes: ‘Should I take action? What happens if I do nothing?’ (I1).
- **Articulation awareness.** Understanding the processes of an industry is crucial for some intermediaries, who often possess a highly developed awareness of these processes and can therefore handle complex requirements and terminology effectively: ‘[…] We explain to the person seeking help what they have to say there so that they get what they need’ (I3). This awareness also reflects a sensitivity to wording, as I2 describes:

‘[...] What do you write so that the insurer directly understands what is meant? Do we really have a compensation claim? And sometimes a bit of sensitivity is required. Not to deceive the insurer in order to receive a compensation that you are not actually entitled to, but simply to ensure clarity. Insurance German is just not a common language virtue’ (I2).

- **Process awareness.** At I5, employees streamline their workflow by identifying procedural efficiencies when handling healthcare claims:

‘Actually, I have to submit each invoice individually here, but I just take one and enter the invoice data [...]. I then add the other invoices, and they are all reimbursed, too’ (Field notes Friday).

- **Organizational awareness**. I2 explains that he knows whom to work with, selecting from multiple customer-facing actors and departments in each respective case:

‘Of course, we have at least one key account manager at every single company who is the go-to guy [...] because if we ever have pain [and] are dissatisfied with something. [Otherwise] of course, every insurer has its own departments, usually a property division, a pension division, or a life

insurance division, a division for workforce protection. You can also contact them directly. You don't call the key account manager about every nonsense' (I2).

4.2 Investigating Infrastructuring Practices

So far, we have examined common perceptions, challenges, and coping strategies of all five intermediaries in their work arrangements and associated conflicts. In the following, we focus on bridging practices related to infrastructure, which we captured narratively in the interviews and explored in greater depth during our fieldwork. When presenting the results on work practices involving infrastructure, the data from the fieldwork predominate due to its higher level of detail, while we aimed to highlight both the commonalities and the differences also within the interview data.

4.2.1 Work Materiality Matters

The cooperative work of an intermediary manifests itself materially in the exchange, processing, archiving, monitoring, and reviewing of various artifacts. We found a range of material artifacts where, on the one hand, materiality plays an important role in the work, and, on the other hand, discontinuities between different media have to be bridged (these will be covered in the following section).

Media discontinuity. In both the field observations and the interviews, we noted numerous media discontinuities in the intermediaries' work. These discontinuities can be understood as breaks in the information flow, occurring when data must be transferred manually between incompatible media or systems, as exemplified by the following observation from Thursday:

> 'She has opened a document in Microsoft Word on the screen, with two binders in front of her, copying documents. Handwritten notes are being made on a document with a pen. She is copying information from another sheet in the binder' (Field notes Thursday).

Here, employees manually bridge the heterogeneous materiality of this work, converting artifacts into the correct format for further processing, as the following notes demonstrate:

> 'When mail arrives from former customers, it is scanned and sent to the contact person via email' (field notes Monday); 'At their workplace, some employees run back and forth in the office [...] From desk to colleague, to scanner, to printer, etc.' (ibid).

For this reason, the work was observed as highly error-prone: 'The work is not difficult, but you can make mistakes very quickly. "Wrong table, wrong column"' (quoted from I5-E7; field notes Monday) (see Fig. 7).

Digitization of paper. To streamline often highly manual, human-executed tasks and minimize potential errors, a common objective at all intermediaries is to digitize all (all incoming) mail and messages. As the CEO of I5 states, '[…] we are currently working on scanning the entire incoming mail […]'. This digitization effort also allows I5 employees to work from home with their laptops, eliminating the need to transport physical binders.

At I2, all paper-based customer documents are digitized by employees during the inventory process and stored in the customer app: 'They are simply photographed via an app and immediately stored with us—we call it the consultation folder […].' In some cases, this digitization must also be carried out by the client when forwarding documents (cf. Section 4.1.3), which is '[…] usually a photo […]' (I1). Meanwhile, I4 (as well as I2) provides customers with appropriate technology for this practice: 'Yes, we have users who come home and just lay their documents on the scanner, press the AI button, and then it is just in the application'.

'Originals'. In some cases, the availability and exchange of certain documents in a suitable 'original' format also play a crucial role. In the office, original documents are perceived as important to keep and share with certain insurers who explicitly require the original invoice, which is perceived as the only genuine representation of valid information. This creates a conflict with digitization goals, as at I5 such documents remain exclusively in paper form. Consequently, 'originals' can only be exchanged via postal mail or in a face-to-face meeting, which, as observed at I5, results in a heavy reliance on postal communication (see Fig. 8a-c).

Nevertheless, consistently articulating artifacts as 'originals' can be a challenge in cases of geographical distance with the client, as I5-E2[8] explained with an example: 'A general power of attorney is held by the son in Australia. The original would be needed here [in Germany] to sub-authorize the company' (field notes Friday).

Usual examples of 'originals' are:

- the 'original' paper-based powers of attorney (see Fig. 4), which are often notarized (only possible in paper form, as digital certificates are not used),
- the 'original' invoice issued by a biller, or
- diplomas, certificates, and other documents belonging to the client and stored on their behalf.

[8] We pseudonymized the 14 employees of I5 observed during the fieldwork, including one of the authors acting as an observer, by assigning identifiers ranging from I5-E1 to I5-E14.

