A KIOSK AS A COLLABORATIVE TECHNOLOGY IN CUSTOMER-SERVICE SITUATIONS

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ABSTRACT

Advances in collaborative technologies in mediating cooperation situations now provide quite natural face-to-face (F2F) interaction with negotiation, information, and manipulation facilities via video-mediated communication (VMC). In measuring F2F situations, research has defined the boundaries and challenges of VMC for collaborative activities. In the context of service kiosks VMC devices have remained untapped though a basic model, design principles and certain ideas on what kind of cooperation it may be useful are given. Our case study on a new car rental service solution shows how a VMC kiosk involves cooperative partners, for what purposes they require VMC, and in what ways other kiosk devices are more appropriate. We show how these purposes unite the kiosk and VMC devices and, by measuring the kiosk use in a public place, provide our analysis aspects and remote service kiosk solutions for collaborative kiosk and service design.

KEYWORDS

Service kiosk, video-mediated communication, cooperative situation

1. INTRODUCTION

Advances in collaborative technologies in mediating cooperation situations (Schmidt & Bannon, 1992; Ciborra, 1996; Finn et al. 1997) now provide quite natural face-to-face (F2F) interaction with negotiation, information, and manipulation facilities. The potential to share media space has also initiated production of public services such as online learning, social services, and health consultation. However, use of the services usually involves a high level of technical skills and expensive devices. For those people who cannot use, or do not own such tools, a video-mediated communication (VMC) based service kiosk offers new possibilities. The kiosk uses an Internet connection and video conferencing where a customer, at some public location, interacts with a service clerk located in a call center at a service firm (Paradi & Ghazarian-Rock, 1997).

A modern kiosk installation automatically opens a service when a customer pushes a kiosk's start button, and a clerk serves the customer remotely from any place where an Internet connection is available. This allows distributed remote service production, which can be personalized for individual customers. From the business point of view, this kind of service is economical as one service clerk can serve many users, and perform other tasks when kiosk service is not needed. Only local maintenance of the kiosk stores is needed.

The basic idea of the VMC kiosk is not new, but newer research on kiosk configurations and user studies are still scarce. Due to the earlier network and VMC technology's inability to mediate real-time interaction (Finn et al. 1997; Schmidt & Bannon, 1992), VMC has remained an untapped resource in providing personal kiosk services. It is more commonly used for private and casual purposes (Kirk et al. 2010; Teoh et al. 2010) and laboratories and research institutions. Research on service design has focused on completely computer-supported self-services, e-services, and improvements in self-service technologies (SSTs). Consequently, the

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prevailing belief in service production is that F2F service is expensive. F2F services by a VMC kiosk can challenge that belief and the service providers who have developed their own remote kiosk service solutions.

By using Avis's novel remote car rental service as an example, our case study shows how a VMC kiosk is used in customer−service-clerk cooperation, by analyzing for what purposes VMC is used in car rental situations and what information is mediated by other kiosk devices. We conclude lessons from the case with attributes of service situations that show the conditions where VMC kiosks offer alternatives to SST kiosks.

2. VIDEO-MEDIATED COMMUNICATION FOR SERVICE KIOSKS

Advances in communication technologies have greatly improved the possibility of using VMC, ever since the late 1990s when the available bandwidth permitted the use of special hardware and communication channels (Finn et al. 1997). Nowadays, a VMC device can be installed easily and audiovisual signals transmitted by using a standard Internet connection and computers, but it still sets some limits to online communication.

2.1 Video-mediated communication

VMC has been a focal topic since the 1990s when research institutions conducted dozens of studies on video to study F2F remote communication. Whittaker and O'Conaill (1997) divided these aspects into two main categories: coordination of the communication process and coordination of the communication content. The first relates to people's turn-taking cues, based on observing and interpreting how the other person acts. The latter relates to information exchange, feedback, and interpersonal cues. In everyday life, people use these cues in F2F situations and they expect certain cues in their interaction rituals (Goffman, 1967) as expressing understanding, enriching verbal interaction, and anticipating situational changes (Isaacs & Tang, 1993). For instance, eye contact is in use as 'reading' how interested or trustful the other person is (Theo et al. 2010).

