Technology Deployment for Social Connection in Residential Aged Care: Care and Technology Providers' Experiences During the COVID-19 Pandemic

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ABSTRACT

Information and communication technologies are being used for the social connection of people living in residential aged care. However, in HCI research concerning technology use in aged care, the perspectives of care and technology providers have received limited attention. We conducted semi-structured interviews with 15 aged care workers and technology providers to investigate the challenges and opportunities of deploying technologies in aged care during the COVID-19 pandemic. Our findings highlighted that technologies such as videoconferencing and smart displays connected residents with family and friends, kept families informed and reassured, and were used in small groups to meet individual needs. However, limitations in video calling, staff fatigue, volunteer availability, and infrastructural resources presented barriers to technology deployment. Future use of technology for social connection in aged care requires careful facilitation from staff, better resourcing and infrastructural support, collaborations with volunteers, and more attention to individual needs.

CCS CONCEPTS

• **Human-centered computing; HCI theory, concepts and models; Empirical studies in HCI**;

KEYWORDS

technology, aged care, COVID-19, older adult, older people, social connection

1 INTRODUCTION

Information and communication technologies (ICTs) are increasingly being deployed to provide enriching experiences for people

living in care homes [2, 5, 9]. These technologies range from social networking sites [20] and videoconferencing [21], to emerging technologies such as virtual reality (VR) [1], digital storytelling [16], and social robots [28]. When used carefully and with attention to individual needs, ICTs have the potential to support meaningful experiences of social connection for aged care clients [35] and help them gain social support and enjoyment [33].

During the COVID-19 pandemic, the need for ICT adoption in aged care homes was reinforced as residents' ability to engage socially with the outside world was severely compromised. In Australia, where this study was conducted, an elimination strategy was adopted for pandemic control in the first year of COVID-19, which involved strict quarantine rules and lockdown restrictions. Aged care residents were not able to receive visits from family and friends [3]. Their social interactions within the facilities, including contact with other residents and staff, were also significantly constrained [3], leading to social isolation, loneliness [13] and psychological distress [15].

These issues posed a strong need for aged care organisations to adopt more ICTs to maintain the social connection of their clients [27], and existing research suggests that care homes adopted new communication technologies to keep residents connected [31]. However, deploying technologies in aged care settings is challenging. Previous research has identified barriers to technology adoption in aged care, including the physical frailty and cognitive decline of residents [22], the reliance on staff facilitation [6], resource constraints [35], and residents' resistance to technology [40]. Muller et al. [23] argued that 'parachuting' ICTs into care homes is unlikely to prove successful, and the engagement of both researchers and participants is critical. However, Waycott et al. [37] pointed out that researchers are not always responsible for introducing ICTs into aged care homes. This is because technology deployment in aged care often involves collaboration between technology providers (such as IT companies) and care staff, including aged care organisations. Among HCI studies examining technology in aged care, the main focus has been on designing and evaluating bespoke applications and prototypes introduced by researchers [17, 24]. There remains limited understanding of how existing ICTs were deployed in care homes during the pandemic, and how technology and care providers were involved in the process.

In addition, the COVID-19 pandemic introduced new opportunities and challenges to technology deployment in aged care. It is important to understand these opportunities and challenges so that the aged care sector can improve current practices and be better prepared when faced with similar crises in the future. Previous research on how the COVID-19 pandemic has affected the lives of

Table 1: Interview participants

	Pseudonym	Gender	Perspective
P1	Andrew	M	Care provider (health and wellbeing manager)
P2	Ben	M	Care provider (IT project lead)
P3	Carl	M	Care provider (ICT manager)
P4	Daniel	M	Care provider (corporate service manager)
P5	Emily	W	Care provider (lifestyle manager)
P6	Fred	M	Volunteer (technology facilitator)
P7	Glen	M	Care provider (CEO)
P8	Henry	M	Care provider (care staff & trainer)
P9	Iris	W	Care provider (social centre manager)
P10	Jeremy	M	Technology product provider (founder)
P11	Kevin	M	Technology product provider (software deployment & business analyst)
P12	Lucas	M	Technology product provider (director)
P13	Miles	M	Technology service provider (founder)
P14	Noah	M	Consultancy Service provider (director)
P15	Olivia	W	Technology product provider (manager)

