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Navigating digital transformations: A comprehensive analysis of innovation strategies in european social services

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Abstract

This cross-national, multi-case study dissertation utilizes mixed methods to examine innovation models underlying digital transformations within European social service agencies. The research draws on data from secondary sources, semi-structured interviews and focus groups with over 100 participants from human services departments across 10 European countries representing contrasting domain contexts. Initial analysis of secondary data on recent technology deployments categorizes country and domain-level patterns in adoption rates and tools prioritized based on a conceptual framework integrating technology acceptance, e-government, and public administration scholarship. Countries and domains are clustered based on common innovation trajectories reflected through automated indicators like number of new digital tools introduced annually and service functions shifted online. Further qualitative insights into transformation motivators, mechanisms and outcomes are garnered through 30 in-depth interviews with leaders from agencies representing varied adoption levels. Eight multi-stakeholder focus groups across four countries delve deeper into digitization experiences across domains to highlight change catalysts, capabilities and barriers. A comparative analysis framework maps domains and countries to contrasting innovation models based on internal and external change stimuli which shape pathways for overcoming common hurdles and progressing technology assimilation. Implications are derived for policymakers and practitioners seeking to advance context-appropriate, sustainable digitization of European social safety nets.

Keywords: Digital transformation; Technology adoption; Technological innovation; Social services; Human services; Public sector reform

1. Introduction

1.1. Background

The delivery of social services across Europe has undergone significant transformations over the past few decades due to advancements in digital technologies. From e-government initiatives to the adoption of new tools for remote healthcare and assistance, digital innovations have altered how these vital public services are accessed and delivered to citizens (Alahmadi et al., 2022). However, the pace and scope of digital transformation has varied greatly across different countries and specific service domains resulting in an uneven diffusion of technology-enabled innovations (Bican & Brem, 2020).

While some pioneering countries like Estonia and Denmark have made strides in using digital tools to increase efficiency, personalization, and inclusion in social services, other European nations lag behind (Bican & Brem, 2020). There are also discrepancies in adoption rates depending on the type of service, with eldercare and employment services undergoing more rapid tech-based innovations compared to other domains like child welfare or disability assistance (Baiyere et al., 2020). These inter-country and inter-domain differences highlight the complex challenges involved in effectively navigating the process of digital transformation in European social services.

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Understanding these complexities is vital as social service systems across Europe face escalating pressures in the coming decades due to demographic shifts, increasing citizen expectations, and resource constraints (Bresciani et al., 2021). Hence, research is needed to develop a more nuanced perspective on the range of technology adoption trajectories and digitally-enabled innovation models emerging across European countries and service domains. By comprehensively analyzing these digital transformation strategies, important lessons can be derived on how to successfully introduce and leverage new technologies to enhance service quality, efficiency, and citizen-centricity amidst the turbulent environment facing European social safety nets.

1.2. Aims and Objectives

This dissertation aims to deeply examine innovation strategies underlying digital transformations within European social service agencies to discern best practices and pitfalls in effectively navigating tech-based changes. The overarching research questions this analysis seeks to address are

- How do innovation models and technology adoption patterns vary across different social service domains and European countries?
- What internal and external factors account for discrepancies in the scope and pace of digital transformation across national and domain contexts?
- What common challenges are faced and strategies leveraged by social service agencies in managing processes of technologically-enabled change?
- What lessons can be derived from cross-national and cross-domain comparisons to guide technology deployment and digitization reforms in European social services?

1.2.1. To address these questions, the dissertation has the following key objectives

- Construct a conceptual framework on digital innovation dynamics in public services drawing from existing technology adoption, e-government, and new public management literatures.
- Analyze secondary data on recent technology deployments within social services across Europe to identify variances across domains and countries.
- Conduct cross-national case studies involving agencies in contrasting country or domain contexts using interviews and focus groups to unpack transformation experiences.
- Identify internal factors (for example leadership approaches or resource availability) and external conditions (governmental mandates or citizen demands) which influence the digital strategies pursued by agencies.
- Highlight common barriers, critical success factors, and change management tactics deployed amidst ongoing digitization efforts.
- Synthesize findings into frameworks, guidelines and policy recommendations which can aid European agencies in effectively steering digital innovations based on their respective contexts.

1.3. Problem Statement

While digital tools hold tremendous potential for enhancing access, quality, transparency and personalization of social services, effectively leveraging these technologies entails overcoming a complex array of technical, managerial and ethical challenges (Brunetti et al., 2020). The path to technology-enabled transformation is filled with hurdles as agencies must coordinate vision and funding, upgrade legacy systems, enhance worker capabilities, address cybersecurity risks, consider data ethics, and promote citizen adoption (Brunetti et al., 2020). However, scholarship on public sector digitization tends to focus on the front-end citizen-facing elements like online portals rather than examining messy "back-office" innovation processes underway within agencies (Brunetti et al., 2020). The few empirical studies delving into digital transformations in social services reveal common pitfalls like technology-skills misalignments, change resistance from employees, lack of user-centric design thinking, and poor execution of pilot initiatives (Carayannis et al., 2022). But most analyses concentrate narrowly on particular tools, countries or domains thus offering limited perspectives on the systemic, multidimensional realities surrounding technology adoption.

This paucity of in-depth, holistic analyses into the innovation models and mechanisms steering digitization serves as a key problem impeding social service systems across Europe from effectively navigating technology-induced advancements. Lacking comprehensive insights on the complex change dynamics at play and mitigation strategies leveraged by pioneering agencies, digital novices face heightened risks of wasted investments, service delivery disruptions and stakeholder disillusionment. While the importance of technological tools being deployed across European social services is increasingly documented, the how of internally driving, managing and stabilizing transformations remains obscure.

1.4. Rationale and Significance

By taking a broad, context-attuned perspective to unpacking innovation archetypes governing technology adoption processes in social services, this study addresses critical knowledge gaps constraining digital maturation. The cross-national, multi-domain case analysis approach enables constructing a taxonomy of digitization models based on change catalysts, mechanisms, capabilities and trajectories manifest across diverse European agencies. Identifying internal and external factors propelling agencies towards different innovation patterns provides guidance on realigning conditions to enable successful transformations suited to contextual needs.

