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Balancing Optimism with Strategy: Leadership in Public Sector Automation[1]

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ABSTRACT

This study explores leadership in public sector automation, considering how contextual characteristics in two Swedish municipalities interact with the evolution of leadership. Through qualitative analysis of semistructured interviews with leaders and employees in elder care, we examine leadership skills and behaviors understood as crucial for implementing medicine robots. Grounded in reflexive thematic analyses, we present six themes: (1) Tech openness, (2) Optimism toward change, (3) Collaborative coordination, (4) Training and support, (5) Instrumental understanding, and (6) Operational feedback. The main findings illustrate how leadership skills, including cultivating optimism, engaging with technology and fostering collaboration, were considered essential. While proactive leadership was limited, knowledgeable and supportive leadership was apparent. Behaviors understood as supportive included communicating purpose and providing timely education. Leadership is vital in automation implementations, requiring skills to address complexities of human–technology interaction and balancing enthusiasm for automation with strategic foresight and deep understanding of the public sector context.

KEYWORDS

automation / context / implementation / leadership / public sector

Introduction

The growing elderly population and shrinking workforce are placing significant pressure on welfare systems worldwide (WHO 2024). Moreover, rapid technological advancements are introducing new solutions to address these challenges

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(Fasoli et al. 2023). With automation on the verge of a profound expansion (EU-OSHA 2024), public sector leaders must navigate a range of new challenges, including adapting roles and responsibilities, managing human–automation interfaces, addressing ethical dilemmas, and overseeing the implementation and impact of automated systems (Lindgren 2024).

Effective leadership is crucial for successful technology implementation (Cortellazzo et al. 2019; Osmundsen 2024), and studies confirm that this also applies to automation, including robots (Xu et al. 2020) and artificial intelligence (AI, Sriharan et al. 2024). Although there are arguments suggesting that leadership demands will change (Sriharan et al. 2024; Swedish Agency for Work Environment Expertise 2022), there is a significant gap in empirical research addressing leadership during the implementation of automation in the public sector. This gap is problematic, as it hinders the development of targeted strategies to help leaders navigate the complex challenges associated with automation.

Leadership is shaped by context (Mosson et al. 2018) and influenced by the specific technologies, material conditions, and social settings in which it unfolds (Orlikowski & Scott 2008). However, little is known about how contextual factors within the public sector interact with the development and manifestation of leadership during automation implementation. Without this understanding, leadership approaches risk being ineffective and misaligned with the unique challenges that automation presents in different situations.

Aim and contribution

The aim of the present study is to better understand the role of leadership during the implementation of automation and how leaders can support these initiatives in the public sector. Our research questions are as follows:

1. How can the role of leadership during the implementation of automation be understood?
   - Of special interest is how perceptions of leadership skills and behaviors can be understood as supporting or complicating the implementation.
2. How can characteristics of the context be understood as shaping the role of leadership during the implementation?

This article responds to calls for empirical research on leadership during the implementation of automation (Osmundsen 2024) and makes two important contributions to the literature on leadership and implementation. First, we offer insights into the role of leadership, leadership skills, and behaviors that carry focal meaning for the implementation of automation. Automation is a cluster of technologies that has been studied to a very limited extent in relation to leadership during implementation within the public sector. Second, we provide knowledge on how the public sector context interacts with the development and manifestation of leadership during implementation. Our study also contributes with valuable knowledge about leadership behaviors that can facilitate (or complicate) the implementation of automation in the public sector.

Background

Implementation of automation in the public sector

Automation is often viewed as part of a broader digital transformation (DT) driving organizational change. DT involves profound changes for society and organizations due to modern technologies such as robotics, AI, and digital platforms (Reis et al. 2018). Automation refers to using machines, typically computers, to perform tasks previously performed manually (Parasuraman & Riley 1997). In simple terms, there are two types of automation: robots for manual tasks, including algorithms, and AI to automate work tasks that require cognitive abilities [Swedish Association of Local Authorities and Regions (SALAR) 2018]. Automation allows machines to handle repetitive or dangerous tasks, freeing employees for work requiring human skills. In the public sector, automations generally aim to improve quality and reduce staff workload or costs (SALAR 2018), for example, within health and social care (Frennert 2020). Automation is expected to transform human–technology relations by shaping the design of work (Parker & Grote 2020) and significantly influencing leadership behaviors (Cortellazzo et al. 2019).

The pace of technological change has accelerated, driving public organizations to rapidly adopt technology-based strategies and solutions (Tate et al. 2023). While automation is common in sectors such as industry, it is relatively new in the public sector. Reports indicate that 23% of work tasks in the European public sector could be automated (European Commission 2022).

Many Swedish municipalities have introduced automation in certain areas and/or within pilot projects, but these often remain limited to the pilot stage (Frennert 2020; SALAR 2024a). This limited scalability is a critical issue because, even though automation promises significant advancements, its actual implementation is still largely unexplored, hindering its full potential (Frennert 2020; Petersson et al. 2022).

In social care, there is an emerging interest in studying technologies such as robotics (Kajander-Unkuri et al. 2023), and various forms of automation are being tested. Robots are quite commonly used in elder care and aid with daily tasks such as companionship and health monitoring (Kangasniemi 2019). Economic incentives favor elder care at home, making medicine robots popular in Europe and Nordic countries. These robots reduce medication errors and improve adherence to treatment plans (SALAR 2024a). In Sweden, 90% of municipalities aim to increase the use of medicine robots.