older adults has mostly focused on community-dwelling adults [29]. Only limited studies have examined the role of ICTs in residential aged care facilities for social and communication purposes [26, 34], but they mostly focused on the experiences of aged care residents or family members of residents. Our work expands the purview of HCI research to include stakeholders who play an active role in deploying technology for social connection in care. Specifically, we aimed to investigate how COVID-19 impacted technology deployment for social connection in aged care, with a focus on the experiences of care and technology providers. Through our study, we contribute an understanding of the challenges and opportunities associated with deploying new technologies in residential aged care. This adds to the growing body of HCI research on the use of technology within care homes [14, 36, 39] and reveals issues that have implications for technology deployment beyond the pandemic.

2 METHODS

2.1 Study Design

We conducted interviews to gain a deep understanding of key stakeholders' experiences when deploying technologies for social connection in aged care. Interviews were conducted with technology providers who had experience in deploying technology in care homes, and care providers who had experience in facilitating technology with residents. For context, our interviewees were involved in a wide range of aged care services, including residential care in aged care homes, home-based care, retirement villages, and short-term care such as respite care. This paper focuses on their experiences in residential aged care facilities. All research procedures were approved by the University of Melbourne Human Ethics Committee.

2.2 Participants and Recruitment

Participants were eligible to participate if they had experience in either providing technology products or services to aged care homes,

deploying technology in care homes, or facilitating technology-mediated activities with residents. We recruited participants using purposive sampling, which started by searching the Internet for news articles about technological innovations in aged care during COVID-19. We contacted care and technology providers mentioned in the articles and invited them to participate. We recruited other participants through LinkedIn and from an existing participant pool managed by the research team.

A total of 15 interviewees (12 men, 3 women) participated in this study. Nine participants (P1-P9) worked in Australian aged care organisations. Six participants (P10-P15) worked in organisations that provided technology products or consulting services to aged care organisations (Table 1).

2.3 Procedures

We collected data between September 2020 and August 2021. During this time, care providers had begun using technology due to the occurrence of lockdowns in Australia (our study site). We conducted interviews by phone or video calls. Each lasted between 30 and 60 minutes. The interviews were semi-structured with different sets of interview questions prepared for aged care staff and technology providers. Interviewees were asked to reflect on the benefits and challenges of deploying technology in aged care settings and how the pandemic affected the deployment of technology. Participants were provided with an information sheet describing the purpose and potential risks of the study and asked to provide written or oral consent prior to the interviews. To ensure participants' confidentiality and anonymity, all identifying information from the transcripts was removed; pseudonyms were used when referring to the participants.

2.4 Data Analysis

The interviews were audio-recorded and transcribed verbatim for analysis. We analysed the data using reflexive thematic analysis [4, 32]. Interview transcripts were input into the NVivo software.

Technology Deployment for Social Connection in Residential Aged Care: Care and Technology Providers' Experiences
During the COVID-19 Pandemic

CHI EA '23, April 23–28, 2023, Hamburg, Germany

Initially, the first author coded the data line by line inductively, paying attention to the impact of COVID-19 on technology deployment for social connection in aged care and the challenges and opportunities involved. Example codes include "social interactions within the facility", "connection with family and friends", "social programs adapted during COVID-19", "staff facilitation", and "issues with video calling technology". The codes were clustered into 11 initial themes by comparing codes and collating codes that shared similar concepts. The initial themes were written as a report for discussion among the researchers. In the group discussion process, we aimed to achieve richer interpretations of meaning rather than attempting to achieve a consensus of meaning. The initial themes were recursively reviewed, refined, and finally merged into six themes that describe the 'benefits' and 'challenges' of deploying technologies in aged care during pandemic restrictions.

3 RESULTS

Our analysis revealed that ICTs were widely adopted in aged care homes for promoting the social connection and enrichment of residents. Technologies reported by interviewees included tablets with bespoke user interfaces; video conferencing platforms such as Microsoft Teams and Zoom; games such as Solitaire and colouring apps; social networking sites such as Facebook and messaging tools; large screens and projectors for streaming videos; virtual reality experiences such as revisiting childhood homes; smart speakers and smart displays; smart televisions; and robotic pets such as the PARO. We identified three benefits of deploying technologies in aged care homes during COVID-19: 1) connecting residents to family and friends in flexible ways; 2) supporting residents' individual needs and interests; and 3) keeping families informed and reassured. On the other hand, there were several barriers to technology deployment, including 1) issues with video calling technology; 2) staff fatigue and the loss of volunteers; and 3) limitations in infrastructural resources and support.

