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Barriers and Facilitators to Sustainable Technology Implementation in Care for People With Disabilities—Real World Data From a Three-Year Implementation Programme

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ABSTRACT

Background: Implementation issues often impede the realisation of the potential benefits of technology in disability care organisations for people with disabilities. Therefore, we conducted a longitudinal study to gain insights into the barriers and facilitators to implementation.

Methods: From 2019 to 2022, data were collected using questionnaires and interviews during 28 implementation projects in 26 disability care organisations.

Results: Barriers and facilitators were identified using 9 themes and 26 subthemes. The main themes identified were finances, disability care organisations, internal collaborations, external collaborations, technology, care staff, project teams, people with disabilities, and context. Most factors mentioned as barriers in one organisation were mentioned as facilitators in others. This suggests that barriers can be resolved to improve implementation.

Conclusion: A large number of barriers and facilitators spanning the organisation suggests that the implementation of technology should be considered an organisational reform. Acting upon them is crucial for the successful implementation of technology.

1 | Introduction

Approximately two million people in the Netherlands have disabilities. Of these, approximately 130,000 receive daily care under the Long-term Care Act (Dutch Healthcare Authority 2020). People with disabilities want to live as independently as possible, experience the intrinsic value of making their own decisions, and participate in the community (Wennberg and Kjellberg 2010; Kuijken et al. 2016; Independent Living Institute n.d.; United Nations 2006). Policymakers in Dutch long-term disability care promote equal opportunity for people with a disability to experience personal autonomy in how they live, work, and participate in society, regardless of the type, complexity, or severity of their disability (Vereniging Gehandicaptenzorg Nederland 2022, 2020, 2017; Rijksoverheid 2016). In recent years, disability care organisations have begun implementing care technology (e.g., robotics, domotics, apps, and telecare) and have acknowledged its potential benefits in supporting a person's independence, quality of life, and participation (Frielink,

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Oudshoorn, and Embregts 2021; Jamwal et al. 2022; Ministry of Health 2022). However, the realisation of these benefits has been slower than anticipated, presumably due to implementation issues (Ministry of Health 2022). Previous research on the implementation of technologies and interventions found that implementation issues are complex. Barriers and facilitators to the implementation of technology and interventions in general have been described in the scientific literature. Factors that impede or aid implementation include the intervention or technology (e.g., adaptability, costs, and complexity), outer settings (e.g., policies and incentives), inner settings (e.g., compatibility with the organisation and workflow and project management), individual health or care professionals (e.g., attitudes and beliefs), and implementation (e.g., planning and evaluation) (Damschroder et al. 2009, 2022; Ross et al. 2016). Studies on implementation in the disability care setting, including Frielink et al. (2021), Boot et al. (2018) on access to assistive technology, and Oudshoorn et al. (2020) on the use of eHealth, emphasise the importance of these factors. Moreover, Borg et al. (2023) and Zander et al. (2021) concluded that considerable knowledge gaps exist in the implementation of technology for people with disabilities.

To accelerate technology implementation in Dutch disability care, the Ministry of Health, Welfare, and Sports started a 3-year programme, called the Innovation Impulse in 2019 (Ministry of Health 2019). Under this programme, disability care organisations were assisted in the implementation of care technology using the general ZonMw implementation model (ZonMw is the national organisation for planning and funding research and innovation in health, care, and well-being). The Innovation Impulse programme is described in the Methods section, along with an explanation of the implementation processes using the ZonMw model. Longitudinal research was conducted to improve our understanding of the factors that impede or aid the implementation of technology in the care of people with disabilities. This understanding is necessary because potentially successful technologies do not produce the effects they theoretically could. In addition to time and money investments, this prevents people with disabilities from reaching their full potential. Therefore, this study examines the barriers and facilitators encountered by project managers while systematically implementing technological solutions in the care of people with intellectual and/or physical disabilities. To gain insight into the knowledge and tools needed to overcome these barriers, recommendations are made based on the best practices identified by project managers.

2 | Methods

2.1 | Project Description

The Dutch Ministry of Health, Welfare, and Sports aimed to accelerate technology uptake in disability care (WHO 2019; Wouters et al. 2019) to ultimately ensure that the deployment and use of technology is self-evident in the care of people with intellectual and/or physical disabilities. Therefore, the Ministry initiated the Innovation Impulse programme (2019–2022). The aim of this implementation programme was to achieve sustainable technology integration in care processes. Individual and tailored support was provided to project managers by experienced implementation consultants across 28 implementation projects (see the Participation section). The exchange of knowledge and experience between and within care organisations was facilitated through thematic networks (peer support groups), workshops, and webinars.