Teoh et al. (2010) differentiate the use of interaction cues based on how collaborative or conflicting are the motives and goals of people as accomplishing creative or negotiation tasks together. When people agree and share their goals, there is less need for negotiating and a quite limited VMC view can mediate the situation correctly. In creative tasks, body language and wider VMC views were vital but not in negotiating where people typically use face control (Teoh et al. 2010) and expect certain 'face work' (Goffman, 1967). Dong and Fu (2012) see the amount of information for conflict resolution situations as important and suggest exchanging information in small pieces, especially in difficult tasks when speaking by VMC, people's working memory benefits from piece by piece exchange of information. They also consider higher bandwidth as useful for a video channel as handling conflict situations. Groen et al. (2012) stress information selection process and propose a multi-camera video medium and camera shots editing as creating the feeling of being in the same location, and Kirk et al. (2010) advise supporting of people's close relationships by increasing multiparty VMC use, mobility of video devices and integrated webcams, messaging and alerting systems.

Nevertheless, a great deal of previous VMC studies has focused on how people refer to other people, their objects of work and environment and how they share information in documents or in other tangible things. Many authors deem these aspects as vital for cooperation (Finn et al. 1997; Heath et al. 2001; Kraut et al. 2002) which shows how people benefit from visuals per se given by VMC. However, as certain mutual object of interest should be supported for collaboration parties, coordination of VMC in relation to it becomes complex and may demand several video views (Kirk et al. 2010; Groen et al. 2012). Heath et al. (2001) argue that "material resources do not only feature how people produce actions, but also, and critically, in the ways in which they recognize or make sense of the actions of others" (p. 137). Thus, it is important to separate actions that are embedded in the local environment—tools or artifacts, people, and work practices—from those belonging to the shared work space between the actors in a remote activity mediated by VMC.

Kraut et al. (2002) have suggested that when conceptualizing VMC technologies, designers have to understand how people use visual resources in their collaboration, and how part of work occurs at multiple levels (e.g., action in a physical task and its coordination by language). Only certain elements, such as awareness of task state or facilitation of conversation, may be critical for the design of shared visual spaces.

Hence, VMC research has focused on mediating between distributed people and groups by comparing it with F2F action. Measures have defined the boundaries of VMC. Such as privacy and legal issues (Finn et al. 1997), the ineffectiveness of using gestures (Heath & Luff, 1991), noticing peripheral cues, pointing to things

and handling of real-world objects (Isaacs & Tang, 1993), which as the inherent constrains of VMC (Groen et al. 2012) affect experiencing of the visual reciprocity provided in devices. Design principles for VMC kiosks are given and possible application areas (Maguire, 1999; Paradi & Ghazarian-Rock, 1997). Yet, technical problems and network incapacities have hindered the adoption of VMC in kiosks, and SSTs became common. Recently, VMC's potential is shown in private contexts (Kirk et al. 2010) and in negotiations (Theo et al. 2010; Dong & Fu, 2012) giving a cue in what kinds of conditions VMC can be useful.

2.2 An approach to collaborative service kiosk use

Based on the related VMC studies, an approach to a kiosk use situation should focus on: 1) activity in the local environment; 2) shared workspace activity, and 3) remote activity in an environment of cooperation partners. Based on Paradi and Ghazarian-Rock's kiosk model (1997), people using a kiosk system share the purpose of producing the desired service outcome through VMC-based dialogue. This requires a kiosk with VMC devices (video displays, cameras, microphones) and other peripherals for data transformation. Actors' situational cooperation can be analyzed by focusing on how a service producer or service clerk remotely manages the customer's activity in conducting service process steps, content (needs, outcome), and use of peripherals. In this setup, the service clerk is responsible for the main process, which involves the customer's input and defines the service activity in relation to it. Analysis aspects are summarized in Table 1.

Table 1. Analysis aspects with VMC-based collaboration

Activity/actor	Local customer action	Kiosk/VMC devices	Remote service action
Process coordination			
Content coordination			
Use of peripherals			

In this case, we focus on the customer's actions within a local activity and the service clerk's actions within a technologically-mediated remote activity. The role of VMC is seen as providing audiovisual communication for informal service dialogue. Other information exchange happens by kiosk peripherals as formal, secure transmission of data via configured networks to the service provider's system (Paradi and Ghazarian-Rock, 1997). VMC devices in the service kiosk are thus an integral part of the whole collaboration technology.

