# Transforming Frontline Healthcare Services: The Role of Digital Service Innovations in Patient Experience

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**Abstract:**

Patients' service quality and well-being depend on their experiences with frontline services. Due to patients' diverse needs and wants, as well as their expectations of service delivery depending on their personal health situation, providing these services poses a significant challenge. With the advent of digitalisation, digital service innovations offer an opportunity to enhance patient experience. Two experimental studies show that the type of service interaction at the touchpoints reception and waiting room influences patients' perceived service quality and health-related behaviour in different ways. While human contact remains crucial at both touchpoints, in waiting room, the implementation of digital elements in service delivery exceed patients' expectations, leading to greater satisfaction and compliance. Using social cognition concept, expectation-confirmation-theory and needs-congruency-model, we explain our findings. Our findings yield important implications for designing frontline services at different touchpoints and contribute to a better understanding of patients' perspectives on service interactions at these touchpoints.

*Keywords: Digital transformation, patient experience, digital service innovations*

*Track: Service Marketing & Service Innovation*

## 1. Introduction

Improving patient care and digital transformation are the main topics in healthcare and have received increasing scholarly and practical attention in recent years (e.g., Agarwal, Dugas, Gao, and Kannan, 2020; Dt. Ärzteblatt 2022b). For years the healthcare sector has been facing extremely serious challenge, with the expected status in the healthcare system becoming more and more worse in the future, resulting in serious and detrimental consequences for both patients and medical staff. More specifically, the healthcare system currently suffers from ongoing shortage of physicians, work overload and annual increasingly high cost as well as the demographic change (Dt. Ärzteblatt, 2022a; Patrício et al., 2020).

Researchers and practitioners see digital transformation as a promising solution to improve the quality of care and to relieve the burden on the healthcare system (e.g., Dt. Ärzteblatt, 2022b; Grewal, Hulland, Kopalle, and Karahanna, 2020; Iyanna, Ractham, Talwar, and Islam, 2022). In other industries, digital transformation has resulted in the attainment of highly desirable outcomes for both customers and firms. For example, new business models and digital services have led to improved service quality for customers and cost savings and an efficient performance (Verhoef & Bijmolt, 2019). Especially in healthcare, service quality plays a highly crucial role. Previous studies have shown that a good patient experience positively impacts patients' behaviour and their health decisions as well as clinical processes and outcomes (Browne et al., 2010; Wolf et al., 2021). More precisely, patient experience on the patient side is related to patient engagement and compliance, malpractice risk, and patient loyalty, which in turn impacts employee satisfaction and healthcare provider profitability (Browne et al., 2010; Richter & Muhlenstein, 2017; Nakata et al., 2019).

However, despite that the digitalization offers promising opportunities, it is unclear how digital health service innovations should be to employed at various patient touchpoints to enhance service quality. Currently, little is known how patients experience, perceive and evaluate these digital health service innovations and how healthcare providers utilize these in a manner that optimizes their efficacy and value. For example, recent research shows that adoption and continued usage of digital health innovations still remain a significant challenge despite their boom during the COVID-19 pandemic (Iyanna et al., 2022) or may be linked to negative patient outcomes (e.g., Green, Hartley, and Gillespie, 2016).

Given the paradoxical state of the healthcare sector the question arises as to how digital health service innovations should be employed to improve the patient experience and thus service quality. Answering this question is crucial for healthcare providers and the healthcare

system in general, as they can enhance both their organizational and financial performance while creating a pleasant environment for both patients and their own employees. More specially, how they can design service interactions at frontline touchpoints in order to increase their own performance and simultaneously improve service quality, but also how they can avert possible negative effects of digitalization.