Despite advancements in automation, many implementation efforts face obstacles related to organizational integration (Frennert 2020; The National Board of Health and Welfare 2024a) and workforce adaptation (Lindgren 2024). These challenges highlight the crucial role of leadership in ensuring successful integration and long-term effectiveness within the public sector.

The role of leadership during the implementation of automation

Leadership has been studied across various fields and levels, often focusing on individual leaders (Aarons 2014a). Our focus on leadership during implementation

entails that all levels of leadership are viewed as crucial for creating a climate that supports implementation, emphasizing both context and individual leader actions (Aarons 2014b). This includes managers and others in leadership roles involved in implementation.

Leaders in the public sector navigate complex realities, including the widespread adoption of automation, such as robots and AI (Lindgren 2024; Sriharan et al. 2024). Although technology has driven organizational change for a long time, studies have shown that leadership is more crucial for successful implementation than the technology itself is (Kane et al. 2015). Leadership is essential for establishing structures, promoting positive attitudes toward technology implementation among employees (Brunner et al. 2023), and managing ethical and regulatory aspects of data practices (Cortellazzo et al. 2019; Sriharan 2024).

Technology changes how people work and how work is coordinated and managed (Cascio & Montealegre 2016), and automation adds complexity and poses additional challenges to effective implementation and hence leadership behaviors and skills (Sriharan et al. 2024). Unlike other technologies, automation can enhance or restrict the work of care professionals. Leaders need to move beyond implementations of passive technologies (e.g., telehealth and alarms) and focus on understanding how professionals and automation interact to create value. Automation challenges the separation of human skills from machine capabilities, and more complex implementations will require diverse stakeholder involvement.

This places automation at the more complex end of the spectrum studied by implementation sciences, which typically focus on well-defined interventions (Shaw et al. 2019). Additionally, the implementation of automation lacks directions based on empirical support (Siira et al. 2024), yet leaders must navigate these complexities and address diverse needs. To better understand effective leadership strategies and behaviors, it is important to study how leaders handle different implementation challenges (Greenhalgh et al. 2004), which is done within the present study.

Leadership behavior and technology implementations

One of the main leadership theories in the broader field of DT is transformational leadership (TL) theory (Cortellazzo et al. 2019). Transformational leaders focus on motivating and inspiring followers to exceed expectations (Bass & Riggio 2006). Osmundsen (2024) highlights TL as particularly important for DT, as it inspires employees to adopt new perspectives and fosters a collaborative and innovative culture.

Building on TL, the implementation leadership framework emphasizes strategic actions and behaviors to create a supportive climate for the adoption and sustainment of implementation. This includes developing leadership skills through training, coaching, and strategic planning to align organizational support. The goal is to improve leadership, the implementation climate, and employee attitudes, leading to greater commitment and better implementation outcomes (Aarons 2014a). Understanding how leaders and employees perceive leadership during the implementation of automation and what leaders do to support or complicate implementation will provide valuable insights for leadership literature and practice.

Leadership skills required for automation

There is an ongoing discussion about the skills leaders need to support the implementation of automation (Garkisch & Goldkind 2024; Imran et al. 2020; Xu et al. 2020). As scholars agree that automation will change the design of work and how people collaborate (Lindgren 2024; Parker & Grote 2020), leaders may need to develop a variety of new skills. Leaders must both be technically literate, understand how to manage new technologies, such as robots and AI, and be people-oriented with the skills to motivate and inspire during change (Cortellazzo et al. 2019; Xu et al. 2020).

Mumford et al. (2000) highlight three core leadership competencies: problem-solving skills, social judgment skills, and knowledge. All three components are positively related to effective leadership, and knowledge has a positive effect on how leaders engage in problem solving. This might support the claims above that leaders need to both be technically literate and have the capacity to navigate social dynamics.

From the employee perspective, automation may create and eliminate jobs, requiring leaders to focus on upskilling employees and providing support for new, sometimes more cognitively demanding tasks (Cortellazzo et al. 2019). Hence, leaders play a crucial role in identifying, planning, and obtaining relevant employee competencies (Osmundsen 2024). Osmundsen (2024) encouraged future research to explore how leaders can address this challenge.

The relationship between context and leadership

Leaders are highly influenced by their context, yet little is known about how contextual dimensions influence leadership during implementations in general (Mosson et al. 2018) or during implementations of automation (Frennert 2020). The Consolidated Framework for Implementation Research (CFIR) illustrates how leadership evolves in dynamic interactions with both the outer context, such as societal pressures and external funding, and the inner context, including task organization and relationships, such as interactions with and among employees (Damschroder et al. 2022). Reviews of the contextual factors influencing implementation outcomes have shown that while financial resources and time are beneficial, their effectiveness is improved when paired with supportive leadership and positive social relations (Nilsen & Bernhardsson 2019). Leadership and preconditions play crucial roles in creating an environment conducive to successful implementation (Andreasson et al. 2018; Haake et al. 2023; Mosson et al. 2018).

Contextual factors deserve more focus, as technology changes context and influences leadership (Cortellazzo et al. 2019; Frennert 2020). Digital technologies and leadership influence each other reciprocally, with social and technological aspects developing together (Avolio et al. 2000; Orlikowski & Scott 2008). Parker and Grote (2020) suggest bringing back sociotechnical thinking, actively considering interactions between human and technical systems. The sociomaterial perspective contributes to a more nuanced understanding of how the roles of leaders and employees evolve together through practice.

Understanding leadership during public sector implementation requires considering both the broader context and the closely related nature of social and material elements. Through this study, we explore how characteristics of the context can be understood as interacting with and shaping the role of leadership.