3. CASE SETTING

Our study was conducted by using Avis's new car rental service kiosk in a university lobby. Data were collected in 2012 by studying the kiosk in situations when a lot of people were moving in the lobby. We put up some boards between the walking area and the kiosk use area (Figure 1, A). A service clerk worked in a remote place by using VMC and customer management system (CMS) with a kiosk network (Figure 1, C, D).

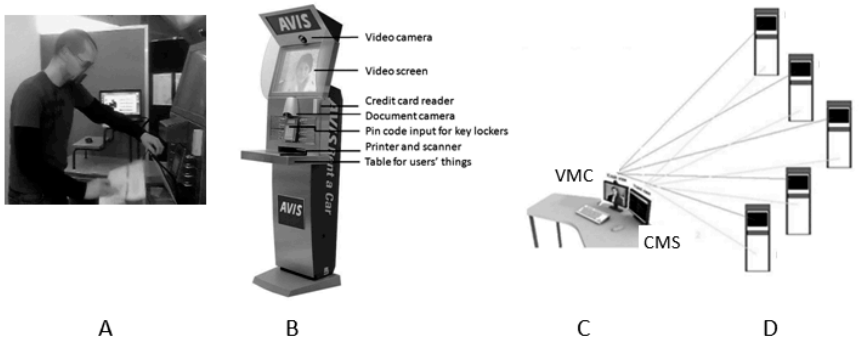

Figure 1. Use situation, service kiosk with customer's view, service clerk's VMC view with CMS and kiosk network

Participants were selected among university staff and students who had a driver's license and not used this rental kiosk before. The sample included 16 people (id1-id16; seven women, nine men; ages 22-63; nine

first-time car renters) who regarded their ICT skills as good or excellent. All had used F2F services and self-service in public places and could base their reflections on these experiences. Before arriving at the kiosk, each participant was asked to choose a suitable car rental theme as a starting point for his or her kiosk use: a business trip, a winter holiday trip, or a family visit. In any of these themes, a participant might have special needs for car, route, timing or belongings (e.g., navigator, child seat, or skis). The car rental process itself was not pre-scripted, and the participant could move freely in and out of the theme.

On arrival at the kiosk, the participant first answered typical background questions (approx.5 min.) and then rented or reserved a car using the kiosk (approx. 10 min.). After that the interviewer asked for free-form subjective experiences and interviewed by using a user-experience adjective form (approx.15-20 min.) The participant was asked to select and justify four adjectives from 16 negative and 16 positive adjectives and give one adjective or description of kiosk use by his or her own words. In each study phase, the participant was free to subjectively comment on the kiosk, rental experience and study situations. All communication was informal, and the participant could ask for help (none did so). All study situations were video recorded and analyzed by using an interpretative approach (Klein & Myers, 1999) to situated rental process analyses.

4. VMC-BASED KIOSK SERVICE PROCESS

Based on the 16 rental processes analyzed in detail, we first show features in a typical car rental process at a kiosk. After that we use one process as an example which demonstrates conversational dialogue between the actors. We identified it as a source of flexible rental process in the course of which the customer can be helped in specifying rental needs and using the kiosk peripherals. We refer to this action as facilitation.

4.1 Remote car rental process at a VMC kiosk

A car rental process at the kiosk (Figure 2) is an activity which starts when a customer pushes a "Push to Begin" button. After that, use happens by VMC in cooperation with the service clerk whose face appears on the video screen (Figure 1, B) and dialogue commences. The purpose is to make a multi-phase process and personalized experience for each participant so that the rental agreement can be produced collaboratively.