The implementation projects were guided by the ZonMw Model for Implementation (ZonMw n.d.) which is based on the Dutch standard implementation work of Grol and Wensing (2015) and has many similarities to well-known and commonly used models such as the Consolidation Framework of Implementation Research (Damschroder et al. 2009, 2022) and the Lippitt-Knoster Model for Managing Complex Change (Lippit 1987; Knoster, Villa, and Thousand 2000). The ZonMw Model consists of seven steps, as shown in Figure 1. Each participating organisation appointed a project manager who put together a multidisciplinary project team, including care professionals, people with disabilities (and/or members of the client council), IT professionals, management, and board members. Steps 1 and 2 focused on formulating a care-related issue identified from the perspective of and in collaboration with people with disabilities (van der Poel et al. 2021). Step 3 involved identifying an existing appropriate technology that provided a solution to this care issue (Reijnders et al. 2020), thereby contributing to the independence and quality of life of people with disabilities. In Step 4, the organisational readiness and IT infrastructure were mapped. The first four steps followed an iterative process and resulted in a dedicated implementation plan (Steps 5 and 6, respectively). Steps

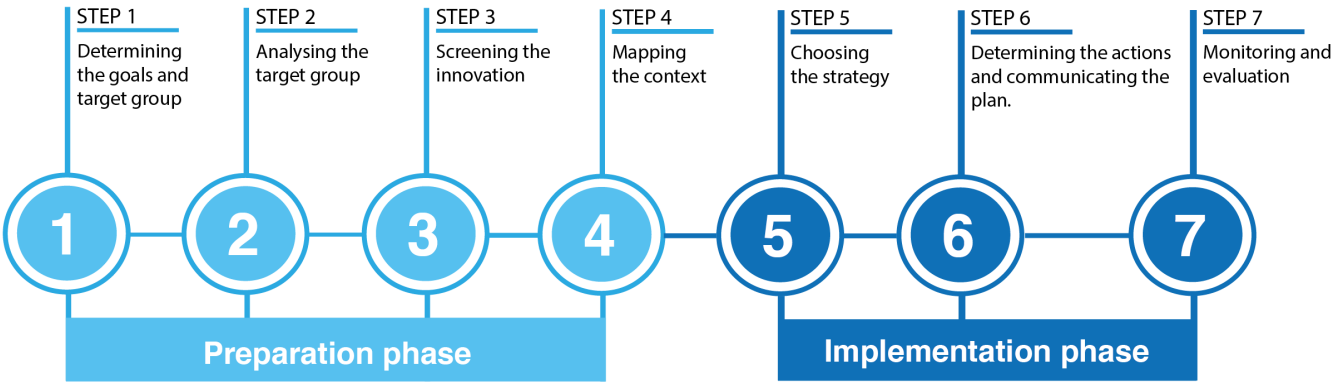

FIGURE 1 | ZonMw model for implementation.

1–6 were carried out in the first year of the programme. In the next 2 years, the plan was executed to achieve sustainable implementation of the technology in the organisation. The implementation was supported by various tools and methods offered by the ZonMw Model. In Step 7 of the model, monitoring and evaluation were carried out by an independent research team that was not involved in the implementation.[1] Moreover, Steps 5–7 also followed iterative processes. For each project, the next steps and activities were informed and guided by previous information and current developments (van der Weegen et al. 2023).

2.2 | Participation

In 2018, the Ministry of Health invited all Dutch care organisations that provide long-term residential care to people with disabilities to participate in the programme by email and organised information meetings. In total, 39 organisations started the preparatory phase of the Innovation Impulse programme. Of these, 13 decided to stop participating during the preparation phase. Reasons for quitting were mainly lack of time due to COVID-19 and the wish to develop (instead of implement) a technology. All 26 organisations that went through the preparation and implementation phases were included in this study. These organisations varied in size; while half of them had between 300 and 2000 people in care and a similar number of employees, the other half had between 2000 and 8000. Together, the organisations provided care to 70,000 people and employed over 50,000 employees (over 30,000 full-time-equivalent). Projects were implemented at several locations within these organisations. Two organisations implemented two technologies, and therefore, had two project managers and teams, resulting in 28 projects for this study. Table 1 presents an overview of the technologies implemented and their goals.

2.3 | Data Collection and Analysis

Data were collected continuously during the programme from various sources to generate a comprehensive overview of the barriers and facilitators at various stages of the project, unbiased by the retrospective views of the project managers. Data from 28 projects in 26 organisations were included in the analyses.

The Ethics Committee of the CMO Arnhem-Nijmegen/Oost Nederland deemed all research in the Innovation Impulse programme not subject to the Medical Research Involving Human Subjects Act (file number 2021–8293, dated 29-04-2021).

TABLE 1 | Overview of technologies implemented in the 28 projects of the Innovation Impulse programme.

Type technology	Name technology	Main goal of technology	Target group in project	*N*
App	MijnEigenPlan	Stimulating self-reliance	Mild-ID; ABI	4
App	SignaLeren	Regulating stress independently	Mild-ID	3
App	Kookapp	Preparing a healthy meal independently	Mild-ID; ABI	2
App	DagjeWeg	Finding leisure activities nearby	Mild-ID	1
Telecare	Mobilea	Providing care from a distance	Mild-ID	3
Telecare	Facetime	Facilitating social contact from a distance	Mild-ID	1
Sensors	MotionWatch and/or Emfit	Monitoring sleep/wake pattern	S-ID+PD	4
Sensors	HUME	Obtaining insight into stress build-up	S-ID	1
Domotics	Home automation and/or care call and alarm system	Increasing independence with domotics	ABI; PD	3
Social robot	SARA	Stimulating interaction and physical activity	Mod-ID; S-ID	1
Device	OmiVista	Increasing physical or mental activity	Mod-ID; S-ID	1
Device	Nordic relax chair	Creating an active moment of rest during the day	S-ID+PD	1
Device	Qwiek snooze	Stimulating relaxation during night-time restlessness	S-ID+PD	1
Device	Google Home	Increasing independence at home	Vis-D	1
Streaming	Severinus TV	Providing entertainment on TV	Mild-ID	1

Abbreviations: ABI = acquired brain injury, Mild-ID = mild intellectual disability, Mod-ID = moderate intellectual disability, *N* = number of projects, PD = physical disability; S-ID = severe intellectual disability, Vis-D = visual disability.