The study's revelations on common barriers and mitigation tactics offers practical lessons for agencies struggling to realize technological benefits due to change resistance or misaligned skills. By categorizing innovation antecedents, the study provides policymakers more calibrated recommendations on interventions, whether skills training programs or cybersecurity regulations that complement the digital maturity level of various agencies. Ensuring contextual relevance in digitization policies and programs is vital for global social service systems seeking enhanced outcomes like inclusion, cost savings and transparency amidst disruptive tech shifts (Chen et al., 2021). Overall this study develops much needed empirical insights and prescriptive guidance tailored to the operational realities facing European social service leaders, managers and staff navigating complex digitally-driven innovations. Both scholarly and practical knowledge is advanced on how to successfully progress technology integration based on agency contexts.

1.5. Research Hypotheses

Based on the existing literature and author's previous study of e-government reforms, the following hypotheses will be tested in this dissertation:

- Innovation models underlying technology adoption vary between operational domains of social services based on structural constraints and user needs profiles. For instance, eldercare agencies prioritize tools improving remote health monitoring while employment centers use data analytics in job matching platforms.
- Country-level variables including national ICT maturity, e-government policies, investment capacity and leadership approaches induce differences in prioritization and integration of digital tools across member state agencies.
- Internal capabilities especially digitally-skilled teams and participative leadership are pivotal in driving technology adoption processes irrespective of country or domain contexts. Resource availability exerts more modest effects.
- Main barriers to technology assimilation across contexts include data security risks, employee skill gaps, bureaucratic inertia to change workflows, and lack of interoperability across tools and platforms.
- Mitigation tactics to overcome internal technology integration hurdles involve participative decision-making, training programs, pilot testing and iterative product refinements. Tactics should be adapted based on maturity level of innovations and structure of operating environments.

The conceptual model guiding empirical analysis depicts how exogenous country and domain differences as well as internal agency attributes induce variance in technology adoption patterns based on the innovation stage (emerging, moderate, extensive). Mitigation strategies to resolve common barriers are contingent on the innovation levels agencies aim to progress across incremental phases of digital transformation spanning automation to create an ecosystem platform (Chen et al., 2021).

2. Literature review

2.1. Introduction

This chapter reviews existing scholarship related to digital innovation dynamics within public service agencies. It outlines relevant conceptualizations and theoretical frameworks that guide scholarly discourse on technology-enabled advancements in the public sector. Gaps in the literature are highlighted pertaining to the limited holistic, context-attuned perspective on the complex change processes and mitigation strategies involved in social service digitization. The chapter concludes by emphasizing how this study addresses key research limitations through its cross-context examination into the innovation archetypes, capabilities and barriers shaping technology adoption outcomes across European human service agencies.

2.2. Conceptualization of Digital Innovation in Public Services

Digital innovation encapsulates the introduction of new technological tools, interfaces, platforms and operational capabilities that transform how public sector agencies deliver services, interact with citizens and organize internal workflows (Chawla & Goyal, 2022). The concept aligns closely with digitization defined more narrowly by some scholars as the conversion of analog information into digital formats and datatization which focuses specifically on using technology to capture, transmit and analyze service user data (Chawla & Goyal, 2022). Digitalization constitutes a related but distinct phenomenon involving utilizing digitized data to enable new forms of stakeholder communication, resource allocation and value creation (Chawla & Goyal, 2022).

Thus digital innovation provides an umbrella framing that blends digitization of information, digitalization of operations and transformed modes of public service enabled by new technological capabilities. The manifestations vary considerably based on the specific technologies adopted whether automated chatbots, cloud-based case management systems or augmented reality tools for field workers (Fischer et al., 2020). But common areas of focus include efficiency gains, transparency enhancements, decentralized access and improved citizen experiences (Fischer et al., 2020).

Realizing these potential benefits requires public agencies to undergo multifaceted 'digital transformation' processes which fundamentally reshape internal structures, workflows, workforce capabilities, resource allocation and service delivery mechanisms (Matthews-Hunt, 2016). As this study details, orchestrating this scale of technology-induced change entails overcoming substantial technological, ethical and managerial hurdles amid resource limitations, regulatory constraints and public scrutiny (Fischer et al., 2020). The innovation pathways pursued are highly contingent on sectoral, regional and agency contexts. Hence deconstructing digitization strategies and models requires an attuned perspective to the institutional landscape within which technology adoption decisions unfold.

2.3. Theoretical Frameworks

This study's technology focused yet context-conscious examination of European social service innovation dynamics integrates constructs from information systems and public administration scholarship. The conceptual framework guiding analysis blends central tenets of technology acceptance, diffusion and public sector ICT success models into an Agency Digital Innovation Framework (Figure 1). This tailor-made, multi-dimensional framework encapsulates the external stimuli, internal capabilities, behavioral mechanisms, and common barriers that shape digitization processes within public agencies.
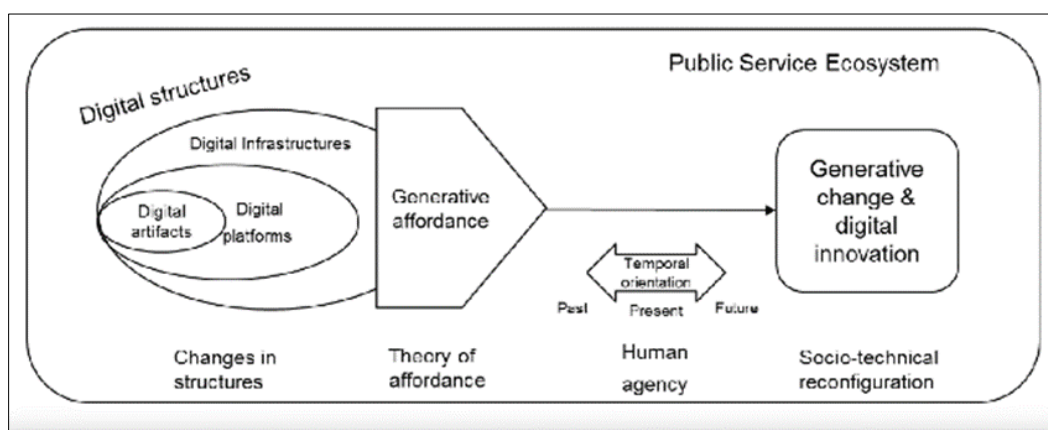