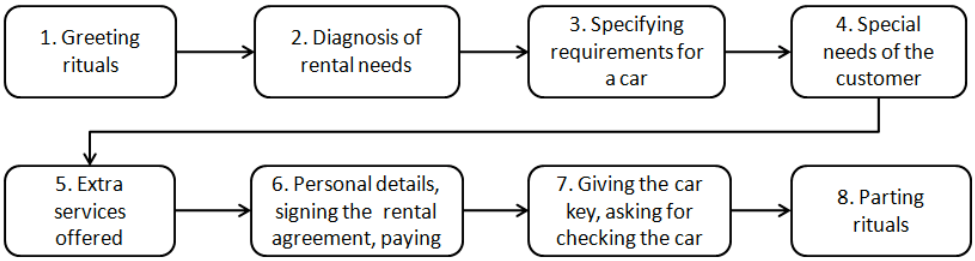

Figure 2. Steps in car rental activity at the remote service kiosk

Dialogue as an informal process/content personalization took place audio-visually by VMC devices (fine-adjustment cameras, microphones, and video displays). From greeting to parting rituals, dialogue was meandering depending on the customer while facilitation given to the customer by speaking guided the dialogue towards the rental agreement. This made the complex, multiphase process easy for all participants so that their conversational goals were achieved (Groen et al. 2012). Comments included, for instance, "This was my first time with a service clerk by a web camera. All the same things could be made here as in a live situation" (id4); interaction with the kiosk was reflected as "surprisingly personal because it's face to face" (id15), or "normal, it's not different from other car rental desk face to face situations" (id13).

Use per se at a kiosk happens with kiosk peripherals (Figure 1, B) during steps 6 to 7: showing a driver's license (document camera), paying (credit card reader), receiving a rental agreement (printer) and returning it (scanner) and taking or returning the car keys (lockers). Because of facilitation, the use remains convenient for the user while the device is configured to operate in formal procedures. Hence, "there was no confusion" (d16) in using the kiosk, and there was no need "to worry about interface" (id14). Personal and rental data were transferred quickly and securely to the service producer's CMS (Figure 1, C). Since the kiosk and network connections are usable only during rental situations (not in a stand-alone state), and the kiosk does

not store any data, the whole service remains secure for public place use. If some problem occurs, a customer can call any time or he can "come back to the kiosk and push the button. Some of us will help you" (Clerk).

VMC thus provides possibilities to improve data acquisition based kiosk interfaces. In SST kiosk use, the required multi-phase selection procedure on computer screens is proved to be difficult for almost half of the users who would use help from humans if it were available (Alcock & Millard, 2006). This help is offered by a VMC kiosk. On the other hand the allocation, where VMC is used for informal service personalization and other kiosk devices for formal data transaction, can also be seen as contributing to the inherent constrains of VMC as improving its role for human-driven communication (Groen et al. 2012)

4.2 Coordination of rental process and content

The following dialogue shows how coordination of the service situation took place during the first five steps. Actors in this case are S, a service clerk working remotely and C, a customer (30-year-old male, id16) who rents a car for a business trip. Dots "…" indicate small breaks, and "(…)" show cut parts of the dialogue.

S: Welcome to Avis car rental. How may I help you?
C: Hi! I'm looking to rent a car to go from [the city of] Oulu to [the city of] Raahe.
S: OK, would that be today or some other day?
C: Aaa, give me some time … let's see my schedule ... aaa [looks at his mobile phone], I think I will be doing that tomorrow.
S: Tomorrow, at which time?
C: The earlier the day I can start is probably the best.
S: OK, 8 o'clock! Is that OK?
C: 8 o'clock is perfect.
S: OK and you will return the car in Raahe or in Oulu?
C: Aaa … I will need to get back to Oulu so I will return it here.
S: OK, when will you be returning it?
C: I will need it overnight so the day after tomorrow (…)
S: OK [by raising voice] small car, one day (…)
S: OK. Any other services? Navigator?
C: I very much would like to have a navigator. I have never been the office I am heading for (…)

This dialogue shows features of reciprocal interaction through which people reach a common understanding. Coordination of the communication process and its content (Whittaker & O'Conaill, 1997) was flexibly driven in the course of the service action, involving turn-taking by questions and answers. The speakers joined content coordination by references to objects (car, navigator), task (rental, drive), time (today, tomorrow, one day), and places (Oulu, Raahe, here).They also gave verbal cues (raised voice, enquiring tone) and non-verbal feedback cues ("aaa," small breaks) that also maintained facilitation tempo and style.

Both actors used typical interaction rituals (Goffman, 1967) (greetings, "how may I help you", "OK"). The raising of voice to confirm important details, the stress on the last syllable and recapping of each other's words like "OK" and "tomorrow" show that F2F interaction remained reciprocal during VMC. In the course of service action, this can be seen as the way how the actors expressed mutual understanding and anticipated the responses of each other (Isaacs & Tang, 1993). The tacit interaction cues, such as a non-verbal voice "aaa" and small breaks in speaking, were used as informing on cognitive processing time, thinking or remembering and managing the pauses during collaboration (Isaacs & Tang, 1993). The rental agreement negotiating (content) was done by giving information piece by piece and by speaking (Dong & Fu, 2012).