Consent from care professionals was included in the agreements signed by the care organisations. Care professionals were duly informed of the study and its contributions. In the preparation phase of the projects, implementation consultants of the Innovation Impulse programme and project managers of the disability care organisations filled digital or paper questionnaires about their activities (Figure 2) to document the implementation progress. Data from 183 digital questionnaires and tens of paper questionnaires were collected and analysed by the researchers. The findings were validated and supplemented by implementation consultants through one individual interview per care organisation.

Throughout the implementation phase, project managers were asked to complete a self-developed monthly online questionnaire (using Survalyzer survey software) regarding recent activities, concerns, setbacks experienced, and success in monitoring implementation progress. The completeness of the data varied because while some project managers returned the questionnaire monthly, others returned it occasionally. A total of 256 questionnaires were completed (on average, 14 respondents per month, ranging from 5 to 25 respondents). All the data were combined in an Excel file.

In addition to the questionnaires, project managers were interviewed three times in the implementation phase to collect data on the progress of and barriers and facilitators to the implementation of technology. In the first two interviews, project managers were asked about the facilitators, that is, successful developments of the past months and their causes, and successful approaches that could be recommended to other organisations, and barriers, that is, issues encountered and their causes, actions taken to resolve these issues, and what they would do differently next time (reflection). For the final interview, all previously collected data were summarised into a case description per project by three researchers. The case description was sent to the project managers prior to the interviews. During the final interviews, this case description was verified for accuracy and completeness and reflected upon by the project managers (member check).

All project managers were invited to participate in all the three interviews, and multiple reminders were sent. For the first, second, and third interviews, 27, 26, and 20 project managers were interviewed, respectively. Some dropped out from the last interview because at the time of the last interview, several projects had already been completed and the project managers were less involved with the programme.

Two researchers from a larger research team (six researchers) were present during the interviews. One led the interview, and the other took notes and prepared a report. All interviews were conducted online using MS Teams and were recorded and transcribed automatically. Researchers discussed the reports and recordings, and transcripts were consulted in cases of uncertainty.

A thematic analysis was conducted on the case descriptions to identify barriers and facilitators. Thematic analysis is a qualitative research method for identifying, analysing, organising, describing, and reporting themes in a dataset (Braun and Clarke 2006; Nowell et al. 2017). Using thematic analysis, the perspectives of participants are examined, key features are summarised, similarities and differences are marked, and insights are generated (King 2004). We followed the steps described by Nowell et al. (2017) to meet the criteria for trustworthiness (Lincoln and Guba 1985; Shenton 2004). During the first step, researchers became familiar with the data, such as through prolonged engagement, documenting reflective thoughts and thoughts about potential codes and themes, and storing raw data in well-organised archives (in Excel). Furthermore, most researchers were involved in the data collection and analysis from the start of the Innovation Impulse programme. During the project, they examined the data along with the implementation consultants who supported the project managers during implementation. Data were stored according to the prevailing laws and rules (e.g., the GDPR). Step 2 involved generating the initial code. We used open coding to capture all barriers and facilitators as it was uncertain whether existing implementation models sufficiently captured barriers and facilitators in this context. Peer debriefing and researcher triangulation helped to generate and examine these codes. Steps 3 and 4 involved searching for and reviewing themes, during which researcher triangulation was important. Themes and subthemes were derived from the data and verified by implementation consultants. Furthermore, the researchers returned the raw data to ensure adequacy. In Step 5, the themes were further discussed, defined, and named after a consensus was reached. In Step 6, a report was produced which formed the foundation of this manuscript. Another member check was conducted with the project managers and implementation consultants.

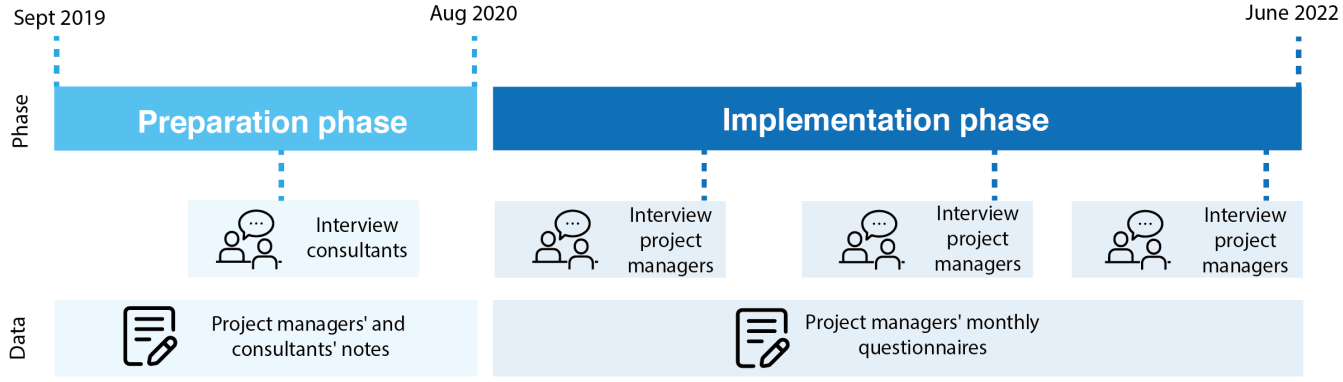

FIGURE 2 | Methods of data collection in the Innovation Impulse programme.