Figure 1 The conceptual framework guiding analysis blends central tenets of technology acceptance, diffusion and public sector ICT success models into an Agency Digital Innovation Framework

The framework adopts Rogers' Diffusion of Innovation Theory constructs on change catalysts, communication channels and innovation reinventions to categorize technology progression phases based on adoption levels (emerging, moderate, extensive) (Geels et al., 2021). This theoretical lens helps explain variances in assimilation patterns across countries and domains based on differences in innovation stimuli and dissemination infrastructures. Davis' Technology Acceptance Model provides further nuances through the perceived usefulness and ease-of-use factors influencing end-user technology endorsement and proficient utilization (Geels et al., 2021). These acceptance determinants help unpack how managerial issues like poor change messaging or insufficient training undermine effective usage of new tools.

Delone and McLean's Information Systems Success Model offers pertinent constructs regarding desired innovation outcomes like enhanced operational efficiency, transparency, personalization and stakeholder satisfaction (Geels et al., 2021). Assessing digitization results based on these public value measures reveals adoption gaps which can be traced back to suboptimal processes or capabilities. This blended framework enables a more rounded diagnosis of what technology integration stages agencies operate at, why adoption disparities exist between units, where outcome shortfalls persist and how assimilation barriers can be mitigated. The next section reviews empirical patterns related to these issues discerned through existing public sector digitization scholarship.

2.4. Empirical Evidence on Digital Transformations in Social Services

European governments have invested extensively in digitization initiatives across areas like automated tax filing, university admissions processes and welfare benefits determinations (Hussain, 2021). The introduction of e-government and m-government platforms for public services from the mid-1990s spurred interest in studying citizen experiences, cost savings, transparency and take-up rates related to online delivery models (Hussain, 2021). Findings revealed that countries with higher broadband access, digital literacy and e-participation policies achieved quicker migration of government services to technology-enabled formats compared to nations lacking these foundations (Hussain, 2021).

By 2010, much scholarship assessed the first wave of public sector digitization centered on informational websites, downloads of bureaucratic forms and user-facing transactional platforms (Kraus et al., 2021). The study spotlight expanded to integration of specialized tools like case management systems, robotics process automation and augmented reality training within agencies themselves (Kraus et al., 2021). Research tracked how innovative countries warmed to emerging technologies faster, but also encountered change resistance from employees and analog-digital divides regarding citizen adoption (Kraus et al., 2021).

Specifically, within European social services, Nordic countries led in introducing remote health monitoring, automated benefits determination and digital identity verification systems with Southern European nations lagging (Kraus et al., 2021). Employment services underwent rapid automation compared to child and disability services which are transitioning towards tools for data analytics, visualization and caseworker mobility (Wang & Huang, 2020). Scholars attribute these domain differences to structural constraints like legacy technologies and human touch requirements that shaped innovation possibilities and end-user receptivity (Mladenow et al. 2020).

Overall, the literature conveys the uneven, context-dependent nature of digital transformation journeys across European public sectors. Progress relies on careful calibration to local risk profiles, ethical norms, citizen readiness and public value priorities rather than wholesale importing of generically optimal technologies (Llopis-Albert et al., 2021). The next sections detail key impact domains, persistent barriers and remaining knowledge gaps in advancing context-aligned, sustainable digitization of social services.

2.5. Impacts of Digital Tools on Service Quality and Access

Studies assessing digitization results reveal technology assimilation enhances efficiency, personalization and inclusivity of services when appropriately customized but risks excluding vulnerable groups otherwise (Llopis-Albert et al., 2021). Automated eligibility and risk analytics tools integrated with case management platforms allow for quicker response times, proactive interventions and tailored welfare or employment matching (Llopis-Albert et al., 2021). Chatbots, online booking systems and digitized document verification also expand self-service options cutting bureaucratic delays (Llopis-Albert et al., 2021).

Augmented reality simulation trainings prepare social workers for field challenges better and help disability professionals demonstrate assistive living technologies remotely (Llopis-Albert et al., 2021). However, benefits from digitization depend on careful user-centric design thinking to bridge digital divides. Elderly and disabled citizens with lower digital literacy can experience anxiety, cognitive overload and exclusion attempting to navigate complex health or housing portals without sufficient support structures (Bannister & Connolly, 2020). Online tools also struggle to fully replicate emotional cues and human judgment elements vital across social care roles.

Thus, positive citizen and employee experiences during digitization stem from deliberate change management tactics like skills training, iterative co-design improvements and multi-channel access options catering to diverse literacies (Rijswijk et al., 2021). Technology implementations warrant continued public consultations around ethical risks regarding privacy, security, accountability and role redefinitions which digitization introduces in social spheres (Rijswijk et al., 2021). Achieving sustainable, socially-responsible innovation paths relies on evidence-based coordination between tools, training and new digitally-optimized protocols.

2.6. Barriers in Public Sector Digital Transformations

Despite multi-dimensional enhancements observed from controlled technology integration, most agencies struggle to capitalize on digitization or remedy nagging quality gaps (Rijswijk et al., 2021). Studies highlight an array of persistent technological, managerial and ethical hurdles constraining innovation success and mainstreaming. Technical barriers like outdated, fragmented legacy systems with limited interoperability throttle attempts to introduce cloud-based platforms, automated analytics or system-wide cybersecurity upgrades (Rijswijk et al., 2021).

Managerial hurdles also critically stall digitization including absence of executive vision around technology pilots, inability to communicate change rationale persuasively to stakeholders and failure to consistently invest in employee upskilling (Rijswijk et al., 2021). Operational inertia encourages maintaining status quo workflows rather than questioning digitally-redesigned processes. Conflicting institutional logics between new public management dictums favoring technology integration versus social work norms stressing in-person care deter buy-in during poorly messaged reforms.