Especially in healthcare, the service encounter plays an extremely important role, as it is directly linked to a person's most valuable asset – his/her health. From service research, we know that the design of frontline services significantly impacts customer experience and perceived service quality (Bitner, Booms, and Mohr, 1994). In the healthcare sector, providing services poses major challenges in contrast to other service situations, as patients are inherently vulnerable (Berry, Wall, and Carbone, 2006) and their situation is often associated with uncertainty. Furthermore, patients' needs are very diverse and vary according to their situation which in turn influence their expectations for a service experience. It is therefore crucial for the healthcare sector to know patients' expectations and their preference for service interaction depending on their situation in order to provide services that meet patients' needs. A key situational factor that not only reflects patients' health condition and associated needs and feelings, but also represents a realistic and daily situation in frontline service is service criticality. Service criticality is characterized as high or low importance that the service be executed (Ostrom & Lacobucci, 1995). Hence, this study addresses the following research question:

*RQ1: To what extent is the relationship between type of service interaction patients' level of service quality influenced by the situational factor of service criticality?*

Every service experience is characterized by individuals' perception and evaluation of the service delivery. These experiences are encompassed by customers' cognitive, emotional, social, and sensory responses to all interactions of firm offerings (De Keyser et al., 2015). For example, previous research has demonstrated that the service environment such as servicescape (i.e., physical design, atmosphere) as well as the use of technology in frontline services affects customer experience (Bitner, 1992; Collier & Barnes, 2015; Van Doorn et al., 2017). In light of the findings, the second research question is:

*RQ2: How does the type of service interaction influence patient perceptions and their health-related behaviour?*

With our research, we provide several contributions. First, this research provides important insights into how services should be (re)designed at two different touchpoints to create a pleasant patient experience and how organizational processes should be adapted

accordingly. The results of this study provide valuable guidance for the development of marketing and touchpoint strategies in the healthcare sector by providing specific recommendations for optimizing interactions along the patient journey. Since healthcare is complex and a good service delivery depends on patients' healthcare situation, we examine service criticality as a situational factor. As a result, our research shows that implementing digital elements in service delivery has the potential to influence patients' service quality positively but not for each touchpoint. More precisely, considering the situational factor we show that the touchpoint *reception* should be still equipped with medical staff whereas the touchpoint *waiting room* should contain digital components. Additionally, we examine the extent to which a redesign of service delivery may lead to an undesirable versus desirable patient outcome to ensure that potential negative consequences for patients are considered and addressed. Here, our analysis shows that a halo effect occurs and redesigning the touchpoint *waiting room* with digital elements leads to higher patient compliance whereas a completely human service should be retained at touchpoint *reception*.

Second, we investigate patients' perceptions to gain a deeper understanding of their preference for a service interaction partner at different touchpoints. These insights are relevant to adapt existing services or develop new ones in order to optimize the utilization of resources. To assess service interaction, we used the concept of social cognition from Fiske, Cuddy, and Glick (2007). People's judgments of others often fall along two primary dimensions warmth and competence (Fiske et al., 2007). Since in our research the focus is on efficient processes, we investigate to what extent the service interaction was perceived as warm or efficient. To our knowledge, this research is the first to investigate perception dimensions warmth and efficiency to evaluate (digital) service interactions in healthcare and what downstream consequences these both perceptions have on patients' service quality.

Third, we contribute to the research in patient experience and digital transformation in healthcare. We extend the research by generating insights into frontline services in healthcare at the touchpoints *reception* and *waiting room* by including patients' perspective. We explain the mechanisms of type of service interaction and patient experience through the application of three theoretical approaches: the expectation confirmation theory, the needs-congruence model, and the concept of social cognition. These approaches allow us to better understand the needs and perceptions of patients at frontline touchpoints, providing thus insights into the digital transformation of services and their effects on patients' service quality.

## 2. Conceptual Background

*2.1 Customers' evaluation process in service environment*

In the field of consumption customer experience is related to tasks and goals as well as the expectations that services provide certain benefits (Wirtz & Lee, 2003). Customers have different needs, wants and expectations of a service and expect the service to fulfil these in the best possible way (Wirtz & Mattila, 2001). Stimuli in a service environment form their impression of service quality (Bitner, 1992). They compare these impressions with their expectations and needs to evaluate to what extent services provide a promising benefit. According to Immonen, Sintonen, and Koivuniemi (2018), customers prefer and value a service channel due to their expectations of pragmatic, social or hedonic benefits. They argue that customers seek benefits in services for two reasons: "(1) the perceived benefits related to accomplishing requisite tasks during the process or (2) the gains experienced at an emotional level" (Immonen et al., 2018, p. 317). Ostrom and Lacobucci (1995) argue that customers compare these benefits with the associated costs and efforts, resulting in customers' preference judgements of service alternatives; in a perceived risky, uncertain situation they may seek benefits in service delivery whereas in situations of relatively less risk, they evaluate the costs of the service. In other words, people focus on social or hedonic benefits in an uncertain situation; if they feel less uncertain, they will prefer the service interaction that he/she perceives as most pleasant, convenient and effortless.