FIGURE 3 | Overview of the 9 themes and 26 subthemes of barriers and facilitators.

Consistency in the coding process (as an alternative to numerical reliability) was achieved using a minimum of two coders. At least one coder was an expert in coding qualitative data. All coders used the same framework and focused on the shared meaning of codes through dialogue and consensus (Cofie, Braund, and Dalgarno 2022).

After the thematic analysis was finalised, the team of researchers summarised the facilitators and actions that resolved barriers as examples of best practices. Best practices were discussed with implementation consultants to create recommendations for the implementation of technology in disability care. Finally, to indicate how common the barriers and facilitators were, the researchers re-read all case descriptions and counted the number of project managers who mentioned each theme and subtheme.

3 | Results

The barriers and facilitators from all 28 projects were grouped into 9 themes and 26 subthemes (Figure 3), which are explained below. Recommendations for the implementation of technology based on the best practice examples identified by project managers are shown in Figure 4.

3.1 | Finances

The theme 'finances' includes monetary barriers and facilitators to implementing technology.

3.1.1 | Resources for the Current Project

This subtheme concerns the available resources, budget for purchasing the technology, and project team and staff hours required to implement and to learn to use the technology. Of the 28 project managers, 11 mentioned resources available to the project team as facilitating factors. Six project managers mentioned that additional hours were allocated for the care staff to receive training on using the technology. This is likely because managerial approval and budget allocation were required to

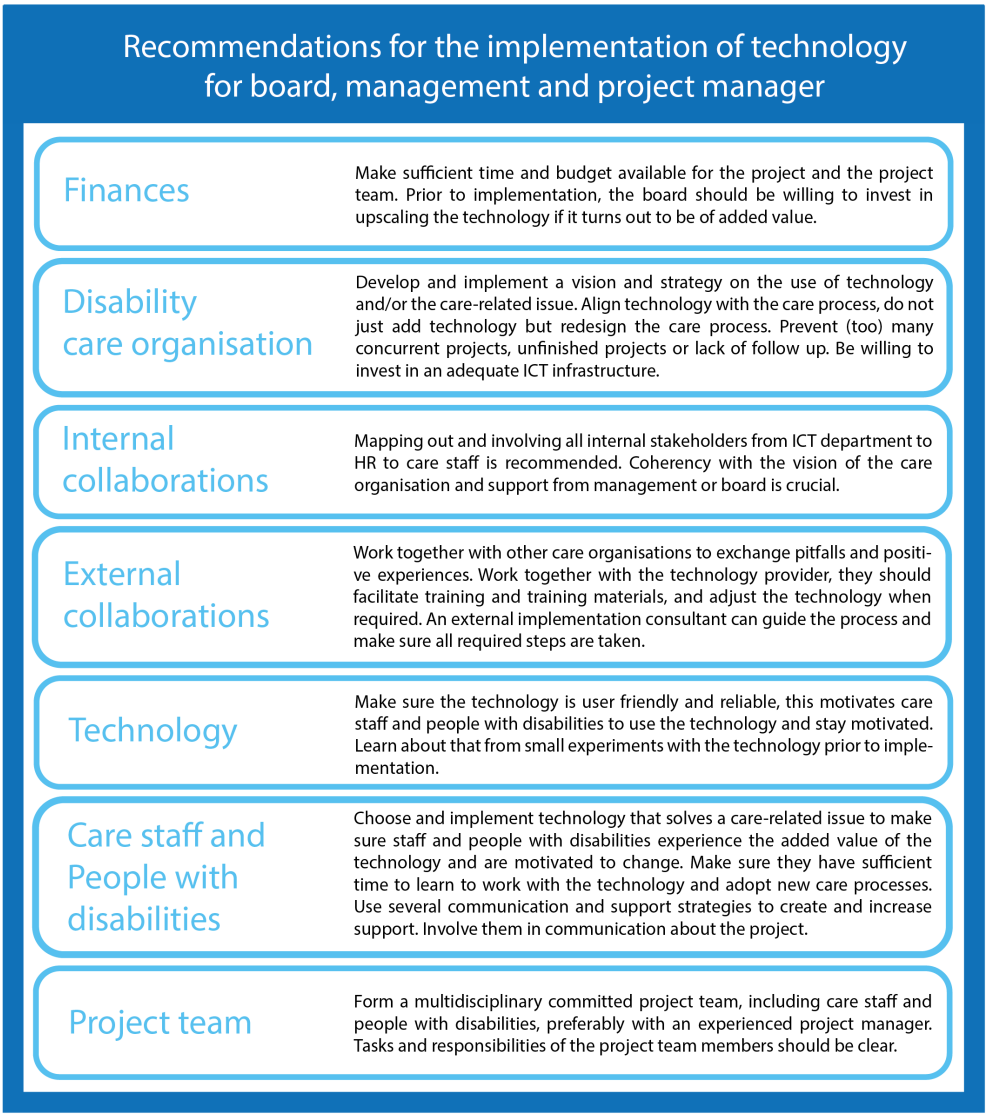

FIGURE 4 | Recommendations based on best practice examples identified by project managers in the Innovation Impulse programme.

participate in the Innovation Impulse programme. Nonetheless, lack of resources was mentioned as a barrier twice. One project manager explained that the number of hours allocated per week was insufficient to manage the project. Another found that the allocated budget was insufficient to train care staff.