In Isaacs' and Tang's study, the managing of turn-taking in VMC was considered limited due to the devices' delays in transmitting audiovisual signals. Yet they also reported conflicting results, which might be typical of a time when devices were under development. In this case, the user (id16) did not encounter such problems, but other user did: "The quality of the connection could be better; there was some pixel stuff" (id7), although this did not detract from the interaction: "I got a fun feeling, adrenaline was flowing, and when I got a price reduction" (id7). Consequently, the coordination of rental by VMC was positive for all participants and resulted in service agreements. This supports Teoh et al.'s (2010) suggestion that when people share their goals, a quite limited VMC view (Figure 1, A, C) can mediate the situation correctly.

Tacit cognitive cues joined in showing of what kind of help (needs, content) from the other was required, and whether the action tempo and interaction style were suitable. When the service clerk said "you will return the car in Raahe or in Oulu?" the given options helped the user to express his needs more accurately: "Aaa …

I will need to get back to Oulu so I will return it here." (id16) Speech as an informal communication method made it possible for the user to express his needs freely by using everyday grammar and words "Hi!" or "OK". The service clerk adopted the customer's style and started to use a similar type of informal expressions: "Yeah, and anything else?"(Clerk) This type of sensitive adaptation toward the other person's conduct is typical in interaction rituals (Coffman, 1967), in situations where people want to appeal to others as they collaborate (Teoh et al. 2012) and in personal customer services (Alcock & Millard, 2006) where they are mutually dependent on the quality of cooperation and its outcome (Schmidt & Bannon, 1992).

4.3 Use of peripherals

During the last three steps users handled several physical items (driver's license, credit card, car keys, rental papers) with kiosk peripherals (Figure 1, A, B). Related VMC studies have revealed variations in physical task guidance, focusing on how people operate in physical environment and manipulate physical objects. In this case, the physical objects or the environments were not manipulated; instead, physical tasks were facilitated by speaking. As compared with F2F situations, typical language change in VMC is the increasing use of indexical terms. Fussel et al. (2004) divide these into "local terms" (this, these, here, etc.) referring to the location and people guided by VMC and "remote terms" (that, those, there, etc.) used as guiding local action from a distance. The following dialogue shows what kinds of terms were used with physical tasks:

S: Now I'll make the reservation. I need your driver's license. Would you take it and put it on the table in front of you and with the picture facing up … just like that. I will make a copy, just a second. ...
S: Now you can remove it ... Next I need to make a reservation on your credit card.
C: OK.
S: Would you take your credit card and slide it through the credit card reader on the right side?
C: OK [slides the credit card as guided] (…)
S: So what I'll do now is print out the rental agreement for you to sign.
C: [makes some voice]
S: It will come out in front of you on the table … it's a two-page printout so I need you to sign it now… Signature on the second page coming out. Now I am printing (…)
C: Yeah, and anything else? You have any questions?
S: No, seems clear to me.
S: Very good. Tomorrow morning you come and just pick up the car outside the main entrance.
C: OK
S: Have a nice day!
C: You too.
S: Good bye!
C: Thank you!

This dialogue has quite a few proximal deictic pronouns (that, this, here, etc.), which is commonly observed in guiding of physical tasks by VMC (Kirk & Fraser, 2006). Spatial deictic terms (in front of, right, left, etc.) were common in the service clerk's speaking, referring to the position of the user standing at the kiosk, and to things handled with the peripherals. In this sense, the terms used were locally oriented and helpful for the user: "This was smooth, more intuitive, or guiding like holding the hand" (id6). Another thought, "Was the person here?" (id7) Experiences combined the service clerk's use of CMS with the kiosk network and car-location information (Figure 1, C, D) that helped to orient the user's attention to local things (e.g., rental agreement on the table) and the local environment (e.g., pick up the car outside the main entrance).

Hence the outcome, that all 16 participants were able to complete the rental process within the estimated time or less, shows the usefulness of VMC-based facilitation for kiosk users. In adjective selections, participants frequently selected positive words such as *novel*, *controllable*, *easy to use*, and *fast* as describing their experiences. Also, their subjective opinions at the end were positive. Two users distilled the experiences into: "It was nice and simple; a different kind of experience as compared with normal automatons" (id10); and "A secure feeling … talking to another person … succeeded to make the whole process" (id1).