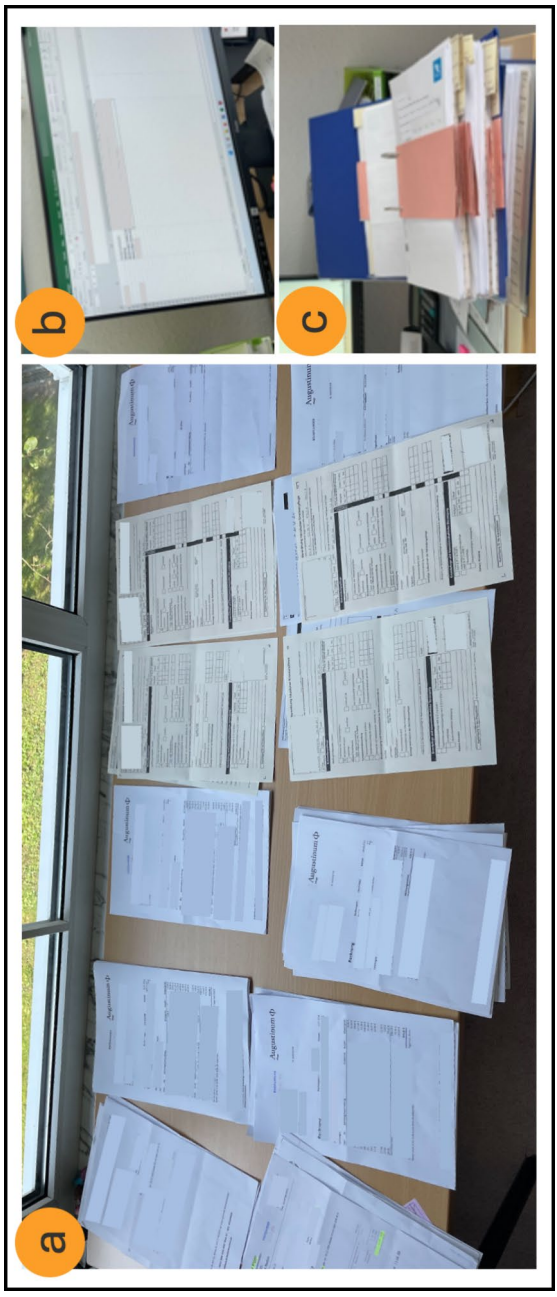

Fig. 7 Different materialities of artifacts at I5

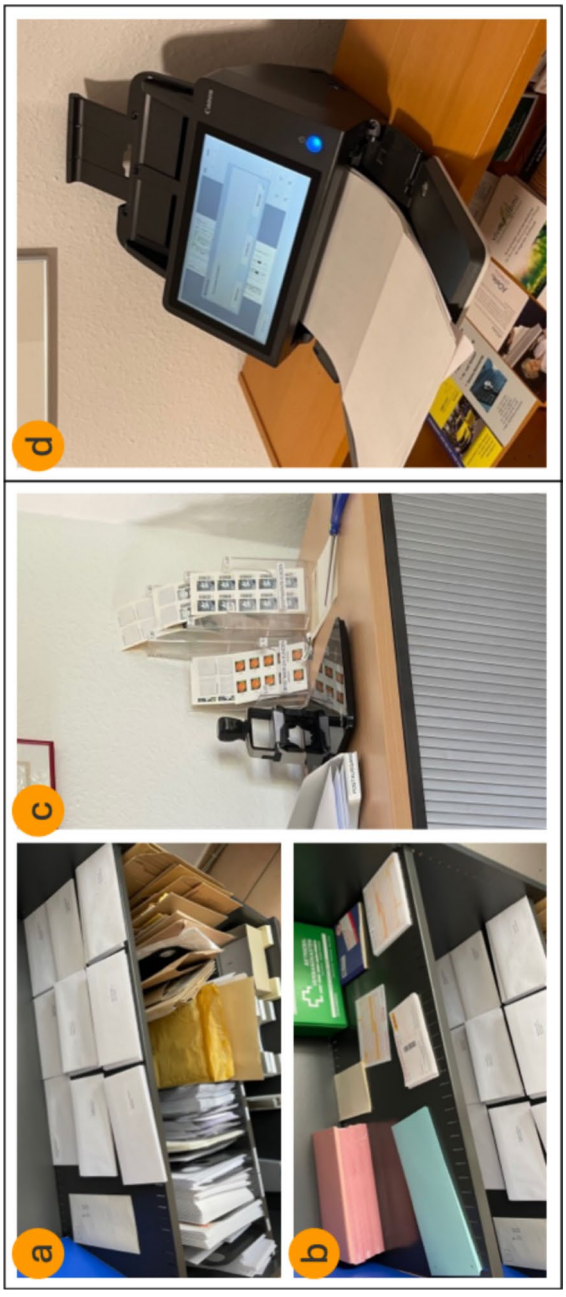

Fig. 8 Artful preparation for handling paper-based artifacts

I2 returns as many original documents as possible to the client, as they may be needed decades later, for example, upon retirement: 'Because these are also partly pieces of evidence that are needed in the event of an insurance claim. If I want to cash out a policy, then I usually still have to send an original insurance certificate back to the insurer'.

Example: 'original invoices'. When billing health services to health insurance companies and subsidy insurance funds, it can be important which organization receives a copy or the original of an invoice. I5-E7 comments: 'The health insurance company gets the original. We make a copy and file it in our office'. If the public subsidy fund is involved, it receives the original invoice, the health insurance receives a copy, and another copy is placed in the client's folder. This results in three copies for the same billing application. If a medical supply store or pharmacy is also involved, the number of copies increases accordingly (see multiple copies side by side in Fig. 7a).