For our research, we draw on expectation confirmation theory (ECT) and needs-congruency model (NCM) and concept of social cognition for our research. ECT proposes that customer compare their expectations with the service performance they receive which in turn results in satisfaction if these are met or exceeded (Oliver, 1980). The NCM has a similar approach. Instead of their expectations, customers compare their needs and values with the delivered service (Wirtz & Mattila, 2001). We use concept of social cognition to capture patients' perceptions. People judge people and targets based on their perceptions and differentiate them on the basis of two universal dimensions, warmth and competence (Aaker, Vohs, and Mogilner, 2010). Warmth is associated with traits like kindness and helpfulness, whereas competence reflect traits like competent and efficient (Fiske et al., 2007).

## 3. Study framework

In our research we explore in what extent service interactions with digital service innovations influence patient's service quality and well-being in frontline services. We thus

consider various degrees of digital service innovations besides human service in our framework that have meanwhile established in service sector.

First, we examine the moderating influence of service criticality on the relationship between type of service interaction and patient satisfaction (Hypothesis 1a, b). We use patient satisfaction as dependent variable because it represents an indicator for patient experience and reflects service quality (Parasuraman, Zeithaml, and Berry, 1994; Wirtz & Mattila, 2001). Second, to better understand the mechanisms that lead to why a certain service interaction leads to higher levels of patient satisfaction, we investigate patients' perception and evaluation and include the dimensions warmth and competence as mediators. We expect that patients' evaluation of service alternatives differs depending on their situation and patients have higher levels of satisfaction either on a human-based or digital-based service interaction. More precisely, in line with the concept of social cognition, we suppose that patients will perceive a service interaction that include a human (human, mix) as warmer than a completely digital interaction; a service interaction, on the other hand, that includes technology (mix, digital) will be perceived as more efficient than a completely human interaction. For the dimension competence we examined efficiency as mediator that allows us to get a more precise and deeper picture of the extent to which the frontline service is perceived by patients as pleasant and effortless. Third, we investigate what extent type of service interaction affects patients' desirable vs. undesirable behavioural consequences. In hypotheses 4a, b, we examine the influence of type of service interaction and service criticality on patient compliance and analyse patient satisfaction as mediator. We test our framework in two frontline touchpoints (Study 1: *reception*, Study 2: *waiting room*) to generate a deep picture to frontline services in healthcare. Figure 1 provides a graphical display of conceptual model.