Method

Design

We were interested in experiences of leadership in the context of public sector automation; thus, a qualitative approach using semistructured interviews was chosen. The interviews were conducted within elder care after the introduction of medicine robots in the homes of elders, which partially or completely replaced the manual distribution of medicines. The perspectives of both leaders and employees were considered equally important in shedding light on experiences of leadership. A reflexive thematic analysis (Braun & Clarke 2022) was carried out to generate themes that help us understand how leadership manifests through the lens of the participants.

The Swedish setting

The interviews presented in this study took place in two Swedish municipalities. Sweden has 290 municipalities financing a large part of eldercare (SALAR 2024b), whereas 21 regions are responsible for health care, including aspects of eldercare. The state provides financial support and has actively promoted digital innovations in public services through various initiatives (The Government of Sweden 2021). All municipalities received targeted state grants for investments in technical solutions, and those that have progressed further have been designated model municipalities, receiving additional support for knowledge dissemination. The municipalities in the study were model municipalities at the start of the implementation period (SALAR 2020).

The medicine robot

In Sweden, many elderly people remain at home despite significant care needs, supported by both social services and health care professionals (The National Board of Health and Welfare 2023). Elders in Sweden use an average of five to six different medications (The National Board of Health and Welfare 2024b), making medical dispensing a significant task. A medicine robot is an automated device that ensures the correct and timely intake of medications via prepackaged dose bags. It reminds the user with sound, light signals, and verbal instructions. Nurses are primarily responsible for medication distribution, whereas assistant nurses or care workers handle refilling and responding to alarms under delegation.

Participants and procedure

To address both research needs and real-world challenges, research questions were developed in collaboration with a participating municipality and a SALAR team supporting social services in automation implementation. The first municipality was a small rural region in northern Sweden, and the second was a medium-sized municipality with urban and rural areas. Change agents for the implementations forwarded information

and inquiries to all potential participants. Volunteers were contacted via email. All followed through with the interviews, except one due to time constraints. Three additional participants were subsequently included based on recommendations.

A total of 31 participants were interviewed from October 2022 until February 2023: 17 employees (nurses and care workers), eight first-level leaders, three higher-level leaders, two change agents, and one strategist. Eleven interviews were conducted face-to-face, while 20 were conducted online with a camera because of travel distance and COVID-19 precautions. The interviews were digitally recorded, transcribed, and reviewed by the interviewer for accuracy. The interviews averaged 51 minutes in length (ranging from 23 to 105 minutes).

The interviews and the interviewer

The semistructured interview guide included questions about participants' roles and experiences with medicine robot implementation, the role of leadership, contextual factors of importance for the unfolding of the implementation, leadership competences of importance for this kind of implementation, and comparisons to other implementations. Probes were used to stimulate both positive and negative views. The interview concluded, 'With the experience you have now, what advice would you give to other leaders on aspects of importance to support the implementation of medicine robots?'

The first author conducted the interviews. Experience as an organizational psychologist with a behavioral perspective on leadership helped stimulate participants to share examples of situations and behaviors, assuming that these descriptions could provide valuable knowledge reflecting an underlying reality (Pilgrim 2019).

Data analysis

The data were analyzed using reflexive thematic analysis (Braun & Clarke 2022). This approach acknowledges coding as a subjective process, revealing theoretical assumptions and leveraging researchers' personal experiences as a resource. A logbook was used for reflections, interpretations, and ideas during the coding, theme development, and writing processes. The analysis began with familiarization (listening or reading through all interviews). Ten interviews were transcribed by the first author, and the remaining interviews were transcribed by a professional transcriber. The interviews were systematically coded in Nvivo14 software, with codes closely reflecting the meanings expressed by the interviewees.

In phase two, themes were developed by organizing codes into meaningful representations to answer the research questions. Themes were developed by organizing subjective experiences and making abstractions and interpretations to further our understanding. The authors aimed to balance displaying participant perspectives with the interpretive process of reflexive thematic analysis. In phase three, the themes were reworked together with the second author by coding trees in Nvivo14, notes, and drawings. The themes were checked against the coded material and thoroughly supported by statements. Finally, the themes were named and described, and the quotes were translated from Swedish to English by the first author.

Ethical considerations

All participants received written information about the study, data storage, and voluntary participation. Consent forms were sent in advance. During the interviews, the information was reiterated, and the participants were reminded of their right to withdraw at any time. Oral consent was restated and recorded. The study design was approved by the Swedish Ethical Review Authority (Dnr: 2021-06975-01).

Findings

We present the findings for both research questions together, structured in the order that best supports an understanding of how leadership evolved in relation to contextual factors during the implementation of medicine robots. Six themes were developed, crucial for this implementation process: (1) Tech openness, (2) Optimism toward change, (3) Collaborative coordination, (4) Training and support in practice, (5) Instrumental understanding, and (6) Operational feedback. Since the relationships between the themes partly involve a temporal dimension, they are presented with this in mind.

Themes 1 and 5 focus on contextual aspects and are gray in Table 1. While all the themes illustrate the inseparable link between leadership and context, themes 2–4 and 6 primarily contribute to understanding the role of leadership during implementation. Importantly, all the themes are empirically grounded in data from both employees and leaders, allowing the same phenomena to be reflected from multiple perspectives. Additionally, the top codes are marked to indicate how the codes are understood as supporting, neutral (black bullets) or complicating (white bullets) in relation to leadership during implementation.

