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Data-driven insights in public sector housing

A case study of Stavanger Municipality

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Abstract

This qualitative case study explores the role of Business Intelligence tools in enhancing data-driven decision-making within municipal housing management in Stavanger, Norway. Drawing on a theoretical framework comprising Bounded Rationality, Decision Support Systems (DSS), Technology Acceptance Model (TAM/UTAUT), and Crisis Management Theory, the study addresses four research questions concerning routine decision-making, operational efficiency, crisis response, and adoption barriers. Through semi-structured interviews with four key stakeholders in Stavanger Municipality's Housing Section, the findings reveal that BI tools significantly improve routine operations by providing structured data insights, yet remain underutilized in strategic planning and crisis scenarios, such as refugee influxes. Organizational barriers, including limited training, fragmented data systems, and cultural resistance, hinder effective BI adoption, aligning with TAM's emphasis on facilitating conditions and Bounded Rationality's focus on decision constraints. The study highlights a gap between BI's potential and its practical implementation in public sector housing, underscoring the need for context-specific strategies to enhance data-driven governance. By examining these dynamics in a Norwegian municipal context, this research contributes to the limited literature on BI application in public sector housing, offering insights into digital transformation challenges and opportunities in municipal governance. The findings have implications for policymakers and practitioners seeking to leverage BI for improved efficiency and crisis preparedness in the public sector.

1. Introduction

In an age of tight budgets and increasing expectations, public sector organizations face a pressing challenge in the optimal allocation of limited resources in order to meet the needs of their residents (KS, 2024). It is most visibly seen in the municipality level, the frontline in providing public services, where primary needs like housing should be managed with less financial elasticity.

In February 2025, Stavanger Municipality revealed its worst budget result in ten years due to increasing operational expenses, level tax revenues, as well as major investments in housing assets and municipal housing (Skumsnes, 2025). Such fiscal tightness, combined with an already volatile housing market affected by the local petroleum and gas sector (Gjerde, u.å.), reflects an overall problem: traditional decision-making methods, built on precedent or counter-responsive measures, are insufficient for ensuring optimal resource allocation in such demanding environments.

The urgency of this challenge intensifies during periods of crisis, when resource allocation decisions must be made quickly and accurately to address sudden spikes in demand. The Ukrainian refugee crisis, beginning in 2022 and continuing to impact European municipalities into 2025, exemplifies such a scenario. Municipalities like Stavanger Municipality, tasked with providing housing for vulnerable groups, including refugees, face heightened pressure to adapt quickly as influxes strain existing housing stocks (Skumsnes, 2025). Traditional administrative processes, marked by delays and inefficiencies, often fail under such conditions, leading to prolonged vacancy periods, underutilized resources, and unmet needs of the public.

The need for innovative tools to enhance decision-making precision and efficiency is highly important, as municipalities are faced with balancing daily operations and unforeseen challenges. As Merhi (2021) points out, data intelligence tools have the potential to improve decision-making, enhance service delivery, and reduce inefficiencies, making them especially relevant for resource-constrained environments. This thesis investigates the adoption of Business Intelligence (BI) in the public sector as a potential solution, focusing on its capacity to transform municipal housing management which is a domain where efficient resource use is fundamental, especially in times of crisis. BI refers to a set of methodologies, tools, architectures and technologies that transform raw data into meaningful and actionable information (Nasir et al., 2021) . Organizations use this information to enhance strategic, tactical, and operational insights, enable more effective decision-making (Nasir et al., 2021). BI helps improve organizational performance by providing accurate, real-time information that supports effective decision- making (Abai et al., 2019). By enabling real-time analytics, predictive modelling, and data-driven decision-making, BI has gained attention among municipal organizations seeking to enhance operational efficiency and responsiveness. In Stavanger, where investments in housing for refugees and vulnerable populations coincide with a financial shortfall of NOK 94 million (Skumsnes, 2025), BI's potential to optimize allocation, reduce inefficiencies, and support crisis management is particularly compelling. Municipalities adopting BI to move beyond reactive strategies, leveraging data to anticipate demand, streamline processes, and ensure resources are used where they are most needed is a shift that promises both economic and social benefits. Elbashir et al. (2022) argue that public sector organizations can achieve BI outcomes comparable to the private sector if top management promotes knowledge sharing, invests in operational competence, and provides robust BI infrastructure. However, the sector often struggles to attract digital talent. Similarly, Duvier et al. (2018) highlight that high-quality data, interoperability between systems, and employee training are essential for successful BI implementation. Without a culture that fosters learning, collaboration, and openness to change, organizations risk underutilizing BI's potential despite having access to the necessary tools.

While the application of data-driven decision-making (DDD) and BI has been widely researched, significant gaps remain in the academic literature, particularly regarding their role in public sector crisis management, and also in a Norwegian or even Scandinavian context. Extensive studies have explored DDD's impact in private sector contexts, with Brynjolfsson & McElheran (2016) demonstrating its ability to boost productivity by 5-6% through systematic data use. In the public sector, research has highlighted BI's potential to improve governance, with the OECD (van Ooijen et al., 2019) noting cost reductions of up to 10% in administrations that integrate data strategically. However, much of this work focuses on routine operations rather than crisis scenarios.

Crisis management literature (e.g., Drennan et al., 2014; Boin et al., 2017) discusses decision-making under pressure, highlighting issues like poor coordination and limited information, yet links to BI remain underexplored. Nwosu (2024) show that BI can reduce operational costs in healthcare settings, while Yiu et.al (2020) have findings that show higher operational capability in high-tech firms that has high tech intensity and implements BI systems. Another article by Yiu et.al (2020) is drawing on data from 278 U.S. manufacturing firms that implemented BI systems between 2005 and 2014, and the study finds that companies experienced immediate improvements in profitability and reductions in return-related risks following the operation adoption of BI tools (Yiu et al., 2020). None of the articles are focusing on housing or crisis contexts in Norway or even in a Scandinavian setting. Given BI's ability to forecast demand and optimize resources which is critical during refugee influxes, this lack of research marks a clear gap. This thesis addresses that gap by examining BI's role in enhancing municipal housing decision-making, especially in crisis scenarios in a Norwegian setting.

To bridge this gap, this study employs a qualitative case study approach centered on Stavanger Municipality, a municipality whose economic and operational context makes it an exemplary case. Stavanger's economy, historically boosted by the oil and gas industry, has driven high housing demand and costs, yet its 2024 financial downturn highlights the need for resource optimization (Rogaland Revisjon, 2025). The municipality's investments in housing for vulnerable groups, coupled with administrative inefficiencies like prolonged vacancies, provide a rich setting to examine BI's potential impact. Through interviews with key stakeholders from the Housing Section under the City Environment and Development service area in Stavanger Municipality, supplemented by insights from municipal reports, this research will explore how BI tools can support data-driven decisions to address inefficiencies and crisis demands in a Norwegian setting. The case study method is appropriate, offering in-depth insights into a real-world application while allowing comparison with existing literature and theories. This case study investigates how BI contributes to reducing vacancy periods, improving resource utilization, and strengthening crisis response strategies, as well as the barriers and opportunities in BI adoption in municipal housing. These aims are explored through four research questions:

1. How can BI tools transform municipal housing management with respect to decision-making, efficiency and adaptability in both routine operations and crisis scenarios?
2. How can BI tools, such as Power BI, support municipalities in making data-driven decisions for optimizing housing allocation and addressing inefficiencies?

3. How can BI improve municipal crisis response strategies, specifically during housing demand shocks such as refugee influxes?
4. What are the practical barriers and opportunities in adopting BI tools in municipal housing management?