However, we noticed different perceptions of what qualifies as an 'original' and when an 'original' is required—among the employees of I5, the other intermediaries, and interacting organizations. Aside from hand-signed copies, we were unable to identify any distinction between an original and a copy in the case of machine-generated artifacts.

I5-E6, for instance, provides another explanation that shows the complex and varying perceptions of originals across different cases: 'You need an original for some health insurance companies or subsidy insurance funds. [However, some also accept it], even if it is a copy. You may only need the originals for your tax return'.

Follow-up inquiries during the interviews revealed not only varying characteristic properties but also that these requirements typically originate from the organizations themselves, as demonstrated by the previous quote and the following statement from the interview with I2:

> 'Interviewer: What do originals mean?
> Interviewee: Yes, they should be notarized. For the client, it actually doesn't mean anything. But there are certain companies which, unfortunately, still insist on receiving a notarized original.'

Different degrees of digitalization. The processes of the different organizations across various industries, and thus also within the intermediaries, are digitalized to varying degrees. While I1 and I2 can partially rely on more digital collaboration within their relatively homogeneous and well-established business transactions, only a few activities at I3 and I5 are fully digital, as the following quotes illustrate. At I1 and I2, however, processes related to industry-driven operations tend to be largely digital, whereas those involving consumer-driven operations remain predominantly non-digital.

> ‘So via our digital application route […]—I just press send—it automatically goes to our head office for application entry, automatically to the insurer and automatically to the client’s [online] portal’ (I2).
> ‘Usually, orders are transmitted via an API, and therefore this is not a classic correspondence, but rather correspondence is only required when it comes to other actions that the user communicates to us so that we can transmit them on their behalf’ (I1).
> ‘Whether I actually receive the documents digitally from my health insurance company is a bit of a matter of luck’ (I4).

Monitoring and tracking. I5 records internally all client-related actions, as well as their clients’ income and expense statements, customer contacts, and orders, digitally in Excel spreadsheets (see Fig. 7). In contrast, I1–I3 make use of specialized software. I5-E7 emphasizes that monitoring and tracking of workflows and finances are crucial: ‘[…] if you don’t do this or check the invoices, people will lose thousands of euros’ (field notes Tuesday). I5-E7 continues later with a wrong reimbursement from an insurer: ‘“Where did [the health insurance company] get the figures from? I’ve given up trying to understand.” An invoice amount is entered in an Excel spreadsheet. The Excel table is only about the incoming invoices’ (field notes Tuesday).

The requirements regarding materiality when cooperating with organizations lead to varied uses of infrastructures, as we show in the following chapter.

4.2.2 Use of Communication Infrastructure

Despite the messy heterogeneity of communication, we were able to identify some patterns in the use of different communication media. I2 attempts to quantify the various media used: ‘Let’s break it down: 10% customer portal, 20% email, WhatsApp is maybe 30, 30% phone, 5% Instagram, 35% phone’.

Here, across these diverse and fragmented systems—ranging from old to new, digital to analog—we observed various bridging practices employed by intermediaries to achieve interoperability.

In the first stance, we observed that the choice of the communication system for mutual interaction is primarily determined by the organization they cooperate with: ‘[S]ometimes by fax, sometimes by email, sometimes by postal mail. It depends on the health insurance companies’ (I5). The quote from I1 shows that an intermediary must choose another medium if the preferred one is not available: ‘So, a partner or a provider who doesn’t like us won’t provide us with an [API], and then it’s up to us to communicate this in other ways’.

Online portals, applications, and APIs. The intermediaries primarily prefer to use online portals or APIs to cooperate on service claims. These are perceived as efficient options for transferring information securely and with minimal effort:

> ‘Fortunately, you can do it online with the [health insurance company]. It doesn’t necessarily save time, but you don’t have to print it out [,] scan it […], describe it, upload it, check it again, enter the company details and insurance details.’ (quote of I5-E6; field notes Tuesday).

Depending on the industry sector, intermediaries—particularly I5, as we observed—can gain access to specific portals to perform self-service on behalf of their clients.

- **Consumer-directed portals and APIs.** Within customer or citizen portals, I5 logs in using the client’s credentials to initiate service cases. This includes uploading, for instance, accident-related artifacts for car insurance, submitting medical invoices for health insurance, or managing commodity contracts—extensions, cancellations, adding options, etc. rather than intermediaries, an intermediary employee must act as the consumer, making it indistinguishable to the system whether actions are performed by a consumer or on their behalf. Only rarely have we observed intermediaries being granted their own dedicated access to such portals.
  At the intermediaries, these portals are typically accessed exclusively via a web browser on a PC, as using a smartphone or tablet app would require a more complex infrastructure. However, some organizations provide access only through smartphone applications, rendering these tools unusable for intermediaries:

  > ‘The apps that the health insurance companies have are designed for a person to make a submission using a smartphone. We can’t do that. We can’t have 50 smartphones lying around here’ (quote of I5-E3; field notes Friday).

- **Special case: online banking.** In our observations, banking portals play a unique role. Some banks do not offer online access for accounts linked to representatives as legal entities, but only to natural persons. As a result, all accounts managed by I5 are grouped under one access that is personally granted to the CEO, encompassing the clients’ accounts, her private accounts, and business accounts. Consequently, bank account transactions at I5 are carried out exclusively by the CEO (or a deputy), rather than by the respective client managers. Unlike the previously described case of shared access to online portals, banks can precisely track who performs each account action.