Table 1 Themes and top-level codes from Nvivo14

Themes	Codes
1. Tech openness Organizational openness to new technology	• Political and top management support for digital technologies • Fueled by model municipality projects • Common understanding of motives
2. Optimism toward change Positive attitudes and willingness to try new technologies	• Engagement and positive attitudes – home care leader • Motivate, explain, and encourage • Willingness to try and test new technology ◦ Communicate a positive attitude, no active involvement
3. Collaborative coordination Facilitate collaboration between levels and roles	• Coordination, home health care, and home care • Change agents facilitating collaboration • Coworker representatives for early participation ◦ Role ambiguities regarding responsibilities
4. Training and support in practice Comprehensive understanding, timely education and support	• Education – with opportunities to practice • Need for a comprehensive understanding of the robot • Use of employee representatives for support • Accessible support ◦ Poor timing of education

Themes	Codes
5. Instrumental understanding Issues during human technology interactions	• Simple technology and user friendly ◦ Experiencing issues in handling the robot such as taking time refilling, jamming ◦ Challenges arising in human-technology interface
6. Operational feedback Taking interest and making adjustments	• Talk about robots in practice • Goals and strategic follow up, focus on numbers and client experience ◦ Follow up, a reaction to issues

• Codes reflecting supporting or neutral components.

◦ Codes reflecting complicating components.

Presentation of themes

The themes are presented in the same order as in Table 1 and support a temporal aspect of the findings in relation to the implementation process.

Tech openness: organizational openness to new technology

The first theme portrays how strategic direction from politicians and top management can be understood as a central contextual factor supporting the organization's overall openness to the implementation of medicine robots. This is put into words by a key change agent:

> We always have legitimacy from above. We have a board decision saying, "digital first." This is important in everything we do. We can fall back on it, knowing that the highest decision-making body in social services says we should look for digital solutions. This is extremely important, as it creates legitimacy in everything we do. (Change agent, No.17)

Directions from the board are understood as robust support when, for example, negotiating interests within the organization.

Participation in the model municipality project, which provided resources and opportunities to test technologies, can be understood as having accelerated the municipality's digitalization efforts, influencing attitudes such as openness toward new technologies. This is highlighted by a leader:

> The municipality is one of those selected to develop the technology of the future within elder care. I absolutely believe that has played a role. However, regarding our future staffing challenges, that crisis might have contributed to speeding up the process as well. (Leader, No.29)

The quote also reflects pride in being selected for the mission. The model municipality project and the introduction of medicine robots are also understood as preparations for

future challenges. Participants view the implementation as an opportunity to develop skills that will be needed for future technology implementations. A care worker explained:

> We get to learn more about this technology and how it works, and I think it can be good when more robots come for other purposes. Then we have received an introduction to this technology. (Care worker, No.15)

This statement places the municipality's development within the broader context of technological advancement. Interestingly, leaders, change agents, and employees share an understanding of the motives driving the need for new technologies. They emphasize organizational needs such as resource shortages, increased efficiency, and challenges with skills supply. Additionally, promoting independence for the elderly is highlighted as a desirable outcome. These contextual factors appear to contribute to a positive organizational climate for implementation. This climate is important for understanding leaders' and employees' attitudes toward DT and their willingness to experiment with new technologies such as automation.

Optimism toward change: positive attitudes and willingness to try new technologies

The second theme encompasses how positive attitudes toward implementation are understood and exhibited by individual leaders. Employees and leaders perceived positive attitudes to be profoundly important for supporting the implementation. A few participants in the larger municipality explained that the number of robots implemented is related to the attitudes of first-line leaders or nurses. The importance of home care leaders showing a positive attitude was perceived as crucial, as their role was understood as gatekeeping. In the quote below, we illustrate how a nurse highlights the importance of the home care leader's attitude:

> The home care leader has the greatest importance, in my opinion. If they are enthusiastic, this goes very well, and the outcome is good. If they have a negative attitude, I will argue that this will have the greatest impact. (Nurse, No.11)

A negative attitude is described as having a greater impact in terms of the magnitude of its effect. Interestingly, all the leaders interviewed appeared positive about the implementation, although some mentioned 'other leaders' as negative. All home care employees described their leaders as positive, but some home care leaders did not engage further. This lack of engagement can be understood as a complicating factor contributing to role confusion, as some employees stepped in assuming leadership roles or responsibilities.

A common understanding among both home care employees and leaders is that leadership involves motivating employees by explaining the reasons for introducing the robot and its benefits for elders and operations. A care worker describes what kind of arguments are relevant to use as motivation:

> This freedom for elders, to bring up positive aspects of the robot. And I would think that most of the home care groups are very busy at medicine times, … and then you can save

> time so that it will not be as stressful in the morning or evening - for example, use that as motivation. (Care worker, No.24)

Employees often share specific behavioral descriptions of what they need from leaders, here in the form of motivation.

Optimism toward implementing medicine robots was also apparent as a willingness to try and test new technology. This attitude is prevalent among leaders and is understood as a good way of approaching the implementation of new technologies, such as automation. Trying and testing was understood as an efficient way of moving forward in small steps.