These questions aim to locate actionable insights for Stavanger, contributing to both academic understanding and practical governance.

This investigation is timely and significant, as municipalities worldwide navigate similar pressures as declining budgets, rising demands, and unpredictable crises. Stavanger's experience reflects a broader trend: public sector organizations must innovate to remain effective stewards of public resources. BI offers a pathway to transcend the limitations of traditional decision-making, aligning with theoretical frameworks like Decision Theory's bounded rationality (Simon, 1997) and the Technology Acceptance Model (Davis, 1989), which will guide this analysis. By illuminating BI's role in housing management, this thesis not only addresses a scholarly gap but also provides a blueprint for municipalities to enhance resilience and efficiency. The findings, once fully developed, will reveal whether BI can indeed transform municipal governance, offering a compelling case for its adoption in an era of scarcity and uncertainty.

2. Literature review

This chapter presents an overview of a selection of literature relevant to the study of BI in the public sector. The aim is to establish a conceptual foundation for understanding how digital tools can enhance governance, resource allocation, and organizational responsiveness particularly in the context of municipal housing. The reviewed literature provides an understanding into how BI is understood and applied in practice and identifies both opportunities and barriers with its use. It also helps clarify how organizational factors such as leadership, culture, technical infrastructure, and competences influence the effectiveness of BI initiatives. These perspectives provide an insight into how public organizations can transition toward more data-informed practices, especially when facing operational pressures or acute demand shocks.

However, much of the existing literature is from international or private sector. This puts into doubt how applicable findings are to Norwegian municipalities. Notably, Norway's public sector is distinct both in its scale and in its breadth: general government employment as of 2021 accounted for 30.9% of Norway's entire labour market which is the largest share of OECD nations (Lupi et al., 2024; OECD, 2023). The average in OECD countries is 18,6% (OECD, 2023). That there is such an unusual context demonstrates the fact that local research is necessary. There is a significant literature shortage regarding BI use within Scandinavian public housing management, particularly during times of crisis. This thesis tries to bridge this gap by linking theoretical frameworks to empirical findings from a Norwegian case.

DDD represents a transformative approach in organizational governance, prioritizing empirical evidence over traditional intuition-based methods, with significant implications for public sector resource management. The impact of DDD on improving organizational performance in the private sector is well documented, and its relevance in public sector is increasingly recognized, including in municipal housing management. In their study of U.S. industries, Brynjolfsson & McElheran (2016) demonstrate that DDD adoption leads to measurable productivity improvements, particularly when supported by robust IT infrastructure and employee training. Their following paper, Data in Action: Data-Driven Decision Making in U.S. Manufacturing, further again suggests that the most significant performance benefits are found in single-establishment companies as well as among early adopters, thus emphasizing the importance of both organizational context and timing of implementation. These findings are reinforced by Oesterreich et al. (2022), whose meta-analysis covering 125 studies concludes that human resources, leadership capacity, as well as organizational culture are more decisive in generating business value through analytics than technical infrastructure alone. These studies together shed valuable light on an important concern in public sector: value extraction out of DDD goes beyond technological aspects and requires building up a data-savvy workforce, encouraging management culture, as well as aligning decision-making structures with analysis capabilities. In the context of public housing where resource scarcity and demand fluctuations such as refugee influxes are common, DDD holds potential to optimize housing allocation, reduce vacancy periods, and facilitate proactive rather than reactive crisis response. However, realizing this potential requires overcoming well-established routines and enhance technological readiness.

While the productivity benefits from DDD are well established in private sector, the question remains as to how these approaches can be effectively transferred into public sector, where organizational culture, governance structures and accountability systems differ. As a practical manifestation of DDD, BI equips public sector organizations with tools to convert raw data into actionable insights, enhancing strategic and operational efficiency.

The various benefits concerning the potential of DDD, have been discussed within the policy literature on strategy. Ideally, the Organisation for Economic Co-Operation and Development (OECD) stresses the need for public institutions to centralize data in their digital transformation strategies. The OECD advocates for a data-driven public sector (DDPS), where data are treated as strategic assets to improve policymaking, service delivery, and organizational performance (van Ooijen et al., 2019). This is aligned with the research of Wirtz et al. (2021) that introduced a comprehensive model of data-driven public administration that highlights the importance of embracing big-data and analytics to improve innovation, operating efficiency and citizen participation. Subsequently, Höchtl et al. (2016) examine the impact of data-driven governance on our understanding of reality, shedding light on the sophisticated and intertwined dynamics that accompany the use of data in public administration. Collectively, these studies demonstrate the critical role of the strategic use of data and DDD in public sector, but they also suggest that such transformation is complex, requiring structural, cultural and leadership alignment.

Crisis management literature, such as Drennan et al. (2014) and Boin et al. (2019), examines decision-making under pressure, identifying challenges like incomplete information and poor coordination, yet rarely connects these to BI solutions. While existing studies demonstrate BI´s effectiveness in other sectors, the relevance to crisis contexts remains insufficiently addressed. For instance, Nwosu (2024) shows that BI can reduce operational costs in healthcare settings, and Yiu et al. (2020) find that high-tech firms with strong technological intensity and BI implementation demonstrate enhanced operational capabilities. Another study by Yiu et al. (2020), based on data from 278 U.S. manufacturing firms using BI between 2005 and 2014, found immediate improvements in profitability and reduced return-related risks following operational adoption. Yet, none of these contributions examine public sector BI applications in the context of housing or crisis management, particularly not within a Scandinavian setting. This shortage of research is striking given BI’s demonstrated ability to forecast demand and optimize resources which are critical capabilities during sudden housing demand shocks, such as those posed by refugee influxes. The lack of focused studies on BI's application in municipal housing management during crises represents a critical gap, as municipalities increasingly face such challenges amidst declining budgets. This thesis seeks to address this void, exploring how BI can enhance decision-making, efficiency, and adaptability in both routine and crisis scenarios within the public sector in Norway.

Despite considerable advances in utilizing data for operational improvements, the application of BI and Big data analytics into public sector decision-making during crisis have not been thoroughly examined. In times of crisis, there is a higher demand for rapid, reliable and effective decision-making. Such decisions may be made with uncertainty of outcomes and resource restrain in public sector. Effective crisis management in the public sector demands thorough preparation for crisis, clear emergency procedures, as well as an organizational risk culture, according to Drennan, McConnell, and Stark (2014). This is enhanced by Drennan, Dudau, McConnell, and Stark (2014), who explain how altered forms of governance structures as well as public expectations complicate real-time decision-making even further and thereby make adaptive capacity as well as data availability key aspects of crisis governance effectiveness. Leadership is important as well; Kapucu and Ustun (2018) show that task-oriented and collaborative leadership behaviors enhance the outcomes in public sector crisis, particularly when there is required an inter-agency cooperation. However, across this literature there is a noticeable gap: There are few studies that address how BI as well as Big Data analysis can be utilized in decision-making, in particular in the area of public housing, for both optimal resource allocation as well as in crises such as refugee movement or economic shocks. In principle, BI possesses strong capabilities for real-time analysis of data, predictions, as well as cross-system integration; however, practical implementation within public housing, especially under crisis-like situations, remains in early stages. Closing this gap is critical in facilitating responsive, fair, as well as data-driven administration in the public sector during times of stress.