3.1.2 | Resources for Organisation-Wide Implementation (Upscaling)

While a generally sufficient budget was available for the project, according to 12 project managers, the lack of a budget for upscaling was a barrier. Budget constraints for upscaling prevented or slowed organisation-wide implementation of the technology because project managers were uncertain if their efforts could be sustained. In contrast, the availability of resources for upscaling was mentioned as a facilitator by two project managers who implemented sleep sensors. They explained that it was relatively straightforward to receive a budget for integrating sleep sensors into an existing care process by a dedicated team that had already used other technologies.

3.2 | Disability Care Organisation

The theme 'disability care organisation' included barriers and facilitators inherent to the organisation. Although these factors were not directly controlled by the project team, they influenced technology implementation.

3.2.1 | Vision

Eight project managers mentioned an organisation-wide vision of technology and/or care-related issues as a facilitator. For example, the implementation of an app for preparing healthy meals aligns with the vision of encouraging healthy lifestyles among people with disabilities. Similarly, implementing modern home automation systems implied that video surveillance was no longer required which aligned with the new legislation, the Care and Coercion Act (Wet Zorg en Dwang, in Dutch). Third, project managers who implemented telecare stated that providing telecare was part of a strategy to reduce staff travel time. In summary, an organisation-wide decision that aligns with the

goal of the technology facilitates its implementation. In contrast, the absence of vision was mentioned as a barrier by four project managers. According to them, the absence of a vision created uncertainty about the purpose of the technology and resulted in a standalone project lacking accountability at the managerial level.

3.2.2 | Staffing

Seven project managers mentioned high staff turnover and/or dependence on freelancers for care provision as barriers. They indicated that turnover is an issue for both care and support staff; for instance, losing IT staff affected implementation continuity and resulted in loss of knowledge and skills. Two project managers stated that the organisation relied heavily on freelancers to resolve staff shortages which consumed a large proportion of the budget, thus lowering the budget available to train staff in technology. In addition, one project manager mentioned that training freelancers was considered a waste of resources. This indicates that stability and availability of the required staff is necessary to implement technology.

3.2.3 | Concurrent Projects

Within organisations, unrelated projects to improve the quality of care for people with disabilities were carried out simultaneously. Seven project managers mentioned that other projects in the organisation distracted staff from implementing technology and were, therefore, a barrier. Moreover, the two organisations were undergoing large reforms which affected the working hours, tasks, and responsibilities of staff, thus distracting staff from implementation. According to one project manager, other projects within the organisation exert a positive effect on the implementation of technology. This organisation implemented two voice-controlled technologies simultaneously and therefore experienced synergistic benefits.

3.2.4 | IT Infrastructure

The IT infrastructure subtheme includes the software, hardware, and networks required to use technology. Six project managers mentioned an inadequate IT infrastructure as a barrier. Most technologies required a reliable Wi-Fi connection; however, Wi-Fi signals often had insufficient coverage or were not sufficiently strong. Project managers navigated this barrier by upgrading the IT infrastructure as part of their implementation strategy. Two project managers considered the IT infrastructure a facilitator; for instance, an additional Wi-Fi network was introduced specifically for sleep sensors.

3.3 | Internal Collaborations

This theme summarises the role of internal stakeholders, such as the IT department, management, behavioural specialists, and dieticians, involved in the implementation of technology. Several project managers acted upon barriers in this theme during the project.

3.3.1 | Support from Management/Board

Support from management and the board is one of the most frequently mentioned factors by project managers. Eleven found it to be a barrier, and seven found it to be a facilitator. Lack of support was characterised by a lack of interest in the project, mostly because of competing priorities. For example, the management of the two organisations in which telecare was implemented did not encourage employees to use telecare; thus, increasing uptake among staff was challenging for project managers. If the management and board provided support for a project, two approaches were observed. First, the management was 'hands-on' involved in the project, advised on the budget, and ensured alignment with the organisation's vision and strategy. Alternatively, the management and board allowed the project manager to make decisions independently regarding the technology and only requested updates on milestones and signed off on the budget where necessary. According to the project managers, both methods facilitate the implementation of technology.

3.3.2 | Responsible Director for the Project

The absence of a responsible director or one who acts as such was mentioned as a barrier by five project managers. This was often explained as a lack of affinity for the technology or insufficient time, which delayed decision-making, particularly when the project was at an early stage. Four project managers stated that having a responsible director was a facilitator.

3.3.3 | Collaboration With Different Disciplines

In addition to a multidisciplinary project team, good collaboration with internal stakeholders, such as the finance and communication teams, and key users, was mentioned as an important factor. Five project managers mentioned the absence of important stakeholders in the early stages of implementation as a barrier because the plans may not have been feasible. Six project managers mentioned early collaboration as a facilitator. One project manager stated the benefits of understanding the client journey to identify relevant stakeholders who should be involved in the implementation of the project.

3.4 | External Collaborations

The theme 'external collaborations' includes all relationships with stakeholders outside the organisation, such as other care organisations, technology providers, and Innovation Impulse consultants and researchers.

3.4.1 | Collaboration With Other Disability Care Organisations

As described in the Section 2, the Innovation Impulse programme facilitated project managers to learn from each other in peer networks and webinars. Collaboration with other

disability care organisations was considered a facilitator by nine project managers. They acknowledged that learning from each other's successes and setbacks provided them with tools to navigate challenges in their projects; for instance, learning about best practices to overcome resistance from care staff proved helpful.