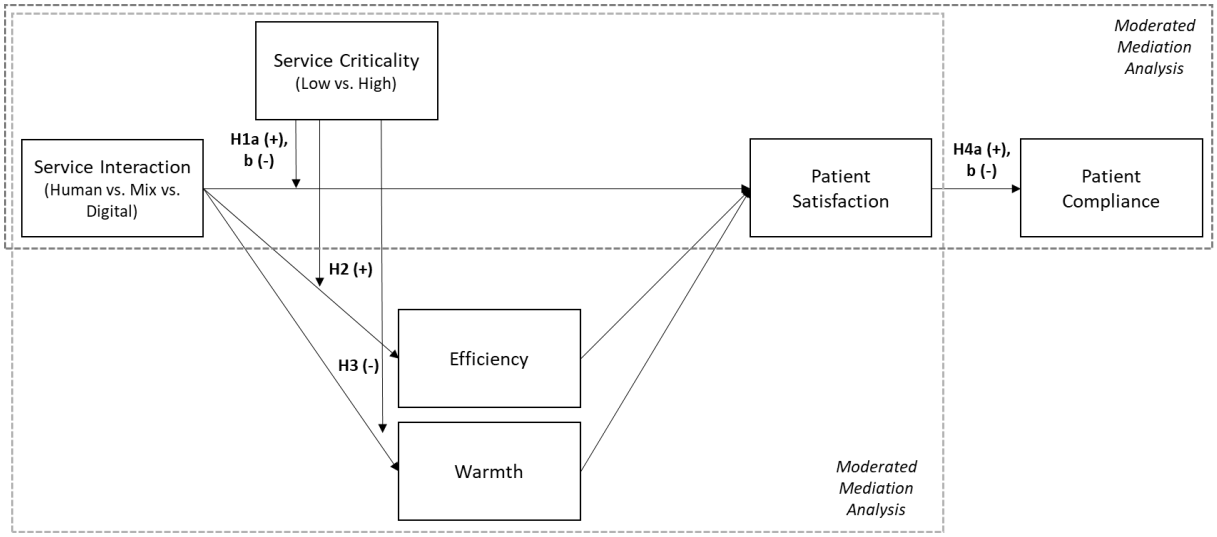



Figure 1. Study framework

## 4. Hypotheses Development

Based on the conceptual background and research findings, we pose the following hypotheses:

**Hypothesis 1**: Service criticality moderates the effect of type of service interaction on patient satisfaction, such that (a) in low service criticality, patients are more satisfied with a digital-based interaction rather that a completely human service interaction and (b) patients are more satisfied with a human-based service interaction rather than a completely digital service interaction if the service criticality is high.

**Hypothesis 2**: If service criticality is low, patients are more satisfied with a digital-based service interaction rather than a completely human service interaction, mediated by higher efficiency perceptions.

**Hypothesis 3**: In a high service criticality situation, patients are more satisfied with a human-based service interaction rather than a completely digital service interaction, mediated by warmth perceptions.

**Hypothesis 4**: Patient satisfaction mediates the relationship between type of service interaction on patient compliance, such that (a) patients exhibit higher levels of patient compliance with a digital-based service interaction rather than a completely human service interaction if service criticality is low (b) whereas in a high service criticality situation, patients are more compliant with a human-based service interaction rather than a completely digital service interaction.

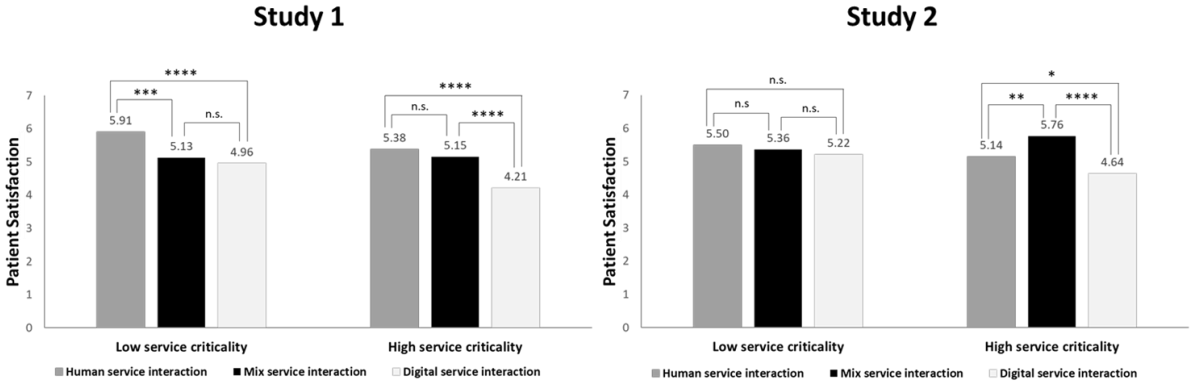
## 5. Method and results

To test our hypotheses, we conducted two experimental scenario-based studies, each for one of two frontline touchpoints. The scenario of both studies is designed as common physician's visits. In both studies, participants[1] were recruited by the online panel provider Prolific and received a monetary compensation for their participation on the study.

In both studies, we used a 3 (type of service interaction: human vs. mix vs. digital) x 2 (service criticality: low vs. high) between-subjects experimental design. All manipulation checks are succeeded and all Cronbach's alpha are above the cutoff value of 0.7, indicating construct-level reliability (Hulland, Baumgartner, and Smith, 2018).