Collaborative coordination: facilitating collaboration between roles and levels

The third theme focuses on leaders' role in facilitating collaboration between roles and levels. Both municipalities involved two organizational lines in the implementation. Home health care assesses the suitability of implementing a robot, in some cases offering it to the elderly person. Home care handles refilling the robot and responds to alarms. The alignment of leadership levels as well as horizontal cooperation between leaders of home health care and home care was understood as a facilitating component. A first-line leader was asked for advice to give to other leaders ahead of similar implementations:

> Some important things... I start with one, and that is teamwork. Helping each other out, the home care service itself cannot drive the project alone; nurses must be involved. A coordinator or planner or a similar function within home care is also helpful. (Leader, No.29)

Leaders can be understood to play a crucial role in facilitating these collaborations. Change agents were also central for collaboration and took on different roles in the two municipalities. The words of a change agent and a nurse in the same organization are as follows:

> I understand that much of my job is about being able to establish good relationships. It is in all directions in the municipality, both with different units, but just as much toward management. (Change agent, No. 30)
>
> The change agent has been very important, the spider in the web. And it is probably important to have such a person from the beginning who holds the strings toward everyone and to hear from different units what they have tried, what has gone well and can spread information on to the rest of us. (Nurse, No.25)

The change agent acted as a cohesive force and information distributor within the organization.

In both municipalities, employee representatives (ERs) were involved in early participation, connecting employees with change agents and others in leadership roles. ER responsibilities vary on the basis of organizational context, competence, and interest in technology. ERs faced role ambiguities when taking on leadership tasks that were not

formally part of their role. In one municipality, a key change agent closely collaborated with the ER, blurring the lines between the ER and leaders' responsibilities.

Training and support in practice: Comprehensive understanding, timely education, and support

The fourth theme encompasses the role of leadership in training and support. Robots placed in the homes of elders make employees depend on acquiring adequate skills for operating the robot and attending to issues. Leaders within home care were clearly expected to ensure that employees possessed the knowledge and skills needed to operate the robot. Employees believed that this should be provided foremost through education. Practical experience or 'having your hands in the robot' was understood as crucial for building confidence in the use of the robots. However, the poor timing of educational efforts is understood to have negative effects on outcomes. The delay between education and implementation was perceived as a complicating factor. Facilitating and complicating elements of education are expressed by a nurse:

> That we get the conditions and education. That is most important and that we get it at the same time as we are both home care and nursing groups. The training must be for both parties so that you do not end up in an imbalance and it takes months for some, and they don't get to try it in action, then you might forget. (Nurse, No.25)

The nurse emphasized the need for proper conditions. It is commonly understood that if leaders understand the robot, they can better support employees and create the right conditions for implementation. This belief is shared by both employees and leaders, reflecting the same intended meaning from both perspectives:

> If they (leaders) can handle the robot themselves, know why and how, and understand the tasks we have, then I think we will have an easier time. (Care worker, No.10)
>
> It's easier where it isn't… (technology), because you must be familiar with what you're going to teach or are about to learn, so you must know what you're talking about, it requires a little more. You must be competent in the digitization or the technology that will be used. (Leader, No.14)

Providing accessible support is also viewed as a key leadership responsibility during implementation. The use of ERs and ambassadors was understood as an efficient strategy for supporting employees during the implementation, serving both as a bridge between employees and formal leaders and as an important source of collegial support among employees. Specific technical support was provided by the company delivering the robots. This worked well but disconnected leaders from information about how the robot works in practice.

Instrumental understanding: Issues during human-technology interactions

The fifth theme encompasses how the understanding of technology interacts with how the role of leadership evolves. The robot is understood as a simple technology that is

generally perceived as user friendly by both elders and employees. A leader for medical care describes the robot:

> The robot is quite a simple device. I think all managers have competence for it; it's easy. Easy to instruct and there are good instructions on how to use it. (Leader, No. 19)

While leaders viewed the robot as a simple technology with clear instructions, the implementation revealed a more complex reality. The interaction between employees, elders, and the robot created practical challenges that were not anticipated by leaders.

Issues in handling the robot recurred during the implementation. Employees described issues arising when loading the robot with medications or in relation to elders and their varying needs. This is described by a care worker:

> Some go back and forth to the hospital, so we have turned off some machines because it was more work to replace the roll constantly... One person found it stressful to hear the machine when they were sick and needed more help to get up, and then having a nagging robot saying, 'It's time to take your medicine,' so we turned it off. (Care worker, No.31)

These examples show how the introduction of the robot affects and is affected by the environment in which it is introduced as well as by the characteristics of the robot. The issues arising were not merely technical problems but were also context related.

The initial integration plan relied heavily on education and support for a smooth transition. Despite these efforts, unforeseen issues arose at the interfaces between the robot and its surroundings. These challenges may point to the need for a comprehensive integration approach that includes proactive implementation strategies that consider interactions between people, technologies, and organizational routines.

Operational feedback: Taking interest and making adjustments

The last theme captures how operational information is collected and used during implementation. Medicine robots are used when elderly individuals need continuous medication in combination with being able to care for intake assisted by the robot. Employees, who are best informed about the elders' changing health conditions, emphasize the importance of sharing this information with leaders or nurses responsible for medication management. They noted that issues due to deteriorating health, technical malfunctions or human-robot interactions are often resolved as they arise. While follow-ups are sometimes performed informally, many see the need for a formalized structure. A first-line leader shares thoughts on follow-up:

> I don't think we document anywhere how it (the robot) works. It's probably if it doesn't work, it gathers somewhere so eventually it becomes, "this doesn't work." But we don't do any follow-ups, I mean, those of us working on the floor, we're the ones who notice if it's not working. (Leader, No.14)

A care worker also described a reactive strategy to handle problems and that information was not requested. Leaders' lack of a systematic approach to collecting operational information was seen as a barrier to addressing elders' needs and identifying technical or organizational issues. A leader described her process for handling this in a successful manner on her team:

> It is that we are talking about it. We are trying to see, how is Agda doing now since we put in this dispenser. And, "yes, but she's doing great, it is working great" or "no, I had to bring it in" and then "well, but why did you have to bring it in from Agda then? What just happened?" and things like that, that we talk about what's going on. (Leader, No.18)

She emphasized that the information that employees gather from daily interactions with elders is crucial feedback on how the robot works. This highlights the role of leaders in monitoring implementation by engaging with employees to capture information. Systematic follow-ups have focused mainly on elderly people's experiences, economic measures, and other hard data.