However, the intermediary lacks a multi-tenant structure that would allow for proper separation of accounts.

Email. Alongside their preference for using online portals and APIs, intermediaries also favor the use of electronic mail. It is utilized not only for intra-organizational coordination between employees within an intermediary but also as a preferred medium for inter-organizational communication. However, the perception at I5 is that emails have certain technical and organizational weaknesses:

(1) Emails are typically unencrypted and offer no protection against access by unauthorized third parties. For this reason, according to the interviewees, other media—such as postal mail, which provides organizational layers of security through envelopes, or fax, which intermediaries and organizations perceive as being encrypted—are often preferred.
(2) Only digital artifacts can be exchanged via email, whereas 'original' documents are often required.
(3) Emails lack a legally valid proof of delivery, unlike fax or postal mail with tracking and tracing (see also I2's quote on missing terminations below).

Postal mail. As already discussed, cooperation still relies heavily on paper: '[…] And since online banking is not available, the (bank) transfer form must be signed and then sent by mail later' (Field notes Tuesday).

- **Inbound.** I5 receives a high volume of paper-based mail daily, most of it through forwarding orders via the postal authority (cf. Section 4.1.3). Paper-based artifacts received are carefully archived to ensure that relevant information and evidence remain available for their clients, as also reflected in I4's statement about providing a 'peace-of-mind feeling'. Whenever possible, these artifacts are scanned, digitally processed, and shared via email, as illustrated by I5-E1's interaction with care facilities: 'I have this letter. One of your colleagues took a photo of it, and now [referring to another third person] he has it in his email box' (quote of I5-E1 talking on the phone; field notes Wednesday).
  Even in the highly digitized business of I2, they still receive postal mail: 'Sure, I also still get things by postal mail'.
- **Outbound.** However, a significant number of artifacts continue to be exchanged via postal mail, as this communication medium is used when others do not work or are not accepted by the organizations (due to data protection, processes, authentication, etc.). I5, in particular, frequently falls back to postal mail:

'I5-E6 has a customer at [health insurance company] and she can upload the forms online in her browser. [...] With the subsidy insurance fund, this

still works by postal mail.' (field notes Tuesday).'I5-E6 has a customer at [health insurance company] and she can upload the forms online in her browser. [...] With the subsidy insurance fund, this still works by postal mail.' (field notes Tuesday).

The postal service was observed as a communication system that was always reliable for bureaucratic activities.

Consequently, I5's office is designed and well-equipped specifically for handling postal correspondence, with a range of supplies such as envelopes of various sizes, stamps, a postal scale, payment forms, and outgoing mail bins (see Fig. 8a-c). By contrast, the industries where I1 and I2 operate are largely reliant on digital communication, as I1 notes: 'We hardly have any paper, unless someone sends us something by postal mail, which doesn't happen very often. But of course, we have […] a lot of email communication in all directions, and with that we have the digital equivalent of paper […]' (I1).

Phone. The telephone is used for short-term matters and minor consultations in which instant feedback is needed. It is particularly effective for emphasizing urgencies and following up on unanswered inquiries:

'M7 receives a call. 'Yes, I can come to you tomorrow. Tomorrow is urgent, yes?' [...]' (field notes Thursday).
'[...] with the therapists it's almost exclusively the telephone. [...] We always have to call them anyway. [...] Because they can only be reached by phone. So, of course, we always have a certain amount of time pressure. [...] When it comes to specialist appointments, we use online portals simply followed by the telephone' (I3).
'[...] via telephone, because this is perhaps the fastest way to contact them' (I2).

Fax. The fax machine demonstrates with its functionalities a balance between the advantages of fully digital email communication and the traditional paper-to-paper practices of postal systems. Field observations and interviews show that it remains highly popular and widely used in the medical sector and for legal matters. It enables the direct transmission of paper-based documents without additional steps such as scanning or printing, which are typically required for online portals or emails, thus avoiding media discontinuities from the scanner to file management on the computer, to email programs, and printers. It is perceived as operating in real-time, providing delivery confirmation, and offering perceived security features. In our field observations, the fax machine was regularly used to contact healthcare facilities (see Fig. 8d). The characteristic of delivery

confirmation, for example, was highlighted by I2 in the interviews: '[There is] perhaps a termination [of a contract] that has not been processed because the fax […] allegedly did not arrive, but you had proof of transmission. Then you have to send this proof of transmission again'.

In this varied use of communication infrastructures—including digital portals and interfaces, email, postal mail, phone, and fax—we observed a tendency to revert to more conservative/traditional yet effective media. This phenomenon, along with the other findings, will be discussed in the following.

5 Discussion

As we have shown through the bridging practices of the five intermediaries, they constantly manage various conflicts arising from their work arrangements and the infrastructures they engage with. Using a combination of interviews and field observations, we uncovered these practices and made them visible and understandable to the CSCW community.

Our findings reveal interconnected phenomena on two different levels, offering a comprehensive perspective on intermediaries' bridging work, which we discuss in the following. These insights contribute to a deeper understanding of the challenges, digitalization, and interoperability issues shaping intermediaries' work, which is becoming increasingly significant for cooperation in consumer markets.

In line with CSCW studies on boundary-spanning work (Gasson 2006; Tushman and Scanlan 1981), our research sheds light on the work practices of intermediaries as a relational world that is interdependent with the inter-organizational work from the arena of—favored or conflicted—work arrangements with consumer households and the organizations they interact with (cf. Clarke and Star 2008). Through this research approach, we gained a 'social' perspective on the work arrangements of five intermediaries, as well as insights into their artfully integrated 'techniques' and technologies in practice (cf. Suchman 1996). In combination, both perspectives draw an interwoven picture of 'what the bridging work ist about'.