According to Elbashir et.al (2022) public sector can achieve the same good results as private sector in using and developing knowledge through BI when top management encourages knowledge sharing and development the operational level, and provides support in a solid BI-infrastructure. The problem is that public sector has challenges attracting and keeping employees with good technological knowledge. If the managements succeed in getting competence from outside, public sector may succeed in using BI to measure and improve results. Implementation of BI in public housing sector : high quality data, pathway for different information systems to communicate (Duvier et al., 2018). Lack of training the employees can be a hinder to implement BI systems successfully (Duvier et al., 2018). There needs to be a culture that supports learning, decision-making collaboration and sharing of information to reduce organisational reluctant to change (Duvier et al., 2018).

3. Theoretical framework

This chapter presents the theoretical framework guiding the analysis of how BI can enhance resource efficiency and crisis responsiveness in municipal housing management. The framework is structured around two core theories: bounded rationality from Decision Theory and the Technology Acceptance Model (TAM) supported by a set of complementary theories that extend and deepen the explanatory power of the core concepts.

The core theories were selected to reflect two critical dimensions of the research questions. Bounded rationality, as developed by Herbert Simon (1997), highlights the structural and cognitive limitations that affect decision-making in complicated and resource-constrained public sector environments. This theory helps explain why enhanced decision support, such as BI, is necessary in municipal housing systems. On the other hand, TAM, along with its extensions, explains whether and how such technologies are actually adopted and used, by focusing on behavioural, organizational, and cultural factors influencing user acceptance. However, these core theories alone do not fully capture the organizational and contextual complexities observed in the empirical data. Therefore, this study also draws on supporting theories including TAM2, the Unified Theory of Acceptance and Use of Technology (UTAUT), and literature on Decision Support Systems (DSS). These theories are not treated as standalone frameworks but serve to amplify and contextualize the main theoretical perspectives. For example, while TAM emphasizes perceived usefulness and ease of use, UTAUT introduces the importance of facilitating conditions and social influence, which are factors especially relevant in public sector environments like municipal governance. Similarly, DSS theory operationalizes the abstract concept of bounded rationality by illustrating how technology can extend cognitive capacity and improve institutional responsiveness.

This layered theoretical approach enables a nuanced understanding of the dual challenge municipalities face: improving the quality of decision-making while also overcoming barriers to technology adoption. By clarifying the role of both rational and behavioural dimensions in BI implementation, this framework is well-suited for analysing the specific case of Stavanger Municipality. The framework supports a qualitative methodology, in which theory and data develop together in dialogue, allowing for the flexibility needed to handle the complexity of organizational settings.

3.1 Decision theory and Bounded rationality

Decision-making in municipal housing is by nature complicated, given the heterogeneous set of stakeholders, regulatory limitations and varying levels of demands. Traditional generic decision-making within public administration has tended to be experience-based or reactive in nature, creating inefficiencies in the form of delayed allocation of housing, prolonged vacancies, and inefficient use of resources. With increasing financial pressures and the demand for greater efficiency in municipalities, data-driven decision-making that enhances more effective service delivery and improved resource optimization is assuming a higher level of importance.

One relevant theoretical perspective for understanding decision-making in this context is Decision Theory, particularly the concept of bounded rationality, introduced by Herbert A. Simon in 1947 (Simon, 1997). Simons´ work challenges the classical economic assumption that decision-makers always operate within cognitive limitations, constrained by incomplete information, time pressures and organizational constraints. This leads to satisficing behaviour where decision- makers opt for solutions that are "good enough" rather than optimal (Simon, 1997). Bounded rationality manifests in different ways within municipal housing management, often creating inefficiencies that may delay effective decision-making. Limited access to up-to-date housing data results in delays in resource allocation, while difficulties in predicting demand fluctuations, particularly during crisis such as refugee influx, intensify these challenges. Furthermore, the complexity in the administrative processes slows down decision-making and contribute to prolonged vacancy periods and suboptimal housing distribution.

BI has the potential to mitigate these limitations of bounded rationality by providing real-time, structured information that supports evidence-based decision-making. Rather than depending in manual analyses and fragmented information sources, municipalities can leverage BI to identify underutilized housing units, forecast demand fluctuations, and improve response times during emergencies. By integrating BI into municipal governance, decision-makers can process large volumes of data more efficiently, reducing uncertainty and enhancing the accuracy of resource allocation. In this sense, BI serves as an extension of cognitive capacity, enabling municipalities to shift from reactive to proactive housing management strategies.

3.2 Decision support system

Herbert A. Simon´s work laid the foundation for the development of DSS (Pomerol & Adam, 2004), which integrate data analysis, modelling and forecasting to aid decision-making in complex environments. BI functions as a modern DSS, equipping municipalities with the analytical tools necessary to navigate housing distribution challenges more effectively. By leveraging BI-driven decision support, municipalities can evaluate different housing allocation scenarios, anticipating their potential impact and minimizing inefficiencies in resource distribution. BI also streamlines repetitive decision-making processes, reducing administrative burdens and enabling a more agile response to changing housing needs. Furthermore, by improving data transparency and accountability, BI promotes a more equitable and effective allocation of housing resources. Given the financial and operational constraints faced by municipalities such as Stavanger Municipality, the adoption of BI as a decision-support tool can significantly enhance housing policies, minimize vacancy periods and optimize resource utilization. This study applies the theory of bounded rationality to assess how municipalities can overcome decision-making limitations in housing management by leveraging BI. Specifically, the research explores how BI enhances housing allocation processes, the extent to which bounded rationality influences municipal decision-making, and whether BI integration can support a more proactive, data-driven approach to city administration. Through an analysis of Stavanger Municipality´s housing management section, this study will evaluate the potential of BI to improve decision-making in both routine housing allocation and crisis response, ultimately contributing to a more efficient and adaptable public housing system.

3.3 Technology acceptance model (TAM) and organizational adoption

While Decision theory and Bounded rationality explains why enhanced decision tools are needed, the TAM (Davis, 1989) addresses the behavioural and organizational factors that determine whether these tools are actually adopted. According to TAM, the two primary factors influencing technology acceptance are perceived usefulness, which is the extent to which a person believes the system will improve job performance, and perceived ease of use, which is the extent to which the system is seen as easy to operate.

This model is particularly relevant in public sector settings, where digital tools often face resistance due to a lack of training, unclear system ownership, or general discomfort with technological change. In the interviews conducted for this study, several barriers to BI use were reported, including limited knowledge of Power BI among employees, lack of standardized data routines, and the perception that only a few key individuals understand the tools well enough to implement them. These align with TAM's predictions and suggest that even with available infrastructure, organizational culture and perceived complexity can inhibit meaningful use.

To extend the analysis further, this study also draws on TAM2 (Venkatesh & Davis, 2000) and the UTAUT (Venkatesh et al., 2003), which emphasize the role of social influence, facilitating conditions, and user experience in shaping technology adoption. These models are especially relevant in municipal environments where interdepartmental collaboration and leadership support are crucial for cross-functional BI integration. For example, interviewees described fragmented data responsibilities and weak system interoperability across departments like housing, welfare, and property management, which are issues that UTAUT identifies as common barriers in complex organizations.

The interviewees also revealed that while there is interest in BI's capabilities, much of the implementation remains at an early stage. Several managers mentioned Excel as the main coordination tool during crises, and few had access to structured BI dashboards for crisis scenarios such as the Ukrainian refugee influx. These findings illustrate that perceived usefulness alone is not enough, but system interoperability, user competence, and institutional support are also critical factors.

3.4 Crisis management theory

Crisis management theory (Drennan et al., 2014; Kapucu & Ustun, 2018) emphasizes the need for real-time data and adaptive coordination in public sector crisis response. In municipal housing, crises like refugee influxes demand rapid allocation decisions under uncertainty. BI can support crisis management by providing structured data on housing availability and needs, reducing reliance on ad-hoc processes. This theory complements bounded rationality by highlighting how data-driven tools can enhance preparedness and responsiveness in high-pressure scenarios.