Summary of results

Summarizing the results related to the first research question—how the role of leadership during the implementation of automation can be understood—the themes *Optimism toward change, Collaborative coordination, Training and support in practice*, and *Operational feedback* reflect key leadership skills and behaviors understood to support or at times complicate the implementation. To some extent, these themes focus on different stages of implementation. *Optimism toward change* highlights the importance of leaders actively communicating and fostering positive attitudes and a willingness to engage with new technologies, particularly during the early stages of implementation. *Collaborative coordination* highlights the importance of leaders facilitating collaboration between roles and levels within the organization, supported by change agents and collaboration between leaders and ERs. This theme mostly addresses the planning phase and the early stages of implementation.

Training and support in practice draw attention to the phase when robots are to be implemented. The theme addresses timely education and support provided by both leaders and coworkers. A comprehensive understanding of the robot was seen as crucial for leaders to be able to provide adequate support. Finally, *Operational feedback* emphasizes the importance of leaders collecting and utilizing feedback throughout the implementation process. Employees' insights from daily interactions with elders were understood as crucial for identifying needs and addressing issues. A focus solely on strategic follow-up might have hindered effective adjustments and improvements.

With respect to the second research question—how characteristics of the context can be understood as shaping the role of leadership during the implementation—the first theme, *Tech openness,* highlights how societal and organizational challenges, along with political and strategic leadership, fostered a climate receptive to new technology. This context can be understood as having profound meaning for how leadership developed during the implementation. Leadership can also be understood in relation to the context theme, *Instrumental understanding*, which reflects how the robot was viewed as a simple

and user-friendly technology replacing medication distribution. Consequently, education took on a central role, although more proactive strategies to address the human-technology interface were lacking.

How the themes are separate but tied together, as suggested by Braun and Clarke (2022), is visualized in Figure 1, with context-related themes represented by circles and leadership-focused themes represented by arrows.

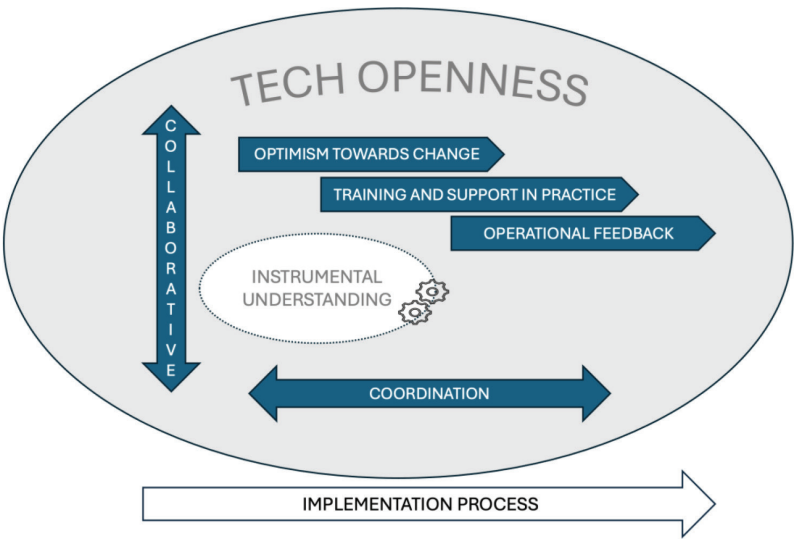

Figure 1 Leadership and context themes interlinked.

Discussion

In this study, we explore how the role of leadership during the implementation of automation is understood and how leadership behaviors and skills are understood as supporting or complicating the process. Moreover, we have examined how aspects of context can be understood as carrying meaning for how the role of leadership evolved during implementation.

The leadership themes highlighted skills related to cultivating optimism and engaging with new technologies as crucial for how the implementation developed. Furthermore, facilitating collaboration between and across levels of leadership was understood as key during the implementation. Leadership behaviors were understood as supportive when motivating explanations of what was to be achieved with the implementation, timely education, and support were provided. Conversely, a lack of active involvement from leaders, not taking interest in the robot and follow-up as a reaction to issues was understood to complicate implementation.

Our findings indicate that dimensions of context, such as political support and shared motives for robot introduction, shaped a positive climate for implementation and interacted with how leadership evolved. Leaders' understanding of the technology as a simple, easy-to-implement technology also shaped their role and priorities.

Optimism, technology literacy, and collaboration: core leadership skills

In our study, communicating a positive attitude was understood as a key leader skill for successful medicine robot implementation. Leaders at all levels, from the top level to the first line, provided inspiration and fostered motivation. This aligns with research showing that leadership shapes perceptions of organizational change and innovations (Haake et al. 2023; Saksvik et al. 2020). A leadership approach that fosters engagement is therefore essential. TL is effective in this regard, as it encourages openness to innovation (Alos-Simo et al. 2017) by inspiring employees to adopt new perspectives (Bass & Riggio 2006).

In social work and social care, automation is often met with skepticism from employees (Garkisch & Goldkind 2024; Johansson-Pajala & Gustafsson 2022). However, such concerns were less prominent in our study, possibly because of the local context characterized by openness toward new technologies and participants volunteering for interviews. Employees were generally positive and shared a common understanding with leaders regarding both motivations for and the desired outcomes of the implementation. Given the ongoing automation efforts in the public sector, such as elder care (SALAR 2024a), it is important for leaders to cultivate optimism and provide a purposeful vision to support future DT (Imran et al. 2020; Ingebrigtsen et al. 2024).