Following the distinction of Olson and Olson (2014) between 'social' and 'technical' bridging, we analyze below how the predominantly human-executed, manual bridging practices identified in our study address socially conflicted work arrangements as well as technically conflicted infrastructures. Finally, we derive implications for CSCW research.

5.1 Bridging Social Conflicts Within the Work Arrangement

The work of intermediaries faces challenges on a social level, particularly regarding visibility, acceptance, and conflicts of interest with organizations, as evidenced by the breakdowns that have led to various coping strategies.

In cases of industry-driven intermediation, the middleman is usually installed by the industry it serves (cf. 're-intermediation' in Chircu and Kauffman 1999; Wigand 2020). Hence, the intermediary faces fewer conflicts of interest, goals, or objectives. Their primary focus is often on technical bridging, while organizations and intermediaries tend to negotiate norms for mutual support and processing (Dennis and Valacich 1999). On this basis, organizations and intermediaries can establish professionalized, inter-organizational cooperation infrastructures, as is common in cross-boundary B2B cooperation—for example, enterprise resource planning (ERP), supply chain management (SCM), or customer relationship management (CRM) systems (Lee and Schmidt 2017). We identified such professionalized infrastructures at I1 and I2 in the energy, finance, and insurance sectors.

However, in our study we were especially interested in the socio-structural impediments in the emerging field of consumer-driven intermediation, where intermediaries act on behalf of consumers and their obligations. In contrast to traditional brokering activities, these consumer-driven activities are considerably more prone to conflict, sometimes escalating into breakdowns (Dennis and Valacich 1999; Mcgrath 1991). Here we found that on the one hand, intermediaries bridge conflicts of interests that consumers face in realizing their interests. On the other hand, they encounter new structural obstacles, such as not being seen or accepted as legitimate representatives. As a result, they must bridge not only conflicts between consumers and organizations but also those arising within their own work. These impediments may result from unintentional or systemic issues caused by (misaligned) heterogeneous systems or procedures, or from intentional nudges (e.g., dark patterns) designed to influence consumer behavior.

Social measures. To address such intended or unintended hurdles, we identified two distinct approaches among the intermediaries. The first relies on social measures (cf. Olson and Olson 2014). Our findings show that intermediaries employ specialized artifacts, such as comprehensive written powers of attorney, to articulate the newly formed work arrangement and clearly authorize themselves as representatives, thereby overcoming mistrust and establishing common ground (see Table 2). Moreover, messy practices and diffuse communication media—with multiple channels or contact persons—necessitate greater efforts to maintain clarity and efficiency. For intermediaries, it is crucial to track and monitor the processes of organizations and to anticipate patterns of issues that consumers are likely to face. In this respect, intermediaries perform 'anticipation work'/'anticipatory work' (Barley 2015; Cohoon et al. 2023; Steinhardt and Jackson 2015) to foresee and proactively mitigate potential problems (Johansen et al. 2016). They rely on expense spreadsheets, collect emails from campaigns of specific vendors, and use similar methods (see awareness in Table 2).

Adversarial interoperability. The second approach is more challenging to implement, particularly when organizations deliberately pursue 'dis-intermediation'

strategies (cf. Chircu and Kauffman 1999) to benefit from direct customer interaction and sales. Conflicts on this level cannot be resolved simply by 'improving cooperation' for both sides but can still be addressed through adversarial 'hacks' and workarounds, as identified in this study. The term 'adversarial interoperability' describes a concept '[…] that's when you create a new product or service that plugs into the existing ones without the permission of the companies that make them […]'.[9]

In this way, when social issues cannot be resolved through social measures alone, adversarial measures help bridge this gap. As existing conflicts become visible, along with coping strategies to mitigate underlying cross-boundary breakdowns (Abraham and Reddy 2013; Easterbrook 1996; Lee and Schmidt 2017), we observed the extent to which adversarial interoperability is employed. Examples include redirecting communication by using forwarding orders from the postal authority or positioning themselves as a doctor's office on brokerage portals, as seen at I3 (see Table 2).

5.2 Bridging Technical Interoperability Gaps Within the Infrastructure

Regarding the technical infrastructure, we identified several concrete bridging practices that intermediaries use to achieve interoperability. Using the metaphor of an intermediary building a bridge between two parties, these practices can be related to Carlile's (2004) model of 'transferring', 'translating', and 'transforming' in cross-boundary knowledge work (cf. Stevens et al. 2009). While information or artifacts are 'transferred' via the bridge, additional techniques are performed on the bridge when heterogeneous systems of consumer households and organizations have incompatible artifacts that must be 'translated' or 'transformed'—as observed in practices like scanning, printing, and copying. These activities are highly manual and labor-intensive. Within these practices, we identified the recurring phenomenon of '(situated) backward interoperability', which we discuss below.