3.5 Integrating theory and case context

Together, Decision theory with Bounded rationality and TAM (including TAM2 and UTAUT) offer a robust lens through which to examine the adoption and impact of BI in municipal housing. While Decision theory highlights the structural need for better decision-making tools in environments marked by complexity and uncertainty, TAM explains the cognitive, cultural, and organizational dynamics that determine whether such tools are effectively used. This dual framework is particularly well-suited for analysing BI implementation in Stavanger Municipality, where both strategic decisions and day-to-day operations are being shaped by digital initiatives such as Power BI dashboards and AI-based inspection tools. Understanding both the rational and behavioural aspects of decision-making is essential to evaluate BI's potential to transform municipal governance in an era of resource scarcity and increasing social demand.

3.6 Summary of the theoretical framework

To analyse how BI can improve decision-making, resource utilization, and crisis responsiveness in municipal housing management, this study draws on an integrated theoretical framework. Together, these perspectives provide a multidimensional understanding of both the need for BI and the conditions required for successful adoption. Decision theory, specifically Herbert Simon's concept of Bounded rationality, explains why public sector decision-makers often operate under constraints of limited information, time pressure, and institutional complexity. BI is seen here as a tool that can extend cognitive capacity and reduce uncertainty in complex decision environments.

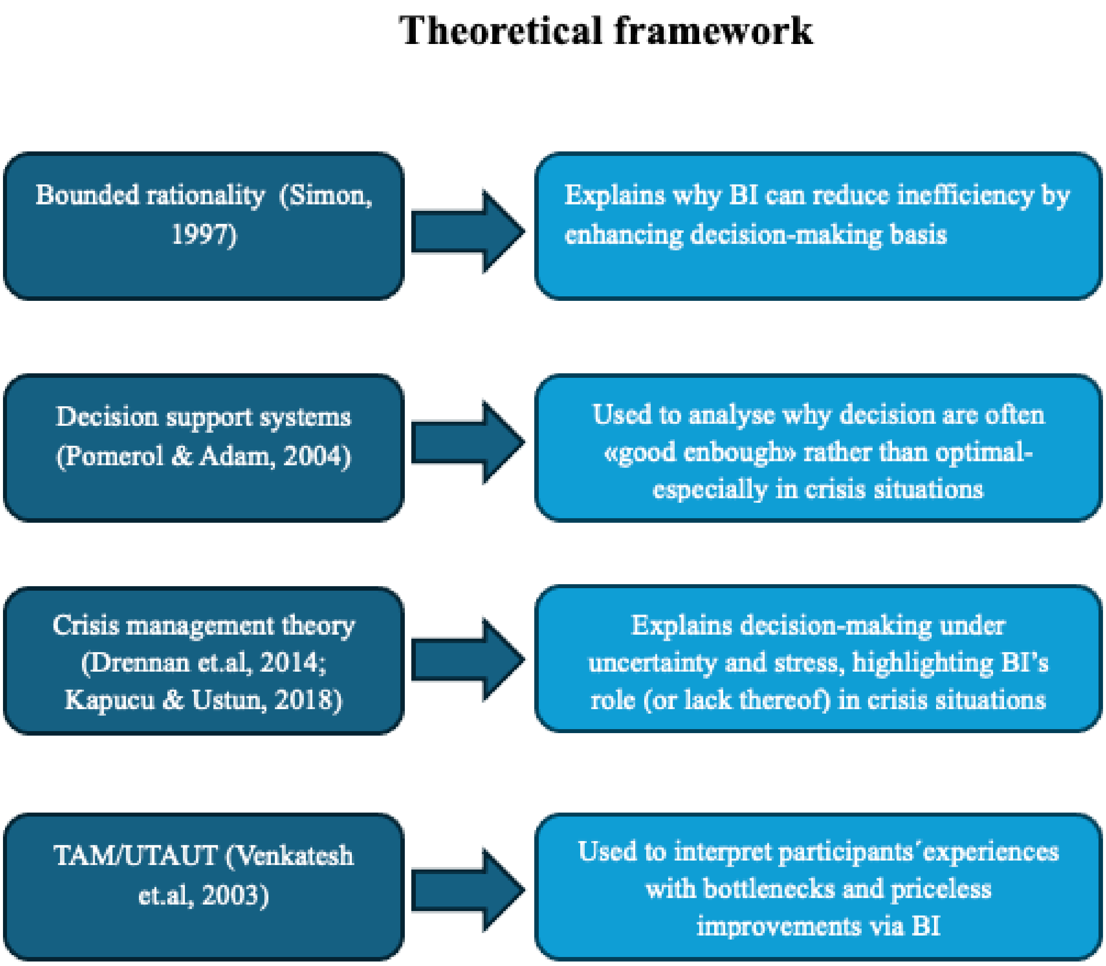
DSS theory adds a structural perspective, illustrating how BI can systematize information flows, visualize bottlenecks, and support more transparent and informed decisions, especially in operational settings like housing allocation.

Technology acceptance models (TAM, TAM2, and UTAUT) help explain the behavioural and organizational dynamics that influence whether BI tools are actually adopted and used. These models highlight factors such as perceived usefulness, perceived ease of use, social influence, and enabling conditions which are elements particularly relevant in fragmented municipal contexts.

By combining these theories, this framework captures both rational and behavioural dimensions of BI implementation. It allows the analysis to address not only what BI can do, but also why it often fails to deliver its potential impact, due to organizational culture, competence gaps, and systemic barriers. This forms the basis for a context-sensitive and practice-oriented analysis of Stavanger Municipality's experience with BI in housing management.

The following figure show how the combined theoretical perspectives are used analytically in this study to interpret empirical findings from the Stavanger case.

Figur 1: Theoretical framework. Made by me using Word



4. Methodology

The method shows us how to obtain knowledge or solve problems in order to find new insights (Dalland, 2014). The reasoning behind choosing one particular method is that we are of the opinion that this specific method will give us valuable data and shed light on our questions in an academically interesting way (Dalland, 2014). This chapter will show the methods used for this research and the reasoning behind and also present the case study used to put it in an organisational context. Furthermore, the research design, data collection, data analytics and ethical considerations will be presented.

4.1 Research design and methodological framework

This study utilizes a qualitative case study approach to gain in-depth understanding of experiences and perspectives within a specific context (Dalland, 2014). The research is based on a qualitative case study conducted within Stavanger Municipality. This case subject has been chosen given its suitability for exploring complex, context-dependent phenomena in detail (Yin, 2018). BI in municipal housing management constitutes such a phenomenon, encompassing technology, management, competence, and collaboration within a real-life setting. The purpose of this study is to examine how BI can be utilized within municipal housing to support decision-making, enhance resource allocation, and improve responsiveness. To achieve this, the study seeks to answer four research questions:

How can BI tools transform municipal housing management to enhance decision-making, efficiency and adaptability in both routine operations and crisis scenarios?
How can BI tools, such as Power BI, support municipalities in making data driven decisions for optimizing housing allocation and addressing inefficiencies?
How can BI improve municipal crisis response strategies, specifically during housing demand shocks such as refugee influxes?
What are the practical barriers and opportunities in adopting BI tools in municipal housing management?

Due to the intricate nature of the research problems, an in-depth approach is needed to collect the relevant data. The case study provides not only opportunities for rich data collection but also for understanding processes and meaning making within natural settings. Stavanger Municipality has been strategically selected as the case due to its prior engagement with several BI initiatives and its experience in managing both routine and crisis situations, offering valuable data for analysis.