3.4.2 | Technology Provider

Seven project managers mentioned that the technology provider was actively involved in the implementation process and facilitated it. In home automation systems, providers collaborated closely with care staff and project managers to adjust the technology to the needs of people with disabilities. For other technologies, the provider delivered training materials for the staff. Three project managers mentioned their relationship with the provider as a barrier. These providers were at times slow to update the technology following feedback which hampered implementation.

3.4.3 | Innovation Impulse Consultants

The support and tools provided by Innovation Impulse consultants were mentioned as facilitators by 15 project managers. However, five found it time-consuming to participate in the programme activities and mentioned it as a barrier. Two project managers mentioned that it was a barrier only because of time-consuming obligations.

3.4.4 | Innovation Impulse Research

Five project managers stated that the research on the Innovation Impulse programme was a facilitator and/or barrier to the implementation of technology. Two project managers mentioned that research was a barrier because it was too time-consuming and yielded little benefit. One project manager mentioned that research could be both a facilitator and barrier. The time required was a barrier; however, the results provided evidence of its benefits. According to four project managers, the research outcomes helped in planning the next steps and/or showing the added value of the technology which helped convince management to support upscaling.

3.5 | Technology

This theme includes barriers and facilitators related to technical aspects, usability, and the influence of technology on existing care processes.

3.5.1 | Reliability

Ten project managers experienced technological unreliability as a barrier. For example, the required updates or adjustments prevent staff from using or implementing the technology. According to two project managers, technology is not an appropriate solution for care-related issues.

3.5.2 | Ease of Use

Usability was mentioned as a facilitator by five project managers. Mostly, the technology is user-friendly or easily accessible through the personal devices of people with disabilities. However, two project managers stated that the two telecare technologies were not appropriate for people with disabilities. One was more complex than similar consumer applications, and the second lacked the necessary functionality (i.e., missed calls could not be returned). A third project manager said that the technology was not easy to use and that considerable support was required from the team.

3.6 | Care Staff

This theme includes the attitudes and competencies of care staff, such as caregivers, support workers, and behavioural specialists, who support people with disabilities as end users of the technology.

3.6.1 | Support for Change in Care-Related Issues

Projects in the Innovation Impulse programme started by identifying a care-related issue and technology as a solution. Eight project managers mentioned support for change in care-related issues as a facilitator. Project managers use different communication strategies to increase their support for the technology. In smaller organisations, visiting the locations to support care staff and acknowledging their experiences helped improve the care-related issues. In larger organisations, different communication strategies such as sending newsletters, organising webinars, and/or approaching location managers improved support for change. For home automation systems, project managers organised meetings for each person with disabilities, their caregivers, and their families to adjust the technology to their needs, thereby reducing potential resistance and increasing support for care staff to work with the technology. Another project manager appointed care staff members who already had experience with technology to motivate and support their colleagues in using it. Four project managers who implemented telecare experienced a lack of support for change. This was primarily because care professionals viewed telecare as a temporary solution during the COVID-19 pandemic. The project managers indicated that involving care staff was essential for creating a sense of urgency for care-related issues and motivating staff to implement the technology.

3.6.2 | Attitude Towards Technology

Attitude towards technology is the staff's perception of technology and its ability to resolve care-related issues. Nine project managers indicated that involving staff early in the project helped create an overall positive attitude towards technology and change. Eight project managers mentioned that care staff's negative attitude towards technology was a barrier to implementing technology. However, most indicated that care staff became more open-minded about technology as they started using it and experienced its benefits.

3.6.3 | Digital Skills

Six project managers mentioned the lack of digital skills among the care staff as a barrier. Examples of navigating the lack of digital skills included providing training and introducing support systems such as IT helpdesks or peer support systems. One best practice example was to allow staff to use the technology themselves before introducing it to persons with disabilities.

3.6.4 | Time/Work Pressure

The lack of time for the care staff to implement technology while providing care leads to additional work pressure. Seventeen project managers mentioned this as a barrier. Thus, it was the most frequently mentioned barrier. Understaffing, sick leave due to COVID-19, and annual leave were the main causes for this lack of time. Project managers perceived this as an important barrier because they had few to no coping strategies.

3.7 | Project Team

The theme 'project team' included barriers and facilitators related to the project team responsible for implementing the technology in the organisation.

3.7.1 | Multidisciplinary

A multidisciplinary team, that is, a project team that does not solely consist of care staff, is a facilitator. Six project managers mentioned that it was important to include IT staff, managers, and experts on care-related issues. For example, a nutritionist was recruited to assist with cooking technology to ensure that recipes aligned with the dietary requirements. Two project managers reported that the project team was incomplete for too long, and that IT staff and digital coaches should have been included earlier.

3.7.2 | Commitment

Ten project managers perceived the project team's lack of commitment as a barrier. In contrast, nine project managers mentioned commitment as a facilitator, often explained by an affinity for care-related issues and the belief that technology could contribute positively.

3.7.3 | Tasks and Responsibilities

Four project managers mentioned uncertainty about tasks and responsibilities as a barrier. This barrier was relevant when the team composition changed and the role of the new project team members was unclear. Clarity regarding tasks and responsibilities after a period of uncertainty was mentioned as a facilitator by six project managers.