When exchanging artifacts or communicating within infrastructures, employees at intermediaries can choose among a wide variety of media (Hüllmann 2022). While CSCW has extensively studied media choice (S. Braun et al. 2019; Daft and Lengel 1986; Dennis and Valacich 1999; Fulk et al. 1987; Ishii et al. 2019, 2019; Trevino et al. 1990; Trevino et al. 1987), our findings add new insights regarding intermediaries' consumer-facing work. If a preferred medium for cooperation (e.g., online portals or APIs) is unavailable, another medium (e.g., postal mail or phone) is frequently used as a fallback (see Table 2). The unavailability of a preferred medium can stem from technical issues (e.g.,

[9] Cory Doctorow via Electronic Frontier Foundation. 02.10.2019. https://www.eff.org/deeplinks/2019/10/adversarial-interoperability; see also https://www.urbandictionary.com/define.php?term=Adversarial%20interoperability, last access 10.03.2025.

Table 2 Coping strategies

Coping strategy	Conflict	Characteristics	Type of measure
Use of comprehensive general powers of attorney	Unrecognized or untrusted work arrangements	Working with specialized artifacts issued as: • paper-based • notarized and form and and articulated via: • postal mail or • face-to-face meetings for the purpose of authorization, overcoming mistrust, and establishing common ground (cf. Olson and Olson 2014)	Social measure
Redirection of communication	The Intermediary is not incorporated in the communication process	• Utilizing forwarding orders with the postal authority to redirect communication to the intermediary • Setting alternative email addresses accessible by the intermediary	Adversarial interoperability
On-site involvement		Obtain information or collect artifacts that consumers only have at their premises by: • visiting consumers at home (by the employees), or • asking consumers to take photos or forward artifacts	Adversarial interoperability
Utilizing awareness		Anticipating or identifying patterns in cooperation regarding missing information, (contract) changes, or latent breakdowns, as well as tracking and monitoring actions	Social measure
Change of communication medium	Technically incompatible systems	Switching the communication media and transforming artifacts to postal mail, fax, or telephone when other media, such as online portals, API-calls, etc. fail	Backward interoperability (see next chapter)

availability, material constraints, security, or legal concerns) or social factors (as discussed above).

(Situated) backward interoperability. We define the term 'backward interoperability' in reference to the concept of 'backward compatibility' in computer science, where systems maintain compatibility with older applications by falling back on basic functions (cf. Bowker and Star 2000, p. 35). With backward interoperability, we we found a consistent pattern across all intermediaries, as illustrated by this central quote from the field notes: '[…] And since online banking is not available, the [bank] transfer form must be signed and later sent by postal mail'.[10]

To achieve interoperability, intermediary employees often manually convert artifacts into formats acceptable to either the systems of the organizations or those of the consumers. In choosing an appropriate fallback medium, rather 'conservative' media are used. The Intermediaries state that, while they prefer online portals, brokerage platforms, API-based exchanges, or email, they most often resort to postal mail or phone calls, as was particularly evident in our findings and discussions at I5, I2, and I3. This finding corresponds with characteristics such as availability, accessibility, efficiency, and capability, which media richness theory typically attributes to either traditional or modern media (Dennis and Valacich 1999; Ishii et al. 2019; King and Xia 2007). It also reflects aspects such as symbolic meaning and the ability to convey importance (e.g., postal mail) or synchronicity (e.g., phone calls) as described in the literature (Dennis and Valacich 1999; Trevino et al. 1987).

However, since the issue is far more complex—as evidenced by our field observations and the variety of perspectives discussed in the literature—we do not propose a new (static) approach to media choice within infrastructures. Instead, we introduce the phenomenon of situated 'backward interoperability' as a contribution to the existing theoretical landscape.

With this phenomenon, we aim to harmonize rational and social constructions while incorporating situated action (Suchman 1987) in the tradition of CSCW. For example, although employees at an intermediary prefer to use online portals to submit health insurance claims, they often lack access and instead fall back on fax or, more commonly, postal mail. If there is no response to a submitted claim after some time, they follow up by phone (see Fig. 9a). We found that postal mail is the most frequently used and consistently accepted medium for insurance claims, as it appropriately satisfies bureaucratic requirements (cf. 'formal record-keeping' Weber 1922).

However, no single medium can be defined as the 'most conservative' or the 'richest' in terms of being the most 'backward interoperable' as implied by

[10] This might also explain the longevity of fax machines, as it's a common fallback mechanism when other means of electronic cooperation fail.

media richness theory (Daft and Lengel 1986). For instance, submitting an insurance claim cannot be done via phone or in a face-to-face meeting, making postal mail the only viable fallback. Conversely, I3 also prefers online portals but often resorts to phone calls to schedule appointments for clients when all other channels—even postal mail—fail (see Fig. 9b).

Therefore, IT system design should account for (situated) backward-interoperability features, enabling intermediary employees to choose context-appropriate options for inter-organizational work—typically using postal mail for verifiable bureaucratic processes or the phone for rapid feedback due to its synchronicity.

We address this in the following section on implications for CSCW research as a technical consideration, while also incorporating socially driven perspectives.

5.3 Implications for CSCW Research

Finally, we would like to reflect on how CSCW research can contribute to addressing the challenges inherent in the (bridging) work of intermediaries. Our findings highlight areas for improvement within the design of cross-boundary infrastructures in consumer markets regarding the inclusion of intermediaries, which can be enhanced through existing CSCW research and concepts. At the same time, the identified bridging practices may also serve as a valuable resource for informing future CSCW system design and development.

(Re-) designing smart powers of attorney. The use of general powers of attorney issued in highly conservative and official formats as specific artifacts, can be considered a best practice to '[reduce] the complexity of articulation work and [alleviate] the need for ad hoc deliberation and negotiation […]' (Schmidt and Simone 1996). The more explicitly and conservatively these powers of attorney are mater-ialized, the more likely they are to be accepted.