The primary data collection method chosen for this study is the qualitative research interview, following Kvale and Brinkmann's understanding of interviews as purposeful conversations aimed at gathering knowledge about the lived world of the interviewees (Kvale & Brinkmann, 2021). The qualitative research interview seeks to understand the interviewees' perspectives (Kvale & Brinkmann, 2021). Specifically, semi-structured interviews will be employed to explore how key actors, users, and technology adopters perceive technology focusing on their own experiences, in contrast to seeking to quantify. This approach allows for a flexible yet focused exploration of the complicated interplay between the system, culture, management, and technology, within the context of BI in municipal housing. An interview is an interactive process, where meaning is being created between researcher and interviewee, but there needs to be focus on the fact that you can be affected by the circumstances regarding what you talk about and how you talk about it (Kvale & Brinkmann, 2021). The aim has therefore not been to map frequencies, but to understand meaning, how different actors in the municipality perceive and give meaning to BI tools and data-driven management in a sector characterized by both routines and crisis.

4.2 The case study

According to Yin (2018), a case study is suitable for exploring something in its real setting, like BI in municipal housing, where it deals with the complexity and interaction between organizational, technical and human factors. Stavanger Municipality has been selected as a case study due to its economic structure, housing market dynamics, and the potential need for more efficient housing management considering financial constraints. As a city with a historically strong economy driven by the oil and gas industry, Stavanger has experienced high wages, rising property prices, and a competitive rental market. However, these economic advantages do not apply for the most vulnerable part of the population. Following a fiscal year for Stavanger Municipality weaker than expected (Skumsnes, 2025), it may be relevant to explore whether improving housing allocation and reducing vacancy periods could contribute to a more efficient use of resources.

Stavanger Municipality has invested in municipal housing for vulnerable groups such as refugees and those struggling in the private rental market (Figur 2), also rented housing from the private market since the war in Ukraine (Figur 3)- yet the waiting list for households needing housing has increased in total since 2020 (Figur 4). Some rental units may remain vacant for longer than necessary, potentially leading to lost rental income and underutilized resources. In this context, it could be interesting to investigate how a more data-driven approach to housing management could help improve efficiency. At the same time, the housing market in Stavanger remains expensive and competitive, with many residents reliant on rental housing. The combination of high living costs, change in housing demand and administrative processes in public housing allocation suggests that there could be room for improvement in how the municipality manages its housing stock.

	Kommunalt eide boliger (antall)				
	2020	2021	2022	2023	2024
1103 Stavanger	2 714	2 699	2 713	2 805	2 873

Figur 2: Overview of housing for vulnerable groups owned by Stavanger Kommune. Made by me with Statistisk Sentralbyrå´s "Statistikkbank" (Statistics Norway, u.å.)

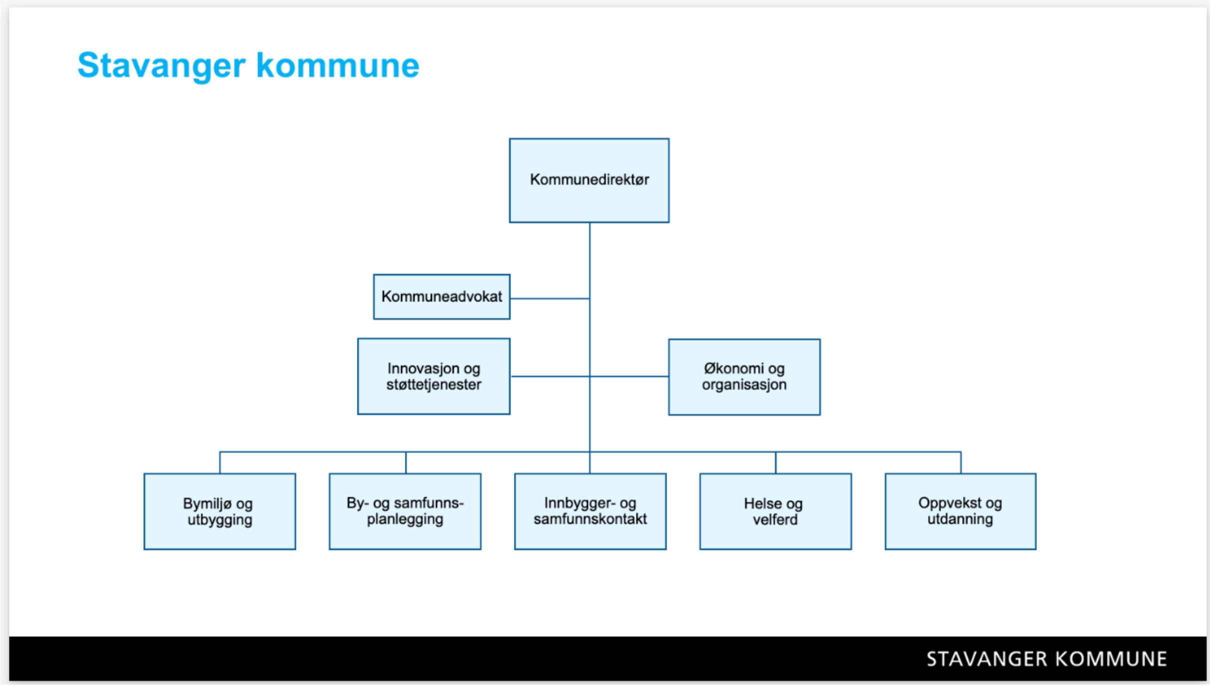
	Innleide boliger (antall)				
	2020	2021	2022	2023	2024
1103 Stavanger	10	4	200	612	836

Figur 3: Overview of housing rented by Stavanger Kommune. Made by me with Statistisk Sentralbyrå´s "Statistikkbank" (Statistics Norway, u.å.)

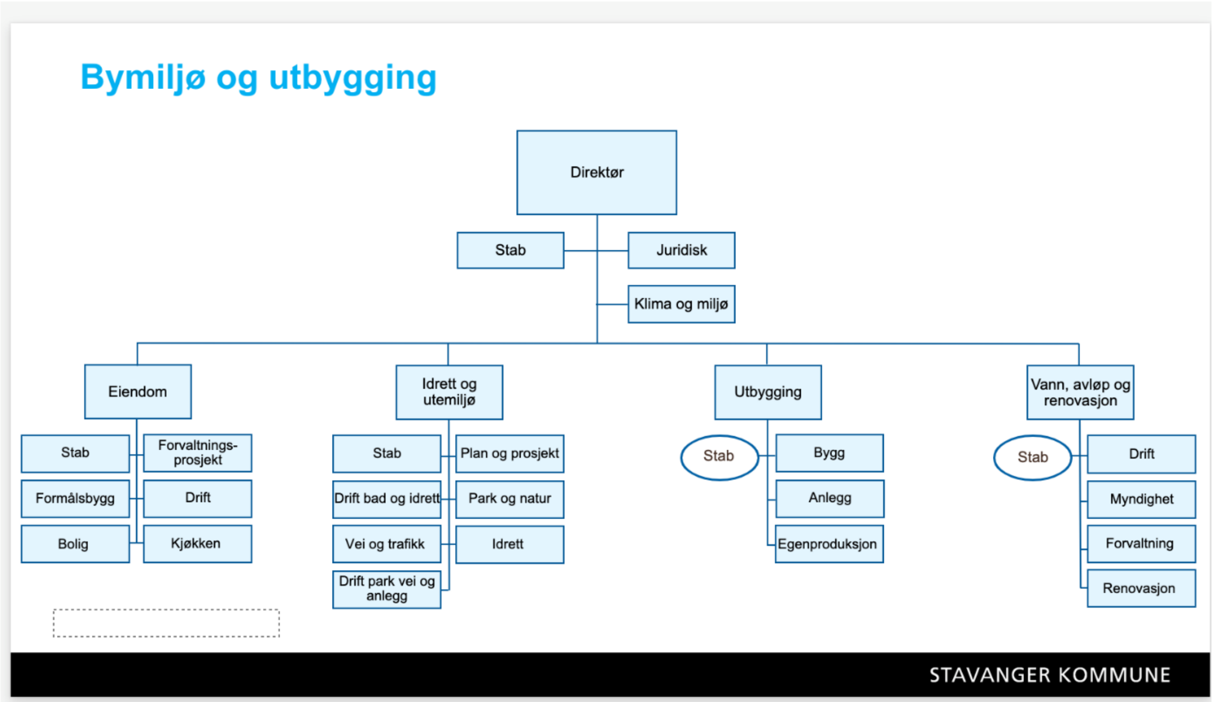
	Nye husstander på venteliste (antall)				
	2020	2021	2022	2023	2024
1103 Stavanger	97	337	211	330	250