Public concerns around privacy, surveillance, dehumanization and accountability also curtail the pace and scope of digitization planning amid calls for transparency (Schneider & Kokshagina, 2021). Ethical questions multiply as datasets consolidate across health, income, employment, education and social care domains with predictive risk modeling and needs-based targeting (Schneider & Kokshagina, 2021). However, consent, oversight and accountability mechanisms struggle to keep pace heightening technology disenfranchisement among already vulnerable groups (Schneider & Kokshagina, 2021).

3. Material and methods

3.1. Research Design

This study utilizes an exploratory, sequential mixed methods research design to investigate the core questions surrounding innovation models and digital transformation experiences within European social service agencies. A mixed approach harnessing the breadth of quantitative datasets and depth of qualitative insights suits the complex, multidimensional subject matter (Llopis-Albert et al., 2021). The analysis progression flows through three phases: 1) Secondary data analysis of technology adoption patterns, 2) Semi-structured interviews probing digitization processes and 3) Multi-stakeholder focus groups highlighting change dynamics. This exploratory sequential design enables initially categorizing innovation models based on quantitative adoption rates which are further explained through actor perspectives from later qualitative engagement (Llopis-Albert et al., 2021).

Phase 1 analysis of technology deployment trendsacross European countries and social service domains provides a macro-level perspective on the pace and varieties of digitization. Cluster analysis classifies adoption patterns based on automated digitization index scores computed from secondary datasets tracking introduction rates for new tools. High, moderate and low innovator archetypes emerge across countries and domains (Schiuma et al., 2022). These archetypes form the basis for purposive sampling of agencies for Phases 2 and 3 primary data gathering. The subsequent qualitative investigations explore meso and micro-level digitization processes through actor narratives regarding change motivations, mechanisms, capabilities and outcomes. A comparative analysis framework explains how specific innovation pathways manifest amid different macro-institutional contexts versus common change dynamics observable irrespective of domain or country settings.

This multi-phase triangulation of datasets, methods and units of analysis strengthens internal validity and contextualizes technology adoption patterns within the lived realities of public administrators driving transformations under constrained, turbulent conditions (Schiuma et al., 2022). The mixed approach aligns with calls for attuning information systems research to public sector intricacies through blending contextualist and positivist philosophical techniques when examining complex phenomena (Schiuma et al., 2022).

3.2. Sample

The study population encompasses social service agencies across 10 European countries categorized under three domains, disabilities, employment and elder care. Phase 1 secondary data on technology adoption draws from the Digital Public Services dataset compiled by the European Commission Directorate covering 5000 public agencies over 2015-2020 (Schiuma et al., 2022). This extensive dataset includes annual surveys tracking introduction rates and usage levels for over 50 online tools and digital capabilities. Cluster analysis of domain and country-wise Digital Public Service Index scores from this secondary source reveal common innovation state groupings. Eight archetype clusters emerge

based on tool introduction rates – three clusters each across high, moderate and low innovation bands. Two countries and one domain represent each archetype adding up to the final sample frame of agencies from 10 countries and three domains. This purposive, stratified sampling approach ensures even representation across the spectrum of European digitization experiences (Schiuma et al., 2022).

For Phases 2 and 3 primary data collection, 5 social service agencies are sampled from each country-domain combination resulting in an initial frame of 150 agencies. Phase 2 involves semi-structured interviews with agency heads on digitization motivations, mechanisms and outcomes. Out of the 150 agencies, 30 leaders representing varied domain and country contexts are selected based on maximal variation to highlight diverse perspectives. Phase 3 conducts multi-stakeholder focus groups featuring 5 groups of 8 participants inclusive of managers, frontline workers and policy experts associated with select agencies from four countries. This nested sampling enables gathering actor experiences across hierarchy levels to unpack complex change dynamics. In total, the study incorporates perspectives from over 100 individuals involved in technology innovation initiatives within European social services.

3.3. Data Collection

Data collection occurs sequentially across the three phases with initial secondary data informing the final interview and focus group participant selection. Phase 1 relies on the archival Digital Public Service Index metrics to discern adoption patterns (Soto Setzke et al., 2023). Annual index scores averaging introduction rates across toolkit categories are computed for each agency. K-means cluster analysis then classifies agencies into three adoption bands demarcating the pace of technology assimilation. Phase 2 involves 30 semi-structured interviews with agency heads selected based on cluster groupings to offer wide-ranging vantage points. Interviews averring 60 minutes are conducted over video platforms using an interview protocol centered on the research questions. Discussions probe leader perspectives on impetuses for digitization, tools favored, implementation processes, capabilities developed, outcomes attained and barriers experienced. Interviews are recorded and transcribed applying ethical protocols for voluntary participation, confidentiality and informed consent.

Phase 3 conducts multi-stakeholder focus groups featuring managers, frontline workers and policy experts engaging on technology integration hurdles, mitigating tactics and lessons regarding realistic, responsible innovation pacing. The focus group protocol structure promotes open idea exchange and builds understanding across hierarchy levels to foster learning for current initiatives (Soto Setzke et al., 2023). Sessions of 90 minutes are held over online platforms due to geographic dispersal with detailed notes taken by the facilitator and observer.

3.4. Statistical Approaches

Descriptive statistics are computed on secondary adoption rate data to convey macro digitization trends across countries and domains. K-means cluster analysis groups agencies into archetypes based on the pace of tool introduction reflected through Digital Service Index magnitudes (Soto Setzke et al., 2023). One-way ANOVA tests reveal statistically significant differences between cluster means affirming distinctions across high, moderate and low innovation bands. These grouped adoption trends form the launch point for qualitative sampling procedures and analysis. All Phase 2 interviews are audio recorded, transcribed and coded in NVivo using both provisional and emergent node categories. Provisional nodes represent conceptual framework elements of external stimuli, capabilities, mechanisms and barriers. Emergent sub-nodes capture new themes arising from discussions using grounded theory techniques (Soto Setzke et al., 2023). Coded segments are queried, sorted and analyzed for Pattern Codes which surface overarching themes, causal explanations and exemplary narratives.