3.1 Benefits of Deploying Technologies in Aged Care During COVID-19

3.1.1 "The Best Thing in the World": Connecting Residents to Family and Friends in Flexible Ways. Maintaining connections with family and friends is essential for the wellbeing of people living in aged care homes [3], but this was constrained during the pandemic. Henry, an aged care staff member, described the experience for residents as "*like being in jail*" when aged care homes were in lockdown and residents had limited ways to connect with the outside world.

In response, video calling technology was widely adopted by aged care homes to help residents stay connected to their families. For example, Carl's organisation provided six iPads to share among residents and used them when residents wanted to make a video call with their families. Emily said most residents in her facility were not used to or had never seen Zoom or FaceTime as a way of communicating. The video calling experience was completely new to them. When asked about how residents felt about video calls, she said: "*there were some beautiful examples where you get people who were cognitive enough to understand, and they thought it was the best thing in the world.*"

One opportunity arising from the pandemic was that video conferencing platforms became widely accepted by family members of aged care residents. This made it easier for video calls to be facilitated in aged care homes. For example, in Carl's care home, more than 100 meeting sessions between residents and their families were organised every week. He said: "*We have a few stories where they're being able to ring more people than they would have seen, which is not surprising. . . Working from home, and all of those digital innovations that occurred during COVID enabled and facilitated more conversations.*"

Videoconferencing technology not only helped residents connect with their existing social contacts, but it also helped some residents meet new people and make new connections. For example, during COVID-19 restrictions, Carl's care home organised video calls for their clients with people living in other care homes. This was considered valuable because the residents had limited opportunities to connect with new people when isolated from the world outside the facility.

In addition to technologies introduced by aged care organisations, there were also some family-led initiatives reported by interviewees, particularly in the use of smart display systems for social connection. Glen described how one family deployed a Google Nest Hub in the resident's room, a system that combines the functionality of a voice-controlled smart speaker with a touchscreen that people can use to look at pictures, watch videos, and control smart home devices. The family also set up a live photo board that had "*rolling photos that kept changing*". Photos were updated synchronously so that the resident could see "*photos of their grandkids' birthday party, drawings by the grandkids or great grandkids, and how they're changing during the year*". In addition, the family pre-programmed the children's details into the system, so the resident can simply video call family members through a voice command.

3.1.2 "It Can Make Someone's Day": Supporting Residents' Individual Needs and Interests. During the COVID-19 pandemic, many aged care homes introduced social distancing rules and changed how social activities were organised. For example, Emily said: "*We tried to restrict the number of people getting together and the amount of time they spent together. Instead of running a bigger activity with more people, it would be a smaller activity. They would do it in their zones, whether it was on that floor on in that wing, and it would go for a shorter period of time.*"

Interestingly, this new model of organising activities in smaller groups received positive feedback, and staff wanted to continue it after the restrictions. Emily said: "*There would be [an] individual social and emotional support visit. The time of the staff was split more evenly. . . If you've got more things going on, it actually frees up staff to be able to go and focus on people who maybe choose not to come out from their rooms or can't leave their rooms.*"

As shown in the above example, when group activities in aged care homes were constrained due to pandemic restrictions, it was easier for staff to split their time and cater to the individual needs of residents. In fact, using technologies to support individual needs and interests did not require complicated deployment. Carl said that one lady living in their care home became a "YouTube DJ" by connecting an iPad to a boombox and playing YouTube karaoke videos. Emily remembered using a smart television to create a

helicopter experience for residents. They recreated the interior of an airplane and displayed it on a smart TV, so residents who wanted to take a trip could experience it and "*access something out of the facility*".