These findings highlight the role of social judgment skills, as effective leadership requires the ability to understand and influence employees' perspectives (Mumford et al. 2000). By recognizing employee concerns and adapting their communication accordingly, leaders can reduce resistance and foster engagement in future automation. The capacity to understand people and social systems is a core leadership skill (Mumford et al. 2000), as problem solving related to automation efforts must be applied in a social context.

The second skill highlighted in our analysis is leaders' ability to understand the technology being implemented. Previous research has shown that the capacity to understand technology, including AI and robot implementations, is crucial for leading DT (Cortellazzo et al. 2019; Imran et al. 2020; Sriharan et al. 2024; Xu et al. 2020). Studies in health care have demonstrated an association between leaders' IT knowledge and positive IT adoption outcomes (Ingebrigtsen et al. 2024), and experts suggest that leaders need at least some technical knowledge and training to successfully implement robots (Xu et al. 2020). Additionally, studies highlight the importance of soft skills, such as the ability to navigate change (Kolbjørnsrud et al. 2017; Sriharan et al. 2024) and critical thinking (Xu et al. 2020). However, employees' expectations regarding leaders' understanding of the robot may be less about their technical proficiency and more about their ability to manage complexity, grasp operational challenges, and translate technological possibilities into practice (Brunner, et al. 2023). This aligns with Mumford et al.'s (2000) knowledge component, highlighting the importance of leaders possessing not only technical knowledge but also the capacity to apply it effectively.

A third skill highlighted in the two municipalities studied was leaders' ability to facilitate collaboration. Effective collaboration and coordination were supported by top-level leaders and change agents and were understood as crucial for implementation progress, particularly during the upscaling of initiatives. This underscores the importance of the problem-solving aspect of leadership (Mumford 2000), as implementation

requires leaders to coordinate efforts between a complex set of stakeholders, manage competing interests (Lindgren 2024; Toll 2024), and adapt strategies as the process unfolds.

Collaboration between leaders and ERs was also fundamental for fostering participation and problem solving throughout the implementation processes. Prior research has identified participation as a key success factor in DTs (Osmundsen 2024) and in the implementation of digital technologies (Zander et al. 2021). This was reflected in our findings, where both leaders and employees emphasized the crucial role of ERs in early-stage participation, training, and support.

The use of champions has previously been shown to facilitate successful DT implementation (Ingebrigtsen et al. 2014; Osmundsen 2024). Similarly, studies from the public sector indicate that involvement in AI implementation processes positively influences both attitudes toward AI and perceptions of its impact on operations (Vision 2025). Our findings align with this, demonstrating that individuals who were actively engaged as leaders or ERs tended to have positive attitudes toward the implementation and a clear understanding of the robot's practical benefits. This further highlights the interconnectedness of leadership skills—where problem solving, social judgment, and knowledge (Mumford et al. 2000) shape the success of automation initiatives.

Implementation leadership behaviors: lacking a structured approach

Our findings indicate that leaders did not follow a structured approach to lead the implementation. This is important, as research not only highlights the role of domain-specific leadership directed toward the implementation (Aarons et al. 2014a; Mosson et al. 2017) but also underscores the lack of empirical studies in this area (Mosson et al. 2017).

Implementation leadership is a framework that emphasizes creating a strategic climate where implementations are accepted and prioritized (Aarons et al., 2014a). Slightly adapted to the context of automation implementation, IL encompasses four behavioral dimensions: (1) proactive leadership (setting standards, planning, and removing obstacles), (2) knowledgeable leadership (comprehending the technology and being able to communicate effectively), (3) supportive leadership (recognizing, supporting, and reinforcing employee efforts to use/interact with the technology), and (4) perseverant leadership (consistent support, problem solving, and making adjustments) (Aarons et al. 2014a).

In the two cases studied, proactive behaviors were limited, with high-level leaders organizing meetings to gather stakeholder input, but there were no further actions regarding systematic planning or support structures explained by employees or leaders. Knowledgeable and supportive leadership was more pronounced; leaders and employees emphasized the importance of clear communication about the purpose and expected benefits of automation. However, knowledge gaps regarding leaders' understanding of the robot complicated its effective implementation, reducing the support available to employees. First-line leaders primarily facilitated training and organized support from ERs. In one municipality, strategic management set quantitative goals for implementation, tracking progress and celebrating achievements. With respect to perseverant leadership (Aarons et al. 2014a), leaders' actions are understood as largely

reactive. This approach complicated the implementation and increased the risk of unresolved issues and missed opportunities for making adjustments. Despite recognizing the importance of monitoring implementation progress, leaders lacked systematic strategies to do so.

While domain-specific leadership is generally more effective than general leadership in achieving implementation success (Kelloway et al. 2006; Lundmark et al. 2017), leaders' prioritization of IL may have been constrained by contextual factors. The observed challenges in the early and later implementation stages may stem from the absence of standardized implementation procedures, insufficient higher-level leadership support, and extensive leadership responsibilities limiting their capacity for domain-specific leadership.

Contextual components shaping a supportive climate

Implementing welfare technologies, such as medicine robots, at scale within elder care and the public sector has proven challenging (Frennert 2020; Johansson-Pajala & Gustafsson 2022). Our analysis made visible how political decisions shaped strategy, prioritizing digital solutions. Additionally, the model municipality projects provided resources to pilot technologies and disseminate learning, which was understood to influence the pace of implementation. These contextual components, including leaders at multiple levels of the system, play a key role in fostering an implementation climate (Aarons 2014b) characterized by openness to new technology.