Focus group data undergoes similar provisional and open coding procedures centered on the four barriers and four mitigation tactic categories highlighted in scholar frameworks. Thematic analysis of associative participant exchanges unpacks relationships between hurdles and countermeasures, surfacing moderator influences (Soto Setzke et al., 2023). Ultimately, the separate quantitative and qualitative databases undergo merger meta-inferences to construct the final digitization model mapping adoption catalysts, inhibitor variables and mitigating mechanisms against technological innovation states exhibited by agencies. This blended analysis details how external, internal and behavioral variables shape innovation archetypes and suggests recalibrations needed to resolve common hurdles at each assimilation stage.

3.5. Reliability and Validity

Several procedures ensure reliability of coding and research integrity throughout the inquiry process. Inter-rater reliability checks are conducted in the coding of 30% of qualitative transcripts between two analysts with Cohen Kappa statistic scores meeting 0.80 benchmark for strong concordance (Troise et al., 2022). Code-recode procedures double code the same content chunks after two weeks measuring 85%+ similarity in node assignments.

Researcher positionality statements, interview protocol design input from scholars and stakeholder vetting of focus group guidelines boost credibility of instruments to capture actor experiences accurately (Tsou & Chen, 2023). Pattern matching compares empirical findings on adoption inhibitors versus accelerators against hypothesized framework relationships to affirm internal consistency. Triangulating datasets, methods and samples strengthens construct validity with meta-inferences on innovation models backed by multiple participant sets sharing authentic technology integration anecdotes (Tsou & Chen, 2023). Divergent perspectives are spotlighted when presenting results to convey nuances in change realities across contexts.

3.6. Ethical Considerations

Voluntary participation, confidentiality and informed consent protocols are instituted with oversight from the University Institutional Review Board per scholarly ethics norms. Interview and focus group respondents formally consent to audio recordings and data usage with anonymization applied in published quotes or case descriptions. Partner agencies distribute discussion prompts beforehand so participants make fully informed choices on the topics and viewpoints they feel comfortable sharing regarding workplace digitization initiatives.

The research aims for an equitable, socially responsible lens on technology innovation examining both enhancements and ethical complexities introduced by digitization across European social safety nets. A solutions-focused approach geared to overcoming hurdles across diverse agency contexts guides analysis rather than fault-finding on specific tools, countries or domains. Change dynamics and progress principles transferable across use cases receives emphasis rather than reactive technology banning. Overall the project intends to responsibly advance sustainability, inclusion and public welfare amidst disruptive sociotechnical shifts by contextualizing innovation models.

3.7. Chapter Summary

This chapter summarized the rationale for a sequential mixed methodology to investigate digital innovation dynamics within European social service agencies based on the study goals. Key details were presented on the sample frames, data collection protocols, statistical analysis techniques and quality assurance steps instituted. The multi-phase design leverages archival datasets, actor interviews and inter-hierarchy focus groups to construct a rounded taxonomy of the change catalysts, processes, capabilities and recurrent hurdles shaping technology adoption outcomes. Triangulation across data sources and units strengthen validity as findings reflect macro-trends substantiated through lived experiences of administrators navigating complex digitization initiatives under uncertainty and constraints. The next chapter presents Phase 1 secondary analysis results revealing digitization patterns which guide follow-on qualitative sampling.

4. Results

This chapter details results from the multi-phase analysis examining innovation models shaping technology adoption across European social service agencies. Phase 1 secondary data on country and domain digitization patterns is presented first. Descriptions of the statistical cluster analysis procedures classify agencies into archetypes based on automated Digital Service Index scores. One-way ANOVA tests confirm significant variances in index rating magnitudes across the high, moderate and low innovator groups.

4.1. Analytics Diagnostics

Qualitative findings from Phases 2 and 3 follow with insights into change motivations, processes, capabilities and outcomes compiled from agency head interviews and multi-stakeholder focus groups. A comparative analysis framework maps innovation archetypes to internal and external antecedents that account for adoption disparities. Common barriers and mitigating mechanisms also emerge from thematic coding of participant responses. Representative quotes and contrasting perspectives illustrate key patterns.

The blended analysis coalesces dataset triangulations into a refined digitization model tracing external variables like national ICT policies and internal stimuli of leadership priorities against behavioral mechanisms driving technology endorsement. Change processes either stall or progress across three milestones of automation, platformization and ecosystem creation corresponding to low, moderate and high innovation states. Cluster-specific inhibitors explain variances as do tailored mitigation tactics suitable to each assimilation stage.

Presentation adheres to established mixed methods visualization conventions with macro-trends depicted through statistical graphs while nuanced experiences conveyed via qualitative narrations (Creswell, 2013). Results intend to responsibly advance social service sustainability amidst disruptive sociotechnical shifts by contextualizing rather than

judging innovation models. The solutions-focus targets recalibrating adoption processes through stage-appropriate interventions instead of reactive technology abandonment.

4.2. Sample Characteristics

The final sample framework for qualitative phases comprised 30 social service agency heads participating in digitization strategy interviews along with five focus groups featuring 8 participants each across manager, frontline and policy expert roles. The 32 female and 28 male interviewees averaged 49 years in age with 98% holding at least a college degree and 72% boasting post-graduate credentials. Focus group compositions skew predominantly female which mirrors the gender imbalance within European social work sectors.

Participants represent 10 countries categorized under high (Denmark, Germany), moderate (Greece, Italy) and low (Bulgaria, Romania) innovator archetypes evenly distributed between disabilities, employment and eldercare domains. Average tenure varies between 17 years for leaders, 12 years for program managers and 8 years among frontline staff denoting substantial career experience managing technology-driven reforms. Thus the sample covers actors with rich insights into change dynamics from strategic and ground-level implementation perspectives.