3.7.4 | Project Management Experience

Data on project managers' project management skills were limited and likely biased because the project managers themselves were interviewed. However, the implementation consultants and project managers noticed that project management skills varied greatly; inexperience was a barrier (in four projects) and experience was a facilitator (in three projects). It was observed that one project did not progress until a new project manager was appointed.

3.8 | People With Disabilities

This theme includes barriers and facilitators regarding the involvement and skills of people with disabilities.

3.8.1 | Collaboration With Project Team

Project managers were encouraged to involve people with disabilities in the implementation. Five project managers mentioned collaboration with people with disabilities as a facilitator. This collaboration ensured alignment between the needs of persons with disabilities and technology. For example, one project focused on implementing an online entertainment channel for people with disabilities. People with disabilities contributed to content creation for this channel which, therefore, aligned with their interests and resulted in a good uptake across the organisation.

3.8.2 | Enthusiasm for Chosen Technology

The enthusiasm for technology among people with disabilities was an important facilitator according to 10 project managers. Investing in technology promotion helps increase enthusiasm for technology. For example, organising a cooking competition using a cooking app made people with disabilities enthusiastic. Five project managers mentioned that resistance to technology was a barrier. Resistance was a particular issue with telecare technologies, as people with disabilities feared that it would replace face-to-face care.

3.8.3 | Digital Skills

The digital skills of people with disabilities were mentioned once as barriers and once as facilitators. These low numbers might be explained by the fact that the implementation consultants advised considering the digital skills of people with disabilities when choosing technology. Moreover, people with disabilities were represented in project teams and were therefore able to ensure that the technology was suitable for their digital skill level.

3.9 | Context

The barriers and facilitators that concern the context include factors that occur at national or sector-wide levels.

3.9.1 | COVID-19

The only contextual factor mentioned was the COVID-19 pandemic. The implementation of technology was significantly impacted by the COVID-19 pandemic, as priorities shifted towards restraining the spread of the virus. Ten project managers stated that this was a barrier. They stated that introducing technologies and providing support using technologies at a distance proved to be challenging. In addition, project managers struggled to identify bottlenecks as they were unable to physically visit locations where the technology was implemented. Five project managers mentioned the COVID-19 pandemic as a facilitator. Four of them introduced telecare applications. The previously mentioned resistance of caregivers and people with disabilities to telecare improved when the national lockdown prevented care staff from providing face-to-face care. However, when restrictions were lifted, project managers noticed that the care staff and people with disabilities began to resist telecare again.

4 | Discussion

This longitudinal study provides a comprehensive and realistic overview of the barriers and facilitators that project managers encountered when implementing technology in 26 disability care organisations during the three-year Innovation Impulse programme. The most common facilitators were having sufficient budget and enthusiasm for implementing the technology. The provision of tools and advice, and assistance with project management from an external consultant were also facilitators for implementation. The barriers most encountered by project managers were insufficient time from care staff, lack of support from the management and board, and lack of resources for upscaling. Barriers to the reliability of the technology were also frequently mentioned. The board and management of an organisation can overcome common barriers by prioritising the implementation of technology and ensuring the availability of sufficient time, money, and attention. The barriers and facilitators found in this study generally align with the results of recent systematic reviews on the implementation, access, and use of e-health and technology, in (disability) care (Damschroder et al. 2022; Ross et al. 2016; Boot et al. 2018; Oudshoorn et al. 2020; Zander et al. 2021), and a recent qualitative Dutch study (Frielink, Oudshoorn, and Embregts 2021).

Most subthemes were mentioned as barriers and facilitators across different organisations, organisational levels, technologies, and over time. This finding suggests that project managers can act as barriers. However, navigating these barriers affects all parts of an organisation which makes the sustainable implementation of technology complex (Damschroder et al. 2009, 2022; Ross et al. 2016). For example, to increase the time allocated to training staff, managerial approval was required so that project managers could demonstrate added value. True added value can only be demonstrated when the technology is well implemented which requires time and training. Similarly, to improve the IT infrastructure and reliability of technology, the IT department must be involved with the project team in a timely manner; however, this is not always the case. Lastly, to successfully implement technology in care processes in the workplace, the technology must fit into the organisation-wide vision of technology and care. Thus, managers and boards can make informed choices on which technology to implement and fully support the project team. In summary, barriers and facilitators to the implementation of technology are multilevel, interrelated, and vary over time. Mapping and addressing the barriers to turn them into facilitators proved to be vital for successful implementation.

The projects implemented aimed to sustainably integrate technology in relevant care processes. Sustainable integration proved to be more difficult than expected by project managers because overcoming the many intertwined barriers required organisation-wide reforms. In many projects, it became clear that the care processes in which technology should be integrated were not written down and that execution varied across locations. A crucial step is to make these processes explicit before implementing the technology. This led to substantial changes in care processes, and working with technology required new courses of action and digital competencies. For example, an app that supports people with disabilities in independently regulating their emotions replaced a paper plan. To personalise the app, behavioural specialists and support workers had to collaborate more extensively. For example, care staff asked people with disabilities what kinds of activities lowered their stress levels and informed behavioural specialists. They had to agree on who would have access to the data from the app which IT had to arrange for. Reading the data required specific competencies. Another example is a social robot that stimulates the interactions and physical activities of people with disabilities. To implement the robot it was essential to decide which people with disabilities it would be most suited for. This required knowledge of the robot, evaluation of individuals with disabilities, and explicit agreement among caregivers on suitability. Therefore, sustainable integration of technology into long-term care for individuals with intellectual and/or physical disabilities requires organisation-wide changes.