However, requiring notarized, paper-based general powers of attorney from every client may pose a challenge for scalable, digital business models. We therefore propose exploring the design of smart artifacts for this purpose, which meet the requirements of their traditional, paper-based counterparts. Smart powers of attorney could leverage recent innovations, such as blockchain-based smart contracts or certificates issued by mechanisms similar to, for instance, certificate authorities (CAs) used in internet authentication. Here, several CSCW and HCI studies have already examined the integration of blockchain-based smart contracts, for instance, for identity management, trusted coordination, transactions, and negotiation (Kow and Lustig 2018; Nissen et al. 2018; Prinz 2018; Yau and Patel 2020).

Such digital artifacts could support infrastructuring by being transparently visible online, articulated entirely in digital form, updated in real time, and integrated into API-based authentication for various CSCW systems. Future work could build on the bridging practices identified in this study and integrate them into the design of such systems.

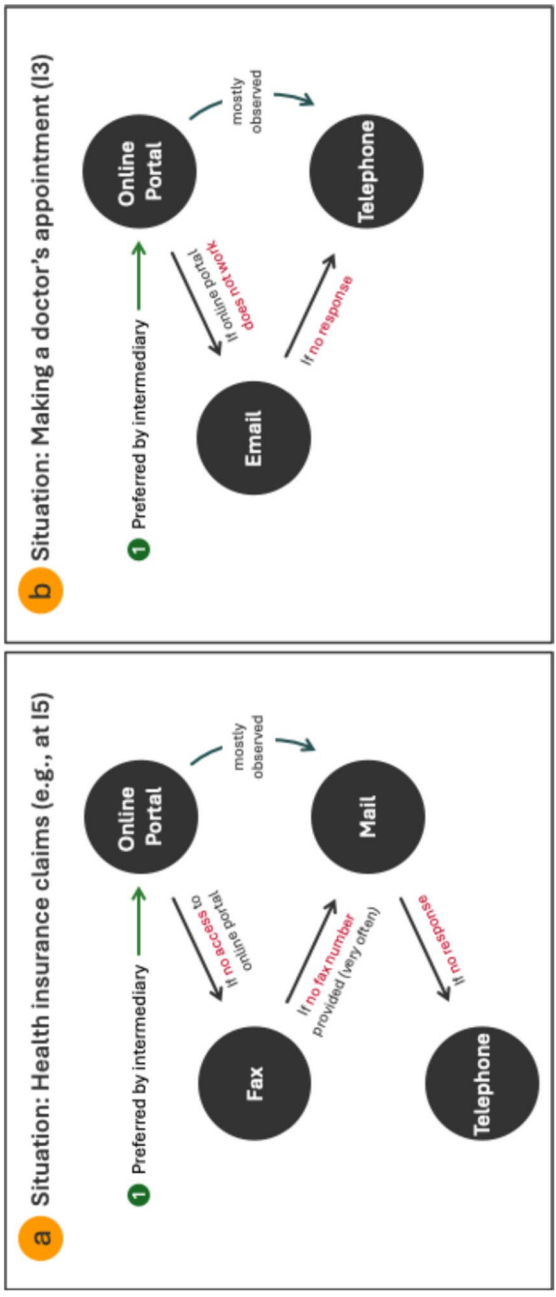

Fig. 9 Situated backward interoperability

New actors in CRM. Our findings show that intermediaries often struggle to be recognized as legitimate middlemen in many cases of consumer-driven activities. To address this, we noted explicit and extensive articulation efforts directed toward each organization, as well as additional measures involving clients to redirect their communication through the intermediary. While these strategies were successful in some instances, they frequently failed.

With this insight in mind, one design need would be to implement representation rules within organizations' CRM systems to account for intermediaries—either by forwarding copies of all relevant communication or by fully directing communication across all channels to them. However, when organizations are unwilling to enable this, strategies of adversarial interoperability, as identified in our study, should be considered. These strategies represent a valuable resource for design needs in customer interactions, which CSCW studies are also likely to explore (Ren, 2010; Xu, 2025).

Furthermore, to support the practices of adversarial interoperability, a dedicated IT system could be developed that operates between the intermediary and the consumer, enabling a more structured and seamless exchange of artifacts. Future CSCW studies could further explore, design, and evaluate intermediation-facilitating technologies, translating the (bridging) work identified in this study into proven and concrete design principles.

Access to APIs and online portals. Efficient cooperation across organizational boundaries depends heavily on IT infrastructure, enabling interaction via user interfaces of online portals or APIs for system-to-system communication. In industry-driven brokerage portals, it is common for intermediaries to commission products through APIs, as noted by I1 and I2. However, in consumer-driven activities, we found that intermediaries often lack access to similar portals and struggle with applications designed exclusively for smartphones.

Multi-tenant use presents a particular challenge: 'The apps that the health insurance companies have are designed for a person to make a submission using a smartphone […] We can't have 50 smartphones lying around here'. For this reason, a design need is for consumer-directed systems of organizations to grant intermediaries access to online portals and to develop digital interfaces for representative legal entities—not just for natural persons, as we found in online banking. Here, web browser-based solutions could facilitate multi-tenant work.

Integration of backward interoperability in CSCW systems. However, where organizations deliberately avoid or are unable to enable such integration and streamlined exchanges, the concept of backward interoperability becomes an important consideration for the design of CSCW systems. It offers a way to cope with the respective conflicts that CSCW research has examined for decades within infrastructures from both technical and social perspectives (cf. Easterbrook 1996; Hüllmann 2022; Olson and Olson 2014).