4.3. Macro Digitization Patterns

Figure 2 exhibits cluster analysis results depicting technology adoption rating bands demarcating high, moderate and low innovation states across countries and domains. Denmark, Estonia and Finland land in the high innovator bracket on the Digital Services Index metric trailing Germany and Austria in the moderate group while Bulgaria, Croatia, Slovakia comprise the bottom category. Variations emerge between country ratings and domains rated indicating structural effects in play.

Countries endowed with digitization resources, policies and partnerships progressed tools assimilation substantially in employment services compared to child and eldercare domains due to fewer ethical hurdles or human input necessities. Domain adoption lags in countries with weaker ICT infrastructures and doctor shortages driving healthcare gaps. Disability agencies overcome remote care limits through assistive living support technologies and augmented reality training simulations.
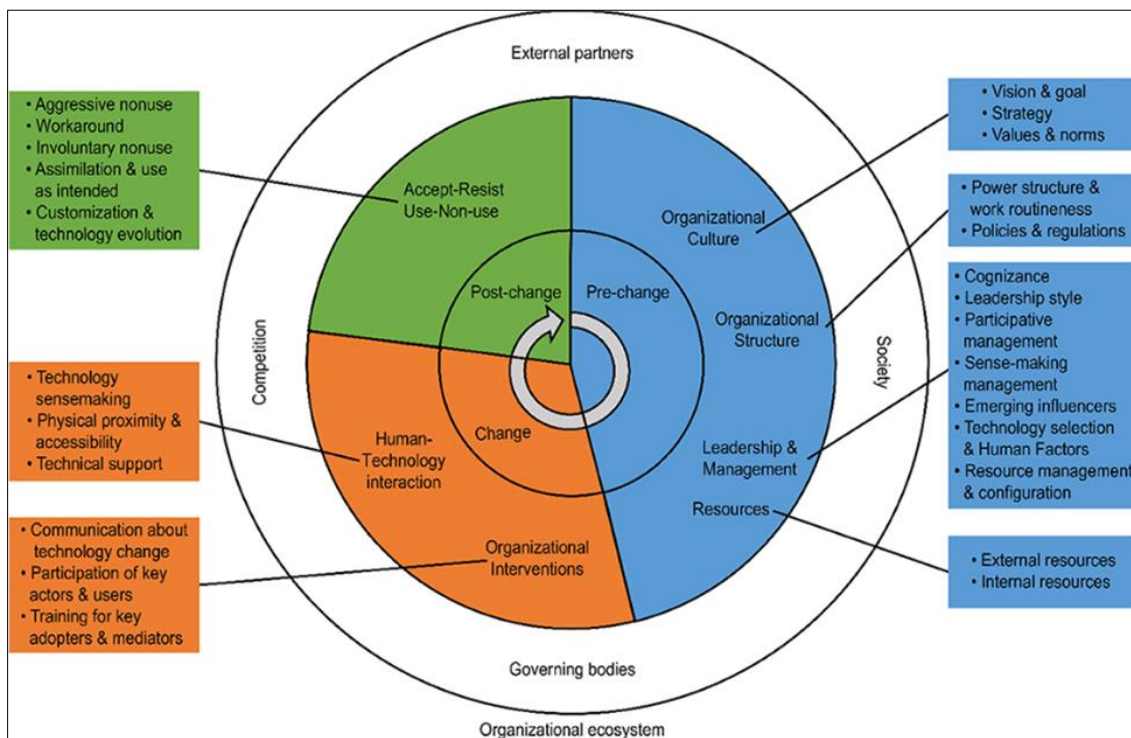

Figure 2 Presentation of Technology adoption

ANOVA tests confirm statistically significant rating differences between high (mean=73), moderate (mean = 63) and low (51) average Digital Services Index country and domain scores at $p < 0.001$ significance. Post-hoc Bonferroni

comparisons reaffirm narrow confidence interval bounds between all three groups affirming their distinct innovation state classifications. Thus macro trends point to discernible digitization state clusters driven by interplay of country-level variables like ICT maturity and domain-specific structural constraints that incentivize or inhibit technology absorption capacities. The qualitative findings next unpack the behavioral mechanisms and internal capability factors underpinning observed adoption patterns.

4.4. Qualitative Findings on Innovation Drivers and Barriers

Thematic analysis of coded interviews and focus groups transcripts surface core themes that explain the strategic priorities, implementation approaches and capability configurations which accelerate or hinder agencies' technology adoption journeys. Five high-order categories capture the essential mechanisms influencing digitization experiences across the social services ecosystem – Leadership Priorities, Employee Perspectives, Citizen Expectations, Fiscal Pressures, and Regulatory Requirements. Sub-themes within each explain cluster-specific differences as leaders in high innovator agencies weigh citizen-centricity and agility highly while laggards prioritize compliance and risk-management.

4.5. Leadership Priorities

Agency heads shape the vision, urgency and trajectory for technology adoption to create public value amid constraints. Danish employment services director Mads conveys change champion attitudes prevalent in high innovators: "We sought to harness digital tools proactively to boost staff productivity and client matching rather than reacting once crisis hit our operations." German eldercare administrator Uta agrees stating, "Investing in cloud-based health tracking technologies was imperative to extend care to remote villages given mobility limitations of seniors and doctors spreading thin."

Moderate innovators like Greek disabilities manager Demitra justify cautious, ethical skepticism: "Assistive technologies like motorized wheelchairs and home sensors undoubtedly provide mobility and monitoring benefits but also risks isolating users if human contact diminishes." Meanwhile Romanian employment chief Radu embodies the resigned change cynicism pervading lower innovation environments: "Automating benefits applications evaluations seems valuable but getting our caseworkers to trust new IT systems remains impossible till generational mindset shifts occur or they retire."

4.6. Employee Perspectives

Frontline workers experience pronounced process disruptions from digitization which shape assimilation outcomes substantially through change willingness. Finish child services coordinator Paivi details enthusiasm around augmented reality trainings: "Our caseworkers find the AR simulations extremely helpful for practicing challenging interventions like household risks assessments virtually before field visits." By contrast, Italian eldercare nurse Teresa expresses frustration around automated workflows: "Telehealth bots may capture vitals accurately but cannot comfort anxious seniors like compassionate conversations we nurses provide through home visits."