Figur 4: Overview of new households going on waiting list for municipal housing. Made by me with Statistisk Sentralbyrå´s "Statistikkbank" (Statistics Norway, u.å.)

Stavanger Municipality is a municipality with over 150 000 inhabitants that is being served by the municipality (Statistisk sentralbyrå, u.å.). There are seven service areas: Helse og velferd (Health and Welfare), Oppvekst og utdanning (Childhood and Education), By- og samfunnsplanlegging (City and Community planning), Bymiljø og utbygging (City environment and development), Økonomi og organisasjon (Finance and administration), Innbygger og samfunnskontakt (Citizen and community relations), Innovasjon og støttetjenester (Innovation and support services). The Housing section (Boligbygg) is organizationally placed under Property (Eiendom) within the City environment and development service area (Stavanger Kommune, 2023). The Housing Section has 23 employees: section manager, housing advisors, financial controller, consultants, and operations managers. The Housing Section is responsible for municipal housing, but not for the allocation of housing to the renter (this is managed by Health and Welfare). The housing section is responsible for the buildings itself while Health and. Welfare is responsible for the people living in the houses.



Figur 5: Overview of Stavanger Municipality organization (Stavanger Kommune, 2023)



Figur 6: Overview of the organisation of City environment and development (Stavanger Kommune, 2023)

The purpose of the Housing section is to provide adequate housing for the most vulnerable members of the community including individuals facing financial hardship, substance abuse, and/or mental health challenges. Ensuring that housing units are ready for rental as quickly as possible is crucial, as this population often has few alternative options. While this is always important, it becomes even more urgent during times of crisis. Coupled with the financial constraints faced by Stavanger Municipality, it is essential that public funds are strategically allocated to meet the needs of the population. These factors make the housing section in Stavanger Municipality a particularly relevant and compelling case to study.

The economy of Stavanger region, largely driven by the oil and gas industry, has led to high wages and increased housing demand (Gjerde, u.å.). While this has contributed to rising of property values- and prices, it has also created challenges in the rental market for vulnerable groups. Given both the financial situation of Stavanger Municipality and the housing market in Stavanger, it is crucial for Stavanger Municipality to optimize its housing resources. By BI, the municipality can make data-driven decisions to improve housing allocation and ensure that available properties are used efficiently. While the petroleum industry has significantly contributed to the overall wealth in Stavanger, the resulting increase in housing demand and cost has disproportionately impacted vulnerable groups. This raises an important question: how can municipal housing resources be better utilized to improve services and accessibility for those most affected?

4.3 Empirical approach

A qualitative approach was selected as the research questions are exploratory in nature and seek to understand underlying meanings, practices, and interpretations. These types of 'why' and 'how' questions require an in-depth, context-sensitive methodology, which qualitative methods are well-suited to address. As Dalland (2014) emphasizes, the chosen method must align with the kind of insight the researcher aims to produce.

The choice of using a qualitative research interview came from the fact that this allows for exploration of lived experiences, evaluations and practises related to the use of BI in municipal housing management. As argued by Kvale & Brinkmann (2021) the interviews are a form of conversations with a purpose and is therefore giving the researcher an opportunity to explore meanings and reasoning more in depth. BI is not only a technological solution; it is also a matter of organizational culture, professional evaluations, collaboration, leadership and digital competence, which are subjects for interpretations and cannot be reduced to merely numbers. This is why a quantitative approach would not have captured the nuances of how BI is integrated in practice, or the perception by professionals, or how it is shaped by contextual constraints and crisis situations. Moreover, the research questions in this study, such as how BI affects decision-making or how it is perceived in crisis response require open, reflective dialogue rather than response options that are pre-coded such as a survey. Quantitative methods would have limited, or even ignored, the discovery of unexpected insights and constrained the flexibility needed to explore the unexpected aspects of BI usage. In addition will a qualitative approach in this case give bring out what is unique, and also a closeness to the phenomena. It allows for the interviewer to see from the inside instead of outside-in (Dalland, 2014). A qualitative interview was therefore chosen to uncover in-depth narratives and to allow informants to express their perspectives on their own terms. This aligns with an interpretivist epistemology and ensures that knowledge is grounded in real-world practise.

4.4 Data collection, sample and interview design

At the very start of the project, I had several conversations with multiple employees at the Housing Section. The sampling and interview method were chosen to enable information gathered to answer the research questions directly and to obtain rich, relevant information from individuals with first-hand experience of the phenomena that is being researched. The data was collected with semi-structured interviews, conducted in line with Kvale & Brinkmanns (2021) recommendations. An interview guide was created with open ended questions connected to five main topics (Appendix D- Intervju guide):

- Introductory questions: About the interviewee and their background
- General questions about BI in municipal housing: Experience and use of BI in municipal housing, resource allocation and efficiency.
- BI for crisis management
- Opportunities and barriers in BI Implementation; the future
-

The questions were phrased to be open, but at the same time relevant for the research questions. Follow-up and probing questions were used during the interviews, in line with Kvale and Brinkmann's advice on “fluid interviews” with a balance between structure and freedom (2021).

The sample was strategically chosen (Dalland, 2014), based on purposeful sampling (Patton, 2015) where the goal was to include informants that were information-rich in decision processes, use of digital tools and had experience from housing management and crisis response. Four people were interviewed:

Tabell 1: Informant overview (Appendix C-Informant overview)

Informant overview (anonymized)

Informant	**Role**	**Responsibility area**
Informant 1	Property manager	Overall property strategy
Informant 2	Section manager	Operative and strategic responsible for municipal housing management
Informant 3	Team leader	Refugee housing responsible and coordination
Informant 4	Operations manager	Operational housing follow-up and team leadership for staff

This selection gives a sample that is professional diverse, with both strategic and operative perspectives. They represent different levels in the organization, from strategic leadership to operative responsibility. The sample also gives a range in perspectives attached to utilization, challenges and potential associated with BI. The process of recruiting was made through email and personal contact. All interviewees gave written consent before the interviews started (Appendix E- Informasjonsskriv). The interviews were conducted in a period of two weeks in March 2025 and lasted around 45 minutes each. Two of the interviews were both video and sound while two were with only sound at the request of the interviewee. All was done with Microsoft teams with Copilot as a transcriber, with an informed consent from the objects. Copilot's transcriptions proved inaccurate and, in many instances, noted the opposite of what was said (for example, incorrectly excluding the word 'not'), which altered the meaning from what was said to the opposite. Furthermore, Copilot struggled with the spoken language if it was not entirely clear or if dialects were used. Therefore, all interviews and transcriptions were manually reviewed and significantly edited. The transcription is not fully verbatim but moderately transcribed in accordance with the recommendations from Kvale and Brinkmann (2021). This means that filler words, even though noticed by the researcher, such as 'hmm,' 'uhh,' 'huh?', laughter, pauses, and interruptions have been removed, and the language has been slightly cleaned up to ensure readability without changing the meaning of what was said. This type of intelligent transcription is suitable where the content and meaning in what is being said is more important than the exact wording. Aligned with Kvale & Brinkmanns (2021) view of transcription as a interpretative process, there has been made conscious choices for what is relevant in the analysis. This is specifically important in this study where the focus is on the reflections of the content around use of- and understanding of BI, not linguistic details or conversation analysis. The transcripts are therefore meant to support a thematic interpretation of meaning, not phonetic analysis, and was carried out with the objective to preserve the authenticity of the content and analytical relevance.