Daniel also shared his experience that simple technologies such as a pair of headphones could easily provoke small moments of joy: *"She put the headphones on the client, and he started dancing. No one else could hear the music. . . And then he invited the others to the dance with it. Those little things, a headphone with music is not major technological innovation, but it can make someone's day if you use it correctly."*

3.1.3 "Mum Looks Good": Keeping Families Informed and Reassured.
The benefits of using technologies for connection were not limited to residents of aged care homes, but also to family members as well. During the COVID-19 pandemic, many aged care homes used social media platforms or bespoke applications to inform families of news and updates inside the facilities during restrictions. This enabled family members to see what residents were doing, and to learn whether they were in good health, as Daniel said: *"When the aged care homes were locked down, connections of the residents back to their families was very important. . . say 'mum's okay, she looks good. She's eating well, and by the way, she is having a dance'. Just to take some of the stress and strain of what the families would be feeling."*

The above example shows that by using technology to access information inside care homes, family members could feel reassured when they were unable to visit in person, especially when they could see the resident's face during video call communications.

Communication through technology also enabled more family members to be involved in the aged care home's agendas. For example, the care home where Glen worked expanded their family outreach program from Melbourne to other cities in Australia during the pandemic. He described: *"We had a room set up where some of the residents were on camera, and we gave all their family members links to that meeting. One of the things that we found really interesting is you'd have family members that were in Queensland or Sydney or country Victoria that could now attend resident relative meetings. And it's one of the things we will now continue."*

These examples show that social media platforms and video conferencing applications can help family members to virtually visit aged care facilities, keep them engaged with the internal agendas, and provide a sense of reassurance through updates on residents' daily lives. However, deploying these technologies in aged care, especially during the pandemic, also presented challenges.

3.2 Challenges of Deploying Technologies in Aged Care During COVID-19

3.2.1 "Technology of That Nature Confuses Them": Issues with Video Calling Technology.
While video calling technology has been in use for decades, it was still a new experience for many older people living in aged care homes. This may be due to delays in the use of technology in the aged care sector, or a lack of strong need to use it because people could previously visit in person.

When deploying video calling in aged care homes, our interviewees claimed that while some residents were able to understand it well, others had difficulty, as Emily described: *"To some people,*

it's like watching a recording. They recognise the voice, and in some instances, they recognise the visual. But they can't make the whole connection with it. . .The hardest thing is that they want to be able to interact with their loved ones the way they would if they were holding their hands. Unfortunately, when it's just conversations and that person is in a screen, it doesn't always work." This example shows how video calling technology could be confusing for some residents and sometimes disappointing for the families when they could not receive reactions from residents.

The feeling of confusion during video calls could be worse for people with dementia, as Fred described: *"It's increasingly difficult, because people with dementia, often technology of that nature confuses them. They find it really hard to use a telephone in a lot of cases, let alone working with something like FaceTime."* Glen described similar issues; some residents felt *"heartbroken and upset"* after the end of the calls, as the connection suddenly stopped. The situation could be complicated by the fact that video calls enabled people to see faces during the conversation, which could give the impression that the person on the other end of the call was right in front of them.

Another minor challenge with deploying video calling technology in aged care was that there were many commercial products available to use. It was difficult for care providers to accommodate all the different needs and requests of families, especially during the pandemic. When multiple platforms were expected to be available, staff facilitators could face barriers, as described by Glen: *"We used iPad with FaceTime. We also used Zoom, Skype. That becomes a challenge because you've got to have your staff knowledgeable of more than one application, which is normal but not all that easy. They always get local technology blocks."*

3.2.2 "Emotionally and Mentally Draining": Staff Fatigue and the Loss of Volunteers.
Staff facilitation is crucial for the deployment of technology in aged care settings. As Daniel said, if someone in their care home wanted to FaceTime their family, "*we would have to do that for them; they couldn't do that themselves, so their use of technology was very limited*". However, careful one-on-one facilitation by staff was very difficult during COVID-19 due to increased workloads. Emily felt that: *"It's been emotionally and mentally draining. But it's also brought out the best in the people working in aged care and their resilience and their determination."* Glen said: *"I think one of the things we are seeing, across providers, is that staff are tired. The staff were dealing with a lot with their work. Honestly, I think a lot of people need a month off. I don't think most people really get how short-staffed aged care homes are."*

The pressure on staff was exacerbated when volunteers were not allowed to visit aged care homes. Volunteers were a major part of service delivery for some aged care homes and important sources of social interaction for residents. Daniel remembered that they had about 200 volunteers across all facilities before COVID-19, but the loss of their support during the pandemic had a huge impact on the facilities: *"They talk to the residents, they deliver a cup of tea, they do little things, they play cards, they set up activities that help with that social interaction. . . A major part of our service delivery to our clients was through the volunteers, but COVID-19 really had a large impact on our volunteer base because they are not coming in and helping us out."*

Technology Deployment for Social Connection in Residential Aged Care: Care and Technology Providers' Experiences
During the COVID-19 Pandemic

CHI EA '23, April 23–28, 2023, Hamburg, Germany

When this support from volunteers was not available, staff members had less time available to facilitate the use of technologies like video calls, because they had to complete many of the tasks that would ordinarily be handled by volunteers. With the increased pressure on staff, it also became more challenging for technology providers to organise training sessions about the use of technologies in aged care homes, as Lucas said: *"The staff members are normally trying to do it in a room if we were doing a one-hour [training] session. [But] they've got people knocking on their door, ringing, you know, they are distracted constantly. They have so much on their plate."*

3.2.3 "They Weren't Set up to Handle Mass Technology at Once": Limitations in Infrastructural Resources and Support. Funding limitations are a substantial challenge to deploying technology in aged care [7]. Henry, an aged care staff member, encountered resistance even to small purchases, such as buying an extra iPad or a bigger television set. He thought it would be difficult for older people to watch things on a small 9- or 10-inch screen, but in order to connect the tablet to a larger TV, he had to use his own money to buy cables.

With the increased demand for video calling during the COVID-19 pandemic, the limited number of devices in some facilities made it difficult to manage their use for different purposes: *"A lot of them are part-time staff, and they need to do the activities and then the booking of the virtual visits. . . They were using the same devices potentially for trying to do the activity, then the device might have been used for FaceTime with a family member or a virtual visit (Lucas)."*

Henry felt that many aged care facilities were "*ill-prepared*" for the pandemic when technologies were needed on a large scale: "*they never thought that they would be locked down and the residents would be cut off*". This lack of preparation meant that they only had limited resources available for the residents. Henry said that they had to "*share one or two iPads among 60 to 80 residents*". This meant that residents only had limited time to connect with their loved ones in each call.

Unstable internet connections also created barriers in some homes. An internet connection was a basic requirement for many technology-based activities, but this was not available in all facilities: *"There have been attempts to try and do the variety [of activities], but then depending on where the building infrastructure is at, from the Wi-Fi and connectivity perspective, a lot of them weren't set up to handle mass technology at once (Lucas)."*

In addition, interviewees emphasised the importance of providing private spaces for residents to use technology. Currently, in residential aged care facilities, the Internet connection is usually provided through Wi-Fi for the whole facility. Carl believed that it is important to introduce in-room Wi-Fi for residents, as it is more stable and secure and can allow residents to use their tablets "*at the bedside or at the point of care*" and do activities such as "*streaming, Netflix, and Chromecast*". Iris also believed that "*there is an opportunity on an individual basis for clients in residential aged care if they had their own devices to participate from their own space*". These quotes suggest an opportunity for care homes to explore how private networks can support the needs of individuals who are able to use technology independently.

4 DISCUSSION

This study investigated how Australian aged care organisations deployed technologies in aged care homes for social connection during the COVID-19 pandemic. Our findings indicate that new innovations, especially video calling, were introduced by aged care homes, bringing significant benefits to the residents. Further, family-led initiatives, such as smart speakers and display systems, supported residents' intimate connections to family and friends and addressed their individual needs. These findings extend previous research on the benefits and barriers of using technologies in aged care [6, 25], focusing on the impact of the COVID-19 pandemic and the perspectives of care and technology providers. However, deploying technologies in aged care is challenging with multiple constraints, including issues with video calling technology, challenges in staff facilitation, and limited infrastructural support.

Based on the above findings, we argue that technology deployment in aged care for social connection requires careful facilitation from staff, better resourcing and infrastructural support, collaborations with volunteers, and more attention to individual needs.

First, our findings revealed that some technologies, such as video calling, function as a double-edged sword. While video calling can help some residents of care homes connect to 'the outside world' [18], it can also be cognitively demanding for people with dementia [12, 30]. Non-verbal cues such as bodily contact and gestures are essential for communicating with people with dementia, but they are difficult to be translated into online settings [30]. Other novel technologies such as virtual reality also require one-on-one facilitation, as they could cause physical discomfort and risks of falling for residents [40]. Therefore, technology deployment in aged care requires considerable attention and careful facilitation from staff. Care providers should be prepared to allocate staff time to facilitating these technology-based activities, given the potential value of the activities for maintaining social connections for the residents living in care homes.

Second, our findings revealed many issues with resourcing and infrastructure in care homes. In Australia, a royal commission report highlighted that the aged care system is well behind other sectors in the use and application of technology [8]. We suggest that three aspects related to resourcing and infrastructural support in aged care be improved in the future: inclusivity, which means providing equal opportunity to access internet connection and digital devices; diversity, which means introducing more diverse types of ICTs to aged care to enable creative uses that respond to individual needs; and training, which includes both training for residents who can operate digital devices independently and training for staff who are less familiar with technologies or lack confidence in using them to support residents.

Third, our findings showed that the loss of support from volunteers during the pandemic led to reduced social interactions for residents and increased pressure on staff. This highlights the important role of volunteers in aged care facilities. Volunteers in residential aged care can provide valued companionship to residents and relieve staff workload [10, 11, 38]. However, there is limited discussion in the literature about recruiting volunteers as technology facilitators in aged care facilities. We see an opportunity

for future researchers and practitioners to explore the role of volunteers in providing technology delivery and support to residents. This requires clarification of the roles of volunteers in aged care [19] and well-structured training programs [38].

Finally, during the COVID-19 pandemic, some aged care homes organised their social activities in smaller groups as their pandemic control strategy. This has shown some benefits in the care homes, as staff can distribute their attention more evenly among residents and provide greater individual support to each person. Previous research has argued that adopting a person-centred care approach is crucial for creating meaningful enrichment experiences in aged care homes [35]. From the examples in our interviews, we see the value of attending to the individual needs of residents through changing the modalities of activity organisation and the ways of working with individual residents. Future work could explore further how the forms of activities (individual, small group, large group) can affect residents' experiences of participating in different types of technology-based activities.

4.1 Limitations and Future Work

This study has provided in-depth insight into the impact of COVID-19 on technology deployment for the social connection of older adults living in aged care. One limitation is that the small-scale, qualitative nature of this study means that the results may not be applicable to other countries and territories. As this study was conducted in Australia, some of the results may be more applicable to the Australian aged care sector. While our research focused on the experiences of care and technology providers, we have limited knowledge of the residents' experiences of living in care homes and using technology for social connectedness during the pandemic. Due to the visitor restrictions in aged care at the time of conducting this study, we were not able to conduct interviews with older adults or observe their experiences with technology. This presents an opportunity for future work.

It is also worth noting that more of our participants identified as men than women. This may be representative of a gendered division of labour within the aged care sector. Of our participants who worked in aged care, most held managerial roles, including ICT management. None of our interviewees were personal care assistants, which is typically a more female-nominated role. In addition, when we contacted care and technology providers through the emails listed on their websites, they were usually forwarded along to the managerial teams of the organisations, which involved more men than women.

In addition, this study was conducted when strict restrictions were imposed. Future work could explore how the use of technology has changed following the gradual relaxation of restrictions and what practices were maintained or suspended. These insights can further reveal the opportunities and issues of technology deployment in aged care.

5 CONCLUSION

Technology was important for supporting the social connection of older adults living in residential aged care homes during the COVID-19 pandemic. The study illustrates the benefits that can be brought from using technology for social connection, emphasising the importance of introducing technology to support connections between residents and families who cannot visit often. The pandemic revealed further opportunities for new and diverse forms of technology to be deployed in aged care settings. However, technology deployment in aged care is complex and challenging. Drawing on the perspectives of multiple stakeholders, this study presents lessons on how technology deployment in aged care can benefit from collective efforts from policymakers, care providers, technology designers and vendors, and volunteers. These lessons should be applied to future practice and help the aged care industry get better prepared before a time of crisis and maximise the benefits of technologies to residents.

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Technology Deployment for Social Connection in Residential Aged Care: Care and Technology Providers' Experiences
During the COVID-19 Pandemic

CHI EA '23, April 23–28, 2023, Hamburg, Germany

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