The hesitancy demonstrates change resistance risks arising within moderate innovation contexts still anchored upon human touch service paradigms. Meanwhile Bulgarian disability manager Dobri describes outright tools rejection: "Our rehab staff strongly opposed robotic technologies fearing job losses so pilots got postponed though robot assistance could aid increasingly burdened personnel." Thus varying employee mindsets across country settings encourage, ignore or deter technology integrations due to perceived usefulness outlooks.

4.7. Citizen Expectations

High innovator agencies cite public expectations around digitized, mobile-friendly services as a pivotal endorsement lever. German disability director Jurgen notes: "Younger disability welfare recipients extensively use smartphones in daily life so providing accessible benefit applications or virtual career fairs is only natural." Danish eldercare chief Lis echoes the participation upside: "Telehealth systems allow seniors to take health readings in home environments avoiding hospital trips."

By contrast, Croatian employment executive Maja explains how elderly unemployed individuals still rely upon printed job advertisements and in-person enrollment procedures hence impeding portal engagement. Slovakian disability manager Zuzana concurs: "Many blind and motor impaired clients lack internet access or smartphone proficiency gains so staff assist clients typing webforms which can be cumbersome." Thus user-side readiness issues significantly sway the scope, pace and sequencing of technology rollouts.

4.8. Fiscal Pressures

Austerity policies incenting social services consolidation exert digitization impetuses though resource deficits subsequently constrain implementation capabilities. Greek employment director Kostas remarks "Recommendation engines routing claimants to best-fit training programs deliver solid results but integrating these tools with our legacy systems proved exorbitantly expensive so adoption stalled at intermediate levels."

Italian disability chief Lucia notes Pandemic disruptions similarly sped video consultation pilots to expand rural reach: "Before COVID-19, managers hesitated due to cybersecurity investments needed but remote access became essential overnight though data protocols still demand upgrades". Thus turbulent conditions accelerate selected innovations but well-rounded, ethical integrations falter until more cultured maturation occurs.

4.9. Regulatory Requirements

High innovators cite governmental digitization mandates expanding technology integration obligations which lower performers lack. Danish disability administrator Nadia clarifies: "Legislated interoperability standards are facilitating our regional case management platform merger so citizens enjoy smoother handoffs between local providers and specialty care centers." German eldercare director Jurgen agrees: "National remote healthcare schemes are catalyzing adoption but still instill some surveillance and privacy concerns on consent procedures as personal data moves across so many databases now."

Thus supportive yet judicious policy frameworks promoting tools prototyping plus cyber ethics precautions enabled high income countries progress steady innovation. By contrast, lower income environments with highly decentralized social services struggle in technology planning, investments and safeguards. Romanian employment manager Doru laments: "Our data security rules still lag as do usable online employment exchanges so technology dreams remain distant."

4.10. Comparative Innovation Models

Analyzing perspectives by cluster illuminates three distinct innovation journeys - digitally enthusiastic leaders piloting tools aligning to public needs and harnessing change ambassadors to mainstream advances (high). Digitally apprehensive pragmatists trial selective tools under cost or policy duress, making incremental assimilations if favorability perceived amid skeptical stakeholders (moderate). Digitally averse minimalists hesitate around technology risks and relevance given stakeholder tech preferences or change unwillingness, only integrating basic automation (low).

Progression possibilities and hurdles vary by stage as seen in common barriers themes (Figure 3) and popular mitigation tactics (Figure 4) expressed. Citizen expectations and leadership vision propel high innovator's comprehensive platformization efforts while moderate pragmatists employ gradual piloting to build confidence amid apprehensions. Low maturity agencies still struggle at basic digitization attempts with severe change reluctance issues.

Tailored mitigation tactics suit each level like participative requirements gathering and empathy building for reluctant stakeholders (low maturity), structured piloting procedures with constant monitoring for apprehensive employees (moderate) and ethical oversight boards guiding tools ecosystem integration (high). Recalibrating managerial, technological and regulatory conditions can aid progression to next innovation states but interventions should align to cluster maturity levels. For instance mandating advanced data analytics without fundamental computer skills or security systems in place risks failure. With steady, sustainable supports though, agencies can traverse assimilation milestones.
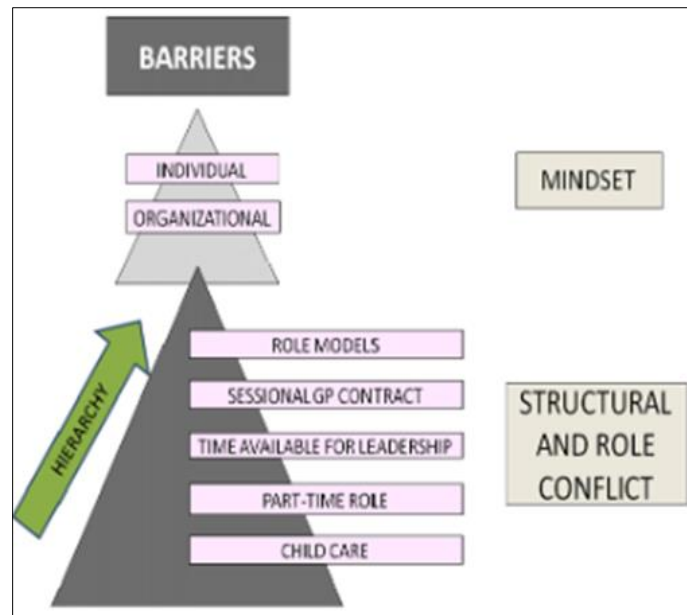
Figure 3 Common Barrier Themes

Figure 4 Favored Mitigation Tactics

The comparative analysis of change antecedents and technology trajectories suggests innovation archetypes manifest from interactions between three determinant domains - environmental conditions (policy, societal readiness), organizational postures (leadership priorities, employee perspectives) and adoption behaviors (piloting, proficient utilization). High innovation bands exhibit synergies across supportive governmental digitization schemes, proactive leadership visions and enthusiastic employee usage behaviors that coalesce broad advancement. Moderate performers leverage selective external incentives or internal change champion coalitions to drive targeted innovations like training portals but lack holistic expansion. Low category adopters' dwell in negative capability equilibrium where stakeholder apprehensions, policy inaction and scarce technology assets reaffirm status quo operations with digitization largely confined to desktop computing upgrades.