4.5 Interview guide design and interview setting

The interview guide was developed based in the research questions and in line with the methodological principles of Kvale and Brinkmann (2021). The goal was to obtain insights from the life-worlds of the participants, which means how they experience and interpret their normal life situations. The emphasis on the interview guide was placed on exploring the meaning of the key themes, from the perspective of the participants. The interview guide had both questions based on facts and meaning with the objective of getting nuanced descriptions rather than quantifiable data. The participants were able to articulate how they feel, act and make sense of their experiences. To ensure consistency across the interviews the format chosen was semi-structured interviews. The interview was then also flexible and able to follow up the responses to explore any emerging topics.

The questions were formulated using clear language to enable an open and trusting atmosphere and to aim to avoid misunderstandings. Follow up questions was asked to clarify if the answers were understood correctly. The questions to the interview guide were formed from the research questions. The focus was on eliciting the interviewees' lifeworld, how the world appears to them in their everyday lives, seeking to understand the meaning of central themes in the person's lifeworld, and attempting to ask both factual and meaning-oriented questions. The aim was not quantification, but nuanced descriptions of their lifeworld through words and not numbers. An effort was made to encourage the individuals to describe what they feel and experience, and how they act. The interview guide focused on specific themes with neither a rigid nor a completely open structure.

There was given a particular attention to the relational and ethical dimensions of the interview setting. Recognising that there is an asymmetry in the researcher-participant relationship, I was aiming to create a safe space so that the participants could speak freely.

Ethical considerations were therefore taken care of both in the design and execution of the interviews with the emphasis on voluntary participation, confidentiality and sensitivity to their experiences.

4.6 Thematic analysis method

Thematic analysis is a method to analyse, identify and interpret patterns or themes in data. It involves repeated and thorough reading of the data to be able to extract meaning and understandings of the material (Clarke & Braun, 2016) A key characteristic of this approach is its adaptability in both theoretical orientation, and also in terms of its applicability to various research questions, sample sizes and compositions, data collection methods and strategies fir interpreting meaning. It also enables the identification of patterns within and across datasets, focusing on participants lived experiences, perspectives and practices. It is particularly applicable for experiential research that looks for an understanding in what the participants think, feel and do (Clarke & Braun, 2016). This approach to analysis is also a recommended approach by Kvale & Brinkmann (2021).

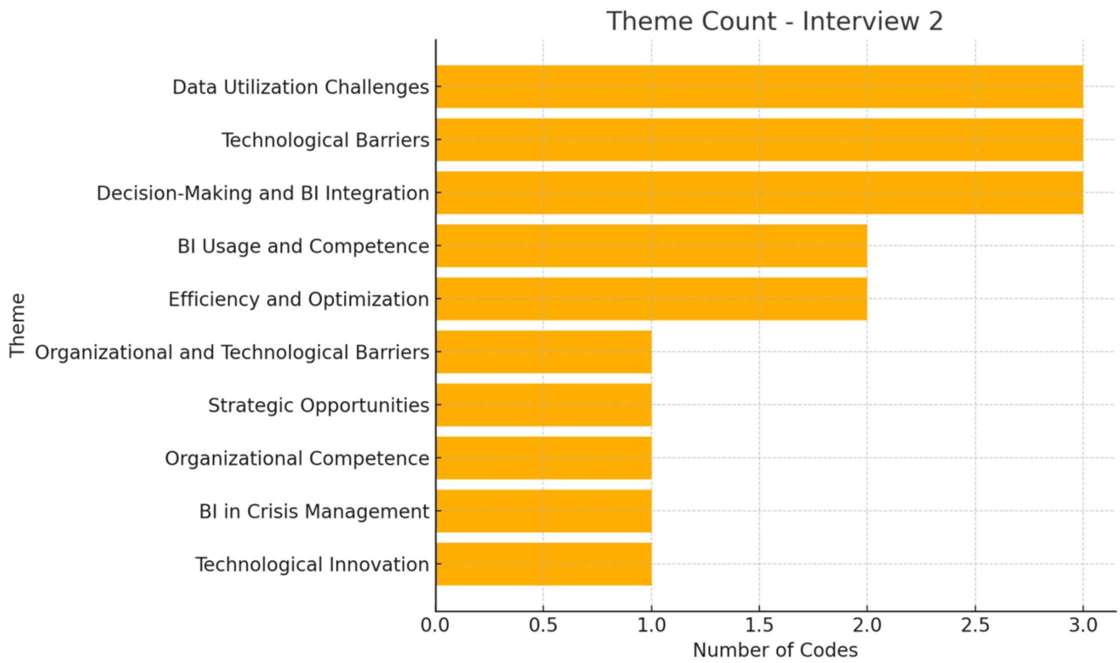
The analysis process followed several structured steps to ensure familiarity with the data and transparency in interpretation. First, the interview transcriptions were read and re-read multiple times, and the original audio recordings were revisited to ensure accuracy and immersion in the material. During this phase, transcripts were edited for clarity, and notes were taken to capture initial impressions. Next, a systematic coding process was applied, beginning with the identification of meaning-bearing units within each transcript. These were assigned first-order codes linked directly to specific quotes. As patterns began to emerge, these codes were grouped into broader second-order themes, and connections to the research questions were explicitly established. This process was initially carried out separately for each interview at first, then a combined codebook was created (Appendix A- Codebook).

Tabell 2: Sample from codebook

Quote from transcript	First-order code	Second-order code	Link to research question
"Jeg går jo inn selv og ser i Power BI rapporten for å se hvor mye vi har disponert av våres tildelte midler." (Informant 1)	Checking budget via Power BI	Routine decision support	RQ1: BI aids operational decision-making by providing budget clarity. RQ4: Opportunity to expand BI use for strategic decisions.
"Noe mer innsyn i hva særlig oppussinger jevnlig koster og vært kostnadsutviklingen der skulle jeg gjerne hatt en løpende tilbakemelding på." (Informant 1)	Wanting cost trend insights	Strategic decision gap	RQ1: BI could improve strategic decisions on renovation budgets. RQ2: Supports data-driven resource allocation.
"Ser jo for meg bedre oversikt og bedre kjennskap til hvilke grupper bor hvor og har vi spredning av forskjellige bygningstype og leilighets boligstørrelser." (Informant 1)	Visualizing demographic data	Allocation decision tool	RQ1: BI enhances decision-making by clarifying housing demographics. RQ2: Optimizes housing allocation through data visualization. RQ4: Opportunity for BI-driven planning.
"Jeg vet sannelig ikke hva BI skulle bidratt med «[in Ukraine crisis]. (Informant 1)	Unclear BI crisis role	Crisis decision uncertainty	RQ3: Reflects limited awareness of BI's potential in crisis response. RQ4: Barrier of knowledge gaps in crisis application.