The rapid pace of initiatives may have enhanced a project-based approach (Frennert 2020) to implementation. This approach often lacks a plan for managing the scaling of implementations, which was also described as a shortcoming in both municipalities. A strategic approach has proven more beneficial (Frennert 2020), although it is common for less mature organizations to attempt to solve strategic problems with isolated digital solutions (Philip 2021). Studies also suggest that pressure from local and national authorities can significantly influence health care professionals' perceived need for new technology (Nakrem et al. 2018), findings that could apply to the two cases studied. Other aims, such as competitiveness or being seen as a modern municipality, are also common (Toll 2024) and were mentioned during interviews.

The optimism of politicians and strategic management toward automation may reflect a simplified belief in the material capabilities of robots to address staff shortages and economic pressures. The merits of automation within the public sector are often exaggerated (Joahansson-Pajala & Gustafsson 2022; Lindgren 2024). This optimism must be paired with realistic understandings of issues regarding regulations, transparency, and data privacy (Kuziemski & Misuraca 2020). It also requires awareness of emerging tasks and responsibilities, new types of interfaces between humans and automation (Lindgren 2024), and the challenges faced by employees (Åkesson et al. 2024). Therefore, leaders need sufficient knowledge to make judgments about technologies (Sriharan et al. 2024) and what automation can achieve (Garkisch & Goldkind 2024), especially in relation to their impact on clients and employees (Frennert 2020; Xu et al. 2020.). These efforts must also be conducted in a transparent and accountable way to preserve public trust (Kuziemski & Misuraca 2020).

Creating new patterns of interaction

In our study, we could see that the implementation of medicine robots created new entanglements between elders, employees, leaders, and technology. 'Entanglements' refers to the interconnectedness of social and material elements (Orlikowski & Scott 2008). Material challenges, such as difficulties with loading robots with medicine or elders and employees responding to alarms, directly impact social dynamics and work practices.

Automation is predicted to change human-technology interactions (Gama et al. 2022; Parker & Grote 2020; Tsai et al. 2022) and differs from other technologies in its potential to both enhance and restrict work roles. This shifts the focus from passive technologies such as alarms to an understanding of how employees and automation interact to create value (Gama et al. 2022) and how employees take on the role of technology 'implementation agents' (Ertner 2019, p. 37).

The sociomaterial research approach states that work practices are shaped by the organizational context, specific technologies, and material conditions in which they are performed (Orlikowski & Scott 2008). Viewing work as dynamic and situated, where the focus is on practices—everyday actions, routines, and interactions through which work is carried out—rather than static tasks (Orlikowski & Scott 2016), provides useful perspectives for understanding the impact of automation on employees. This becomes key for leaders' understanding of automation implementations.

Increasing automation may require leaders to develop skills to influence technology design and manage evolving human-automation relationships to successfully integrate automation into social structures and daily practices. In the cases studied, this would require leaders to understand how the robots are intended to influence employee workflows and the care of elders. With this information, leaders need to collaborate with internal stakeholders and developers of the technology and actively manage ongoing adjustments of workflows, roles, and competencies as automation becomes embedded in daily practice.

Limitations

This study has limitations that should be acknowledged. Participation was voluntary, which may have resulted in favoring individuals with a higher level of engagement or a more defined role in the implementation process. Despite efforts to include diverse perspectives, voices of less involved or more critical individuals may be unheard.

Second, we examined medicine robot implementation in two municipalities. While this is an important example of automation, it is a relatively simple form compared with complex AI-driven systems. Differences between various technologies and settings will surely yield different challenges. Nevertheless, many of our findings regarding leadership and the role of context are likely relevant to other automation initiatives in the public sector and beyond.

Future research should explore leadership during the implementation of more advanced automation across different public sector contexts to expand upon our findings. Particularly relevant is exploring how leaders navigate interactions between context, technology, and social practices in automation processes and what implications this has for the development of leadership skills and behaviors.

Conclusions and practical implications

In this article, we explored the role of leadership during the implementation of automation, highlighting how the contextual characteristics of municipalities interact with the evolution of leadership. The findings emphasize the importance of all levels, from politicians to first-level leaders, in fostering a strategic climate conducive to implementing robots. Through demonstrating optimism, clearly communicating the purpose and benefits of automation, engaging with the technology, and facilitating collaboration, many of the challenges of implementing medicine robots were successfully addressed by leaders.

Consequently, leadership skills must evolve to address the complexities introduced by automation. Leaders need to possess skills, enabling them to understand the technology and translate its potential into meaningful operational solutions. Training for leaders should focus not only on technical proficiency but also on the social dynamics of human-technology interaction, ensuring that leaders are equipped to navigate employee concerns, build trust, and facilitate collaboration across organizational levels. Furthermore, proactive leadership behaviors, such as anticipating challenges and planning accordingly, should be prioritized to prevent the implementation process from becoming reactive and inefficient. We emphasize that leaders must balance their enthusiasm for automation with a deep understanding of the public sector context, including political considerations, resource limitations, ethical issues, and regulatory requirements, while also fostering employee participation and an inclusive implementation process.

Ultimately, as automation becomes increasingly integrated into daily work practices, leaders will need to adapt continuously by developing new competencies that balance technological understanding with deep sensitivity to human and organizational needs. These skills are crucial for ensuring the long-term success of automation initiatives and fostering an environment that is responsive to both the technological and social dimensions of organizational change.

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