4.1 | Implementation Models

The identified barrier and facilitator themes and subthemes are largely in line with those of implementation models such as the ZonMw Model for Implementation used in the Innovation Impulse programme. Moreover, the themes aligned with the domains and constructs of the widely used and recently updated Consolidated Framework for Implementation Research (CFIR) (Damschroder et al. 2022; Ross et al. 2016) and the Lippitt-Knoster model for managing complex changes (Lippit 1987; Knoster, Villa, and Thousand 2000). The CFIR consists of five domains—innovation, outer setting, inner setting, individuals, and implementation process—with underlying constructs. Not all CFIR constructs and domains were identified as barriers or facilitators. For example, 'finances' does not have a separate domain in the CFIR. The themes 'project team', 'care staff', and 'people with disabilities' were captured in the CFIR domain 'individuals'. This study found relatively few constructs from the domain 'implementation process'. The Lippitt-Knoster model consists of six elements essential for effective change in an organisation: vision, consensus, skills, drive, resources, and action plan. From the barriers and facilitators identified in our study, it is evident that vision, skills, incentives, consensus, and sufficient resources are facilitators. No barriers or facilitators under 'action plan' were mentioned. A potential explanation for the limited number of themes related to the (sub)themes in the CFIR domain 'implementation process'

and Lippitt-Knoster element 'action plan' may be that developing an implementation plan that guides the implementation process was required in the Innovation Impulse programme and project managers were supported by consultants. This may have helped project managers navigate challenges. Overall, a comparison of these conceptual frameworks of implementation models shows that they largely correspond to each other and can all be useful for the sustainable implementation of technology in disability care. Careful consideration must be given to the steps, domains, constructs, and themes which needs to be done systematically.

4.2 | Strengths and Limitations

A strong aspect of this study is that data were continuously collected during the three-year Innovation Impulse programme. Hence, the findings of the study are reflective of a real-world setting. Data were collected using monthly questionnaires, summarised, checked, and supplemented periodically by interviews with project managers. This prevented recall bias and provided a rich set of member-checked data (Shenton 2004). Another strength of this study is that the data were collected from 26 different disability-care organisations.

One limitation of this study is that the project managers were the primary source of information. Data from care professionals and people with disabilities were excluded. Care staff or people with disabilities might have emphasised other aspects, especially since the study was conducted during the COVID-19 pandemic when care professionals lacked the time and availability. Project managers were encouraged to work closely with care professionals and individuals with disabilities. Thus, it is likely that some of the experiences of these groups are implicitly integrated into the perception of the project managers. Furthermore, an inductive method with open-ended interview questions was used to avoid bias. However, project managers may have forgotten some barriers or facilitators. Particularly facilitators could easily be taken for granted. In addition, the implementation was conducted in the context of a nationwide implementation programme in which every organisation worked together with other organisations in thematic networks and received support from an implementation consultant who guided them regarding the steps that should be taken, stakeholders that should be involved, and tools that should be used. This support may have created blind spots regarding facilitators and barriers. In addition, eight project managers dropped out from the final interviews, which could have led to the omission of relevant information.

Finally, to indicate how common the barriers and facilitators were, the researchers counted the number of project managers who mentioned each theme and subtheme. These numbers are probably underestimates because of the inductive method.

5 | Conclusion

This longitudinal study was conducted to improve our understanding of the factors that impede or aid the implementation of care technology in the care of people with disabilities. The current study showed that most subthemes were both barriers and facilitators of implementation across organisations, organisational levels, technologies, and over time. Navigating intertwined barriers affects all parts of an organisation. Therefore, sustainable implementation of technology in disability care processes requires organisational reform. Project managers should consider the barriers and facilitators. The board and management of disability care organisations play an equally significant role by developing a vision of digital transformation and prioritising accordingly to arrange sufficient support, time, and money. An implementation model such as the ZonMw model is recommended. Moreover, the Innovation Impulse programme entailed the designing of a website with knowledge and tools for each implementation step to guide future implementation projects and consequently improve the independence and quality of life of people with disabilities.

Author Contributions

Sanne van der Weegen: wrote the paper, conceived and designed the analysis, collected the data, performed the analysis. **Agnes van der Poel:** Wrote the paper, conceived and designed the analysis, performed the analysis. **Eva Kagenaar:** wrote the paper, conceived and designed the analysis, collected the data, performed the analysis. **Ilse Bierhoff:** conceived and designed the analysis, performed the analysis. **Brigitte Boon:** initiator and responsible for the research.

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Ethics Statement

The study was conducted in accordance with the Declaration of Helsinki, and the Ethics Committee of CMO Arnhem-Nijmegen/Oost Nederland deemed all research in the Innovation Impulse programme not subject to the Medical Research Involving Human Subjects Act (file number 2021-8293, dated 29-04-2021), because the technological solutions were implemented in the practice of offering appropriate care and support and not for research purposes. In the care organisations, care professionals introduced and supported individuals with disabilities in using the technology, without engagement of the researchers.

Consent

Informed consent from project managers was obtained through participation of the care organisations in the project.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] Implementation consultants and researchers work for either Vilans—National Centre of Expertise in Long Term Care in the Netherlands or Academy Het Dorp—Research & Advisory on Technology in Long-term Care, the Netherlands. The directors of both centres are professors at Tilburg University in the Netherlands, and PhD researchers conduct research at both centres.

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