[1] All participants are located in Germany. Study 1: initial sample: n = 248, final sample: n = 229 (52.0% male; 46.7% female; 1.3 % divers; $M_{age}$ = 34.39 years, $SD_{age}$ = 9.79 years). Study 2: initial sample: n = 240, final sample: n = 229 (52.8% male; 46.7% female; 0.4 % divers; $M_{age}$ = 34.53 years, $SD_{age}$ = 9.65 years)

The results show that the hypotheses that are related to the analyses of low service criticality have to be rejected in both studies (H1a, H2, H4a)[2]. The hypotheses referring to high service criticality are supported (H1b, H3, H4b). Please see the results in Figure 2, Table 1, Table 2.




Notes. Posthoc analysis of ANCOVA. Study 1: n = 229. Study 2: n = 229. Included covariates: gender, age, need for human interaction, technology affinity.
**** p ≤ .001; *** p ≤ .01; ** p ≤ .05; * p ≤ .10; n.s. = not significant

Figure 2. Graphical representation of the posthoc analysis of H1a, b (Study 1 and Study 2)

| | Study 1 | | | | Study 2 | | | |
|---|---|---|---|---|---|---|---|---|
| Path | *Coeff. (SE)* | *BootLLCI* | *BootULCI* | Mediation | *Coeff. (SE)* | *BootLLCI* | *BootULCI* | Mediation |
| **Low service criticality** | | | | | | | | |
| SI (Human, Mix) → EFF → SATIS | −.02 (.17) | −.34 | .35 | ✗ | .11 (.18) | −.26 | .44 | ✗ |
| SI (Human, Digital) → EFF → SATIS | .24 (.22) | −.13 | .73 | ✗ | .34 (.16) | .04 | .67 | ✓ |
| SI (Mix, Digital) → EFF → SATIS | .26 (.15) | .02 | .60 | ✓ | .23 (.16) | −.04 | .58 | ✗ |
| SI (Human, Mix) → WARM → SATIS | −.19 (.08) | −.37 | −.05 | ✓ | −.13 (.09) | −.32 | .02 | ✗ |
| SI (Human, Digital) → WARM → SATIS | −.31 (.13) | −.53 | −.09 | ✓ | −.47 (.15) | −.79 | −.21 | ✓ |
| SI (Mix, Digital) → WARM → SATIS | −.12 (.12) | −.36 | .10 | ✗ | −.34 (.13) | −.63 | −.13 | ✓ |
| **High service criticality** | | | | | | | | |
| SI (Human, Mix) → EFF → SATIS | .05 (.15) | −.23 | .34 | ✗ | .35 (.17) | .05 | .71 | ✓ |
| SI (Human, Digital) → EFF → SATIS | −.17 (.17) | −.50 | .16 | ✗ | .03 (.17) | −.30 | .36 | ✗ |
| SI (Mix, Digital) → EFF → SATIS | −.21 (.14) | −.51 | .05 | ✗ | −.32 (.17) | −.68 | −.03 | ✓ |
| SI (Human, Mix) → WARM → SATIS | −.11 (.11) | −.33 | .09 | ✗ | .03 (.11) | −.19 | .25 | ✗ |
| SI (Human, Digital) → WARM → SATIS | −.52 (.16) | −.87 | −.26 | ✓ | −.66 (.20) | −1.09 | −.30 | ✓ |
| SI (Mix, Digital) → WARM → SATIS | −.42 (.13) | −.70 | −.19 | ✓ | −.69 (.18) | −1.09 | −.36 | ✓ |

Notes. PROCESS (Model 4). Study 1: $n_{SCLow}$ = 117, $n_{SCHigh}$ = 112. Study 2: $n_{SCLow}$ = 115, $n_{SCHigh}$ = 114. SI = type of service interaction, SC = service criticality, EFF = efficiency, WARM = warmth, SATIS = patient satisfaction. The table reports unstandardized regression coefficients. SE = standard error, BootLLCI = lower−level bootstrap confidence interval, BootULCI = upper−level bootstrap confidence interval. The 95% confidence intervals were created using 5,000 bootstrap samples; confidence intervals that do not contain 0 indicate significant effects. Included covariates: gender, age, need for human interaction, technology affinity.
Direct effects are consistent with the results from H1a, in both studies.