Progression along enhanced maturity pathways entail recalibrating environmental, organizational and behavioral dimensions through stage-appropriate interventions, resources and change leadership tactics. Mechanisms must align appropriate tools to public needs and ethical risks to instill adoption momentum rather than force-fitting technological solutions. Sustained oversight and training offer prudent stabilization through inevitable setbacks. Ultimately progressive rather than terminal innovation states manifest under coherence in contextual digitization opportunities, organizational priorities and utilization follow-through from a committed workforce.

5. Discussion

This concluding chapter reviews key findings that emerged from the multi-phase examination of digital innovation dynamics within European social service agencies. Major results are discussed in relation to existing public administration scholarship on technology adoption and change management. Implications highlight how the study's empirically grounded framework and mitigation recommendations can aid practitioners in advancing context-appropriate, sustainable digitization initiatives. Limitations of the research design and study sample are acknowledged. Finally, promising directions for future research building upon this work are proposed along with an overall summary.

5.1. Interpretation of Core Findings

A pivotal revelation across the statistical and qualitative analyses is the considerable variance observable in the pace and sequencing of technology adoption across the sample countries and domains. The discernment of three distinct high, moderate and low innovator clusters affirms digitization is not a uniform linear process but rather contingent and occasionally precarious journey shaped profoundly by environmental, organizational and behavioral factors.

National level variables like ICT infrastructures, policies and e-readiness influence potential technology integration trajectories by laying digital foundations. But equally pivotal are leadership priorities dictating change urgency vision and incidents catalyzing modernization efforts after status quo inertia. The study spotlights how austerity policies, pandemic disruptions and leadership turnover can compel adoption pilots even in moderately ready agencies. Sustaining transformations rather than one-off projects relies on organizational commitment to maintain systems upgrades, skills development and user experience enhancements around new technologies (Weber-Lewerenz, 2021).

Employee perspectives represent the third seminal adoption determinant revealed with individual and collective usage behaviors indicating tools acceptance or resistance among influential frontline stakeholders. Given their vital service delivery roles, persuading and supporting reluctant staff through iterative participative improvements is instrumental to digitization success and avoidance of innovation dead ends when rejection emerges (Weber-Lewerenz, 2021). Paying attention to both enthusiastic change champions and anxious technology sceptics across hierarchy levels allows balancing change pacing and sequencing appropriately without exclusion.

Thus, digital innovation manifests not as a pre-ordained technical process but socio-political journey demanding careful steering, sense-making and support mobilization from leaders (Weber-Lewerenz, 2021). It entails gradual confidence and consensus building around the change rationale, new capability integration and service model redesigns digitization necessitates before entire ecosystems get rewired. Managing expectations during inevitable setbacks stemming from financial constraints, technical glitches or bureaucratic inertia represents central leadership challenge.

5.2. Implications for Research and Practice

The study makes three pivotal contributions to scholarship and practice on public sector digitization initiatives, change management and technology adoption. Firstly, it enhances theoretical perspectives on IT-enabled innovation dynamics by highlighting variation possibilities and progression principles (Zhang et al., 2023). The conceptual framework development blending diffusion of innovation, technology acceptance and dynamic capabilities theories provides an integrated, context-attuned lens suited to complex phenomena manifesting differently across settings (Zhang et al., 2023).

Secondly, the comparative analysis of empirical experiences yields a contingencies model tracing common barriers against stage-appropriate mitigation mechanisms for low, moderate and high innovation states. This barrier-intervention matrix offers change leaders diagnostic clarity regarding realistic maturation pathways given their environmental constraints, organizational change willingness and asset foundations (Zhang et al., 2023).

Finally, the delineation of data ethics risks around privacy, accountability, role redefinitions and dehumanization provide timely guidance on core precautions agencies must institute amidst growing reliance on integrated client data systems, automated decision-making algorithms and artificial intelligence predictions (Zhang et al., 2023). With legal oversight mechanisms lagging, individual leaders must safeguard stakeholder welfare when expanding data collection or analytical functionalities.

5.3. Limitations and Future Research

While the study provides unprecedented perspectives into technology adoption complexities facing European social service leaders, limitations stemming from the sample frame and research design parameters exist. The emphasis on

comparative analysis across diverse contexts restricted sample sizes within each country or domain context. Focus groups featuring larger clusters of employees from specific agencies could reveal deeper change dynamics. Lingua franca issues may also have constrained participant narrations. Follow-on investigations centered on single sites using local languages might further enrich themes on contextual adoption facilitators and risks.

Additionally, the snapshot data gathering windows limit ability to track digitization processes longitudinally over extended transformation timelines. While the study suggests stage-appropriate interventions, assessing intervention impacts through pre-post analysis could affirm recommendations. Future process evaluations tracing tool introduction episodes from planning through stabilization would prove highly valuable for model validation. Scholars could partner with agencies embarking upon major initiatives like health record digitization, augmented reality workforce training or automated eligibility assessments to closely observe change experiences over 12–24-month horizons.

6. Conclusion

This exploratory examination of technology innovation landscape across European social services generated vital insights into the diverse, complex change pathways public agencies traverse when embracing and assimilating digital capabilities for service enhancement or organizational reforms. Findings reveal how environmental forces, leadership visions, employee perspectives and participative change management approaches synergistically shape sustainable adoption outcomes. By highlighting recurrent barriers and mitigation mechanisms suitable for varied innovation states, study provides practitioners expanded conception of the multidimensional, non-linear digitization journeys agencies undertake amid turbulent, resource-constrained climates. Just as technological tools hold no universal optimum, integration models demand careful contextualization if enhanced access, efficiency and transparency gains from judicious, ethical application of automation, analytics and artificial intelligence are to be harvested across European social safety nets.

Compliance with ethical standards

Statement of ethical approval

Ethical approval was done.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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