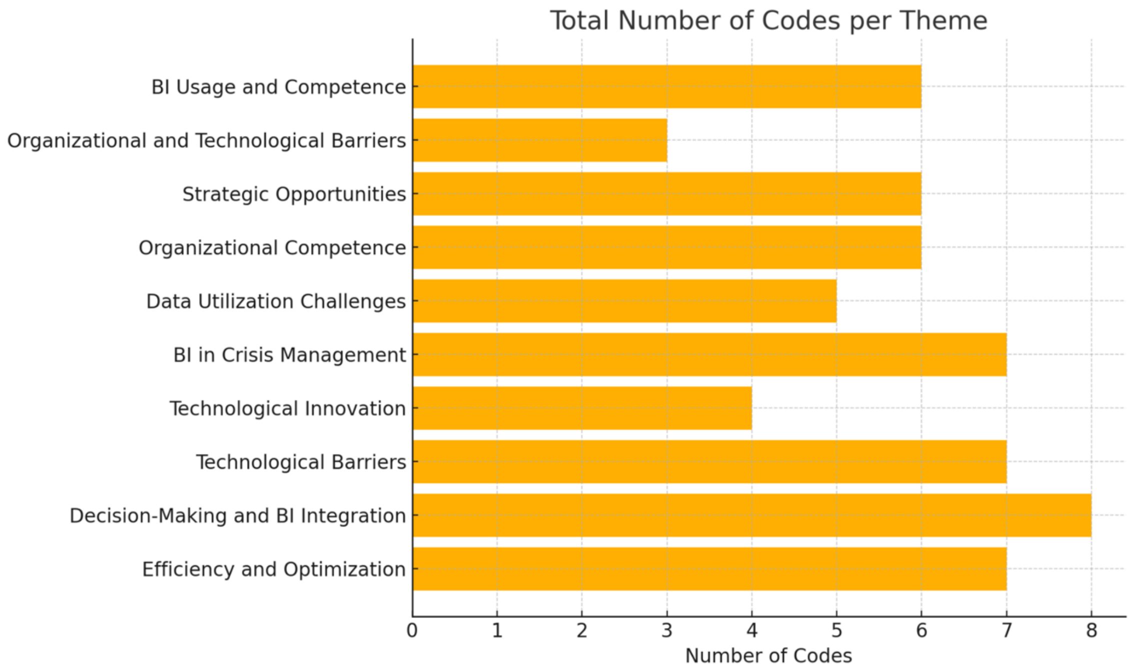
For instance, claimed one of the informants that data visualization (through Power BI) has improved decision-making quality and reduced subjective judgments, which was themed do Decision-making and BI integration and linked to Research question 1: How can BI transform housing management for decision-making, efficiency, and adaptability?

This made it possible to make an overview over each interview and how many codes was given to each theme (Only interview 2 added here):



Figur 7: Theme count of interview 2. Made using ChatGPT

The data collected was then merged for all interviews to get a total overview over the themes and how many codes were connected to each theme.



Figur 8: Total number of codes per theme. Made using ChatGPT

After the themes were developed inductively and first linked to the research questions, I also linked them to theory and literature (Appendix B- Theoretical linkage matrix)

Tabell 3: Sample from Theoretical linkage matrix

Second-order code (Theme)	Related theory	Interpretation	Supporting literature
Routine and Operational Decision Support	Decision Support Systems (DSS); Bounded Rationality	BI tools like Power BI enhance routine decision-making and integration by providing structured data on budgets and housing stock, reducing uncertainty and supporting decision-making processes, though often reliant on intermediaries. .	Simon (1997); Pomerol & Adam (2004); Höchtl et al. (2021)
Efficiency and Process Optimization	Decision Support Systems (DSS); Bounded Rationality Technology Acceptance Model (TAM)	BI improves efficiency by identifying bottlenecks and optimizing processes, such as reducing vacancy periods and streamlining renovations .BI acts as a decision support system to enhance resource allocation.	Simon (1997); Pomerol & Adam (2004); Brynjolfsson & McElheran (2016) (Davis, 1989).
Allocation and Crisis Decision Efficiency	Crisis Management Theory; Bounded Rationality	BI could enhance housing allocation in routine and crisis contexts by providing real-time data on availability and demographics (e.g., "Allocation clarity", "Allocation efficiency", "Crisis decision efficiency"). Its	Drennan et al. (2014); Kapucu & Ustun (2018); Simon (1997)

This approach is based on what Kvale and Brinkmann call an "interactive analysis", where the researcher moves back and forth between data and theory, and where understanding develops gradually in dialogue with the material (Kvale & Brinkmann, 2021). There was then made a connection between second-orders codes (themes), theory and literature and an interpretation was made. One example is second-order code «Decision-making and BI integration» which relates to Decision theory (bounded rationality), supported by Simon (1997) and Pomerol & Adam (2004) and interpreted as «BI enhances structured decision-making but is underutilizes strategically».

All four interviews were analysed separately, then as a whole, but any variations and perspectives were also highlighted. The coding of the interviews was a prolonged process, and after re reading, coding, decoding several times, the codebook and matrix were finalized. In order to see all the connections I had to print out all the documents, spread them out on a table, highlight, rearrange several times to be able to get a good as possible overview.

4.7 Ethical considerations

The study follows the research ethical guidelines related to informed consent, voluntariness, and privacy. Participants were informed about the study's purpose and their right to withdraw at any time (Appendix E- Informasjonsskriv). The interviews were conducted after written consent was obtained, and audio and video recordings were made with consent. All interview material was treated confidentially and anonymized in the subsequent analysis. The project was reported to SIKT in advance, in accordance with applicable guidelines. Emphasis has been placed on ensuring the informants' rights throughout the entire research process. All participants are anonymized, and the data treated confidentially. Audio recordings were used only for transcription and deleted after the transcription was completed. Transcribed material is stored in encrypted format with access only for the researcher.

As Kvale and Brinkmann (2021) emphasize, research ethics is not only about technical consent, but also about the relationship between researcher and participant, and about acting with integrity, respect, and responsibility. Therefore, emphasis has been placed on meeting the participants as co-reflecting professionals and creating a safe space for open conversations.

In line with Kvale & Brinkmann's reflections on the researcher's role, it was important to be aware of my own position. The researcher's background is also important, and the better one masters the method, the better the results, while also being influenced by the researcher's personality (Dalland, 2014). Being both a student and an employee at The Housing Section provided me with insight into the context, but also potential biases. This could have influenced my perceptions of what was being investigated, as I already had some insight and opinions on the matter before starting the research. This was acknowledged and addressed through reflexive practice and continuous evaluation of my own assumptions (Dalland, 2014).

4.9 Validity and reliability

Kvale & Brinkmann (2021) emphasize that validity should be understood as a process-oriented concept, something that is established throughout the entire research process. In line with their approach, reliability is not treated as statistical reproducibility, but as consistency and transparency in how interpretations and findings are produced. To enhance the study´s quality several measures was taken. It was ensured transparency through a detailed codebook and linkage matrix, quotes from multiple informants supporting credibility and reflexivity were addressed through self-evaluation of the researcher's role.

4.11 Limitations

As with all qualitative studies, this thesis is subject to certain methodological limitations. Firstly, the study is limited to four interview objects from a single municipality. While four participants may seem limited, the goal was not statistical generalization but analytic insight. As Patton (2015) and