The service experience can be seen as accepted by the users and increasing opening hours and service availability in several locations (Figure 1, D). The attitude to the kiosk can be seen as positive also from the service clerk's perspective, to whom the most obvious benefit is the possibility to plan work more appropriately, and it is no longer dependent on the customers' arrival to service points. In service production, the kiosk network implemented by using standard technology and Internet solutions allows the centralized

role for personnel and extends their services economically while providing efficiently personal services for their customers by VMC kiosks.

5. LESSONS FROM THE CASE

Previous research has found several limitations of VMC measured by F2F situations. Groen et al. (2012) consider these as inherent for VMC and suggest techniques by which they can be addressed and impacts mitigated. Our study supports their suggestion by analysis on customer-service situations and providing the results for what purposes VMC was used in car rental service and what information was mediated by other kiosk devices. The purposes and how these unite the kiosk and VMC devices are summarized in Table 2.

The results show that with this new VMC kiosk service, typical VMC problems did not hinder users' action. Firstly, this was due to the following attributes of the cooperation condition: there was a concrete goal for cooperation (making a rental agreement) through which actors were mutually dependent; advanced VMC technology configured with other kiosk technology was in use; VMC involved only two actors limited to facial views; actors remained in the same physical space; facilitation was offered to the users flexibly in the course of service; and, participants of the study were accustomed to using public services in public places.

Secondly, the allocation, where informal service personalization happens via VMC and formal data transaction via other kiosk devices, can be seen as improving the situational use of VMC (Groen et al. 2012). In this case, negotiating by VMC was not for conflict resolution; instead, the actors shared the goal and motivation so that the quite limited view was appropriate (Teoh et al. 2010) for their exchange of information piece by piece and by speaking (Dong & Fu, 2012; Alcock & Millard, 2006). The whole service process and the use experience were justified as easy and secure. The solution thus offers an alternative to SST kiosks.

Table 2. Examples of actions and devices used within VMC-based service cooperation

Activity/actor	Local customer action	Kiosk/VMC-devices	Remote service action
Process coordination	Initiation of service by pushing a start button	Start button; video link Cameras, microphones, video displays for VMC	Getting calls by Internet Personalization of steps by facilitation; use of CMS
Content coordination	Rental needs by informal everyday language	VMC	Specify requirements by facilitation; options, extra offers; use of CMS
Use of peripherals with physical things	Show driver's license Payment, credit card Handle rental papers Receive car keys Ask for help	Document camera Credit card reader Printer and scanner Key lockers Start button; video link	Use of document camera Control card reader output Use of printer and scanner Use key locker controls Facilitation; use of CMS

Finally, as Table 2 shows, one of the key attributes in a VMC kiosk is the possibility to use human-driven facilitation during multi-phase and complex service processes, for example, as specifying personal customer needs and using kiosk functions. This kind of *facilitation* is recognized in research on education, and from the business point of view as developing effective groups (Schwarz, 1994). We link it to VMC-based service articulation work. In collaborative technology research, work on articulation (Schmidt & Bannon, 1992) has been integrated with activities such as dividing, allocating, coordinating, or scheduling of distributed individual activities (p. 8). In this remote car rental case, it was used in customer process and content coordination when making service agreement and supporting the use of kiosk peripherals by VMC. Consequently, we argue that the latter type is characteristic only to VMC-based service kiosk solutions.

We consider different types of articulation work and coordination processes useful topics for future VMC and kiosk research. In service situations, however, the measurement of articulation work and coordination processes is very complex, due to the expected service outcome, paid by the customer: service production is dependent on it, and defines the process intricately by need-requirement-outcome structures.

In conclusion, our case study shows the aspects of customer-service cooperation and the analysis results where VMC was needed and where other kiosk peripherals were more appropriate. In addition, we have joined these purposes to kiosk and VMC devices mediating the action of cooperative partners. These

solutions can be seen as appropriate for the implementation of VMC service kiosks used in public places. We suggest the analysis aspects and the remote kiosk service solutions to be used in service design and for exploring new applications for collaborative kiosk technologies used in public places.

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