In this context of backward interoperability (and its counterpart, forward interoperability), several solutions already exist in Germany to digitize and integrate postal

communication into email-like interfaces, such as caya.com, d.velop postbox, or POSTSCAN of the German postal authority.[11] These services allow firms to receive postal communication in a 'forward' interoperable format and process it digitally. While this does not eliminate the need to work with 'originals', they can still be obtained from these providers when required and processed manually. In this regard, CSCW system designers should explore ways to integrate additional communication infrastructures—such as fax, phone, and API calls—into cohesive workflows.

Rethinking 'originals'. Moreover, our findings reveal varying—and sometimes contradictory—perceptions of what constitutes an 'original' and why it is required, particularly concerning machine-generated artifacts. We argue that the necessity of exchanging (paper-based) originals between organizations and intermediaries (as well as with consumers) should be reconsidered, thereby touching upon CSCW's long-standing tradition of examining media appropriateness (Daft and Lengel 1986; Dennis and Valacich 1999; Fulk et al. 1987; Ishii et al. 2019; Rice 1993).

Information privacy and security. Certain topics, such as the use of powers of attorney, the need for original documents, accreditation within CRM systems, and access to interfaces, raise legitimate and important privacy and security concerns for individuals, which could, of course, be exploited by malicious actors. These concerns may also be used as arguments by those who oppose the involvement of intermediaries.

This issue should therefore be addressed with appropriate care and further supports the need for smart, verifiable powers of attorney, since cryptographic methods or trusted authorities can provide greater tamper-proof authenticity than paper-based artifacts, as discussed above. Future CSCW research has the methodological toolkit to explore safer yet more practical approaches than those relying on paper.

5.4 Limitations

As demonstrated above, we examined the prevailing work arrangements of five selected intermediaries across different contexts to understand their common work practices, challenges, and interoperability issues, aiming to ultimately facilitate improvements and share best practices. In doing so, we aimed to create a diverse sample to enable an initial description of archetypical social and infrastructural commonalities across various organizational boundaries. Therefore, this research lays a foundation for considering the role of consumer-driven intermediaries in fostering cooperation within consumer markets and their various bridging efforts. However, future research is encouraged to expand our work to include additional, specific contexts and thus deepen the extent to which there

[11] https://www.caya.com; https://www.d-velop.de/software/d-velop-postbox; https://www.deutschepost.de/de/p/postscan.html, last access 10.03.2025.

are other peculiarities or what this means for certain sectors. In this respect, our study has some limitations in terms of our sample and our methods.

Despite the challenge of recruiting companies in this particular field to take part in our study and to speak to us openly and confidentially about their views, we were able to motivate five founders for interviews and conduct extensive field research with one firm. Although the sample of five interviews is rather small, we spoke to founders who have known their firm since it was founded, know their practices as they have performed these themselves, and have tried out various strategies. These firms represent hundreds to thousands of consumers, who in turn correspond with a variety of organizations, giving each intermediary a large corpus of actors with which to interact daily. However, the study is also based on the principles of qualitative research, resulting in a limited sample size that does not allow for quantitatively supported generalizations. Furthermore, a one-week observation in a firm may also represent a short period of time, but the researchers have already known this firm for years from other research projects and knew where to look during the observation of office practices. However, even the combination of the five interviews with the field observation allowed us to achieve theoretical saturation regarding the main categories.

Finally, it should be noted that we only interviewed firms from central-western Germany. It would be interesting to study such practices in other regions and legislations, especially outside the EU.

6 Conclusion

This study uncovered the often unrecognized bridging work of intermediary firms that support the work of consumers as they fulfill their obligations as consumers or citizens toward organizations. This work involves a substantial amount of human, manual labor, which intermediaries strive to streamline and reduce more efficiently. In doing so, intermediaries face social conflicts within their work arrangements and technical conflicts within their infrastructure. We presented several coping strategies that mitigate underlying breakdowns and discussed how these conflicts can be resolved through social measures or addressed with design improvements related to (smart) powers of attorney, ‘originals’, CRM systems, privacy and security concerns, and access to and interoperability of CSCW systems. If this is not desired by an organization, we demonstrated how intermediaries make use of ‘adversarial interoperability’ or ‘backward interoperability’.

When designing CSCW systems for (private or public) organizations interacting with consumers, it is essential to be aware of these conflicts on a social or technical level and take them into account accordingly. Intermediaries working with organizations that deliberately refuse or are unable to resolve such conflicts should incorporate concepts of adversarial interoperability or backward interoperability into their CSCW system design.

Acknowledgements

We thank the five firms for their invaluable insights, especially the one that allowed a week-long observation its practices. We are also grateful for the coaching provided by our supporters and for the reviewers' feedback during the review process, which has improved the paper.

Authors' Contributions

Erik Dethier collected and analyzed the empirical data and wrote the manuscript. Alexander Boden and Gunnar Stevens contributed to a joint analysis of the data and supported the revision and improvement of the text.

Funding

Open Access funding enabled and organized by Projekt DEAL.

Data Availability

The pseudonymized data can be requested from the corresponding author upon consent by each of the intermediaries.

Declarations

Ethical Approval

According to the assessment of the Ethics Council of the University of Siegen, the study is considered ethically unobjectionable. The participants gave their informed consent to the pseudonymized collection, analysis, and publication of the data.

Clinical Trial Number

Not applicable.

Conflict of Interest

The authors declare no competing interests.

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