Table 1. Separate multiple mediation analysis of H2 and H3 (Study 1 and Study 2)

| | Study 1 | | | | Study 2 | | | |
|---|---|---|---|---|---|---|---|---|
| Path | *Coeff. (SE)* | *BootLLCI* | *BootULCI* | Mediation | *Coeff. (SE)* | *BootLLCI* | *BootULCI* | Mediation |
| **Low service criticality** | | | | | | | | |
| SI (Human, Mix) → SATIS → COMP | −.45 (.16) | −.75 | −.14 | ✓ | −.08 (.15) | −.40 | .20 | ✗ |
| SI (Human, Digital) → SATIS → COMP | −.54 (.20) | −.92 | −.14 | ✓ | −.15 (.14) | −.44 | .12 | ✗ |
| SI (Mix, Digital) → SATIS → COMP | −.10 (.14) | −.37 | .18 | ✗ | −.08 (.16) | −.36 | .25 | ✗ |
| **High service criticality** | | | | | | | | |
| SI (Human, Mix) → SATIS → COMP | −.13 (.16) | −.45 | .18 | ✗ | .33 (.16) | .03 | .67 | ✓ |
| SI (Human, Digital) → SATIS → COMP | −.67 (.18) | −1.03 | −.31 | ✓ | −.27 (.19) | −.65 | .09 | ✗ |
| SI (Mix, Digital) → SATIS → COMP | −.54 (.15) | −.83 | −.25 | ✓ | −.60 (.20) | −1.00 | −.24 | ✓ |

Notes. PROCESS (Model 7). Study 1: n = 229. Study 2: n = 229. SI = type of service interaction, SATIS = patient satisfaction, COMP = patient compliance. The table reports unstandardized regression coefficients. SE = standard error, BootLLCI = lower−level bootstrap confidence interval, BootULCI = upper−level bootstrap confidence interval. The 95% confidence intervals were created using 5,000 bootstrap samples; confidence intervals that do not contain 0 indicate significant effects. Included covariates: gender, age, need for human interaction, technology affinity.

Table 2. Moderated mediation analysis of H4a, b (Study 1 and Study 2)

[2] Contrary to our expectation, H1a shows opposite results. We thus analyzed H2 and H3 in both service criticality conditions separately and included both mediators, efficiency and warmth to uncover specific pattern of interaction and mediating effects.

## 6. General Discussion

Providing services at the frontline represents a significant challenge in healthcare. Patients have different needs and wants and their expectations of service delivery vary, depending on their personal health situation. In our two studies, we show that patients in a high service criticality situation prefer a human-based service interaction compared to a completely digital one. Patients in this situation feel their health is under threat, are helpless, full of anxiety and concerns and expect help if they enter a medical practice. In a human contact they find emotional support and the opportunity to relieve their inner tensions. In contrast to *reception*, patients are more satisfied with a service interaction including digital components in *waiting rooms* rather than a completely human one. In addition to their social needs, their practical needs will also be met as a result of the more efficient processes, thereby exceeding their expectations regarding service performance. We also suppose that integration of digital components in services into one's servicescape is perceived by patients as more innovative, resulting in a 'spillover' effect on their behaviour and reflected in greater patient compliance. Contrary to our predictions, our findings show similar results in a low service criticality situation. In line with Ostrom and Lacobucci (1995), our results suggest that participants prefer a human-based service at both touchpoints because these are perceived as more convenient than a (completely) digital service and better meet their practical needs. In contrast to *reception*, there is no significant difference between human and mix service interaction at *waiting room*, which can be reasonably explained by patients' roles (*reception*: active role, *waiting room*: passive role). We also suspect that social needs play a greater role alongside practical needs. For example, Brambilla et al. (2010) found that in healthcare, warm traits of frontline staff are integral to task fulfilment and patients' goal achievement.

This research highlights the importance of considering of patient perspective and their practical and social needs in designing frontline services in healthcare. More precisely, our research shows that depending on their health situation, certain patients' needs overweigh and may influence subconsciously their expectation and evaluation of service delivery. If underweight needs are additionally met, expectations can be exceeded, leading to greater patient experience. While in other industries, people are willing to accept higher costs through the use of technology in order to avoid contact with frontline employees (Oh, Jeong, and Baloglu, 2013), our research does not support this and shows human service is irreplaceable in patient care and patients prefer digital innovations if these add value to them and do not require additional effort.

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