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# Video Consultations and Environmental Sustainability - Usability's Impact on Long-Term Use

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**Abstract.** The rapid shift to digital healthcare, accelerated by the COVID-19 pandemic, holds promise for sustainable healthcare delivery and climate change mitigation. This study evaluates the *Alltid öppet* application through the lens of usability and patient satisfaction and their correlation with the intention for continued use. A cross-sectional analysis of primary care patients revealed that alignment with user needs significantly predicts long-term adoption, while frustration during use discourages it. Ease of use did not significantly affect the intention to continue, suggesting that usability alone is insufficient to drive sustained engagement. These findings highlight user-centred design's importance in digital healthcare solutions, suggesting that enduring adoption hinges on value perception and reducing user frustration. As the healthcare sector navigates its digital future, this study offers crucial insights into the design and implementation strategies that could underpin the environmental sustainability and resilience of healthcare systems.

**Keywords.** Video Consultations, Usability, Environmental Sustainability, Resilience, Primary Care, Survey, Sweden

## 1. Introduction

The ongoing transformation of healthcare towards digital care, such as virtual care and video consultations (VCs), has the potential to reduce the climate impact of the health system by reducing the carbon footprint associated with transport, fuel consumption and in-person care delivery. Further, it can improve healthcare systems' ability to respond to climate change and other crises by facilitating access to remote and hard-to-reach areas, reflecting a crucial shift in healthcare delivery strategies [1]. During the COVID-19 pandemic, the adoption of VCs saw a remarkable increase [2,3]. While there is high satisfaction and many reported benefits with VCs among healthcare professionals

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(HCPs) and patients, there are indications that not all patients want to continue using VCs in the future [4].

Poor usability of VC applications may be a challenge to long-term adoption and dismantling barriers to digital healthcare adoption is pivotal in leveraging VCs to construct healthcare systems that are both environmentally sustainable and robust, capable of confronting climate change and future health emergencies effectively. Therefore, this study aims to assess the influence of VCs' usability on enhancing environmentally sustainable healthcare systems. More specifically, we aim to unravel how usability impacts digital healthcare solutions' long-term adoption and effectiveness by focusing on perceived usability from a patient perspective.

## 2. Methods

This cross-sectional study was designed, with data collected via an online survey administered from March to May 2022. Invitations were sent to all primary care patients who engaged in VCs through the application *Alltid öppet* [always open] at 10 purposefully chosen healthcare centres during the data collection period and 528 participated. Further details can be found elsewhere [4]. *Alltid öppet* is a service for VCs available at publicly funded primary care centres in the Region Stockholm.

To assess the usability of VCs through *Alltid öppet*, we adapted three items from the Usability Metric for User Experience (UMUX) as suggested by Lewis et al. [5]. Participants evaluated these items using a 7-point Likert scale, focusing on 1) the alignment of VCs through *Alltid Öppet* with their needs, 2) the frustration level experienced while using VC through *Alltid Öppet* and 3) the ease of use of VC through *Alltid öppet*. The mean score of each item was calculated. The first and third Items were used to calculate the System Usability Scale (SUS) score [5]. A SUS score provides a global overview of a system's usability.

Previous analyses on the intention to continue using VCs, differentiating between long-term and short-term adopters, were considered [4]. Similarly, in this study, those intending to continue to use VCs (long-term adopters) were compared with those who were not willing to have VCs in the future or who were unsure (short-term adopters). Only those without experience with VCs through other applications are included in the analysis to reduce other potential influences on intention to use since the focus is on *Alltid öppet*'s usability. T-test was employed to determine the significance of the differences observed. Additionally, logistic regression was conducted on significant UMUX items, and the model was adjusted for the demographic variables age and gender to further understand the determinants of long-term adoption. Stata 17 was used to conduct the analysis.

## 3. Results

Our findings indicate a strong alignment between the application's offerings and patient needs, as evidenced by a mean satisfaction score of 5.30 (SD = 1.72). Moreover, the application's design and operational framework appear to minimize user frustration, with participants reporting a low mean frustration score of 2.45 (SD = 1.88). Critically, the ease of navigating and utilizing the application was highly rated, demonstrated by a mean score of 5.71 (SD = 1.65), reflecting its user-friendly interface and functionality.

Figure 1 illustrates the different responses of long-term and short-term adopters of the *Alltid öppet* application to the UMUX items. The vertical axis represents the mean scores, while the horizontal axis lists the UMUX items evaluated. Notably, a disparity exists between long-term and short-term adopters: long-term adopters report better alignment with their needs, less frustration, and easier application use than short-term adopters (Figure 1). In contrast, short-term adopters report lower satisfaction and greater difficulty with the application, suggesting barriers to usability that could impact the likelihood of continued use.

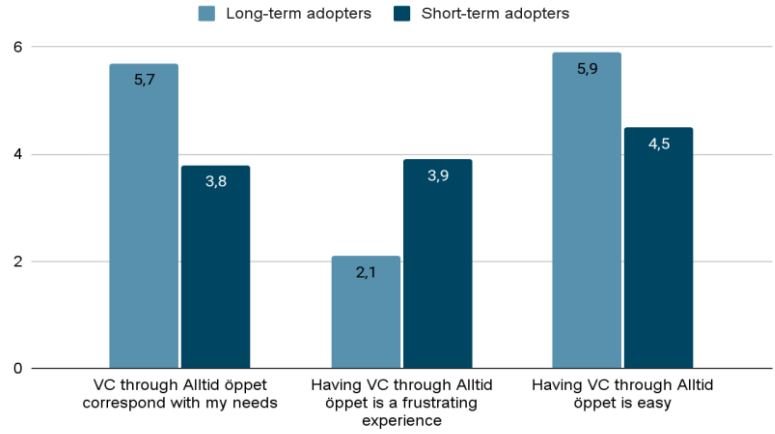


**Figure 1**. Comparison of long-term adopters and short-term adopters in regards to the UMUX items mean score

The overall mean System Usability Scale (SUS) score for all participants was 71.77 (SD = 16.54), which set the application's usability above average. A notable distinction emerged when the SUS scores were compared between long-term and short-term adopters of the *Alltid öppet* application. Long-term adopters reported a higher mean SUS score of 74.94 (SD = 19.30) while short-term adopters reported a significantly lower mean SUS score of 57.15 (SD = 14.21).

In our regression analysis, the likelihood of patients' continued use of the *Alltid öppet* VC application was quantified through odds ratios, offering insights into the factors influencing user retention (Table 3). Our analysis found an association between the application's alignment with user needs and the experience of frustration with continued use. The application's alignment with user needs was positively associated with intention to continue use, with an odds ratio of 1.56 (95% CI: [1.23-1.99], $p<0.001$). Conversely, the experience of frustration was negatively associated with intention to continue VC use, with an odds ratio of 0.78 (95% CI: [0.65-0.94], $p<0.05$). The simplicity of the application's use within the sample studied did not substantially impact the decision to continue its use in the future. To summarize, correspondence with participants' needs increased the odds of intention to continue using VCs, while frustration while using decreased the odds of intention to continue using them. These associations persisted after adjustment for age and gender.

**Table 3.** Odds ratio with a 95% confidence interval for intention to continue use

| | Odds ratio [95% conf.] |
|---|---|

| | |
|---|---|
| VC through *Alltid öppet* correspond with my needs | 1.56 [1.23-1.99]* |
| VC through *Alltid öppet* is a frustrating experience | 0.78 [0.65-0.94]** |
| VC though *Alltid öppet* is easy | 1.05 [0.84-1.32] |

*p<0.001 **p<0.05

## 4. Discussion

Our study aimed to evaluate the potential impact of the *Alltid öppet* applications' usability on patients' long-term adoption of VCs. Considering the potential carbon efficiency of VCs, the findings can inform a sustainable VC adoption and increase accessibility to care in general as well as in times of crisis. Our results indicate that the degree to which the application meets users' needs is a significant predictor of long-term use, which aligns with the aim of establishing environmentally sustainable digital healthcare practices. Frustration with the application negatively impacted the intention to continue using, revealing that user experience is critical in the sustainable adoption of virtual care solutions. The non-significance of ease of use suggests that while a user-friendly application is necessary, it cannot guarantee sustained use. This finding directly feeds into our study's objective by suggesting that for a digital healthcare application to contribute to the environmental sustainability of healthcare systems, it must go beyond being easy to use; it must be perceived as valuable and effectively meet user needs.

The discrepancy in experiences between long-term and short-term adopters of the *Alltid öppet* application underscores an essential aspect of virtual healthcare adoption. A mean SUS score of around 70 is considered "OK" or "acceptable" [6], typically reflecting a level of usability that is not excellent but not poor either; it is about average. Significantly lower System Usability Scale (SUS) scores among short-term adopters suggest that initial usability barriers or negative experiences may deter ongoing use.

These results could reflect infrastructure issues, and according to Australian GPs, upgrades of current technology leading to better emulation of face-to-face consultation could bridge the gap [7]. Additionally, usability issues on the healthcare providers' side could be an essential factor to consider, as HCPs have previously reported VC usability issues [8]. Furthermore, these results may also reflect an inappropriate selection of healthcare mode where VCs might have been scheduled where a face-to-face was more appropriate. Short-term adopters have reported having VC due to a lack of available face-to-face consultations to a higher degree than long-term adopters [4], which likely affects their experiences. Moreover, these results may partially reflect a lack of digital literacy among short-term adopters, as a previous study indicated a relationship between difficulties initiating VCs and self-reported abilities to use digital services and the Internet [9]. Future research could investigate these aspects further.

Our study has several implications. For developers and implementors, addressing usability challenges early is essential for fostering a positive initial experience and encouraging sustained engagement with virtual healthcare services among both patients and HCPs. For healthcare providers and policymakers, enhancing the user experience could lead to broader acceptance and integration of VCs into healthcare practices, aligning with goals for a more accessible and environmentally sustainable healthcare system [10]. Further, our findings have societal implications. As healthcare systems

worldwide pivot towards digital solutions to meet environmental goals and improve efficiency, understanding the user experience becomes more critical. The negative impact of frustration on user retention underscores the need for healthcare policies prioritizing user-centred design in digital health technologies. These solutions must intuitively align with patient needs and expectations for broader societal acceptance.

This study's strength is its examination of usability and its impact on future VC use in general. However, solely examining the usability of one VC application is a limitation.

## 5. Conclusions

In conclusion, our study highlights the necessity for digital healthcare services to deliver beyond basic functionality, providing environmentally sustainable services closely attuned to patients' complex needs. The success of such services, and consequently the realization of a resilient and environmentally sustainable healthcare system, relies on the ability to address and smooth out user barriers. As digital healthcare continues to evolve, its integration into daily practice will be pivotal in shaping healthcare delivery's future and advancing public health objectives amidst climate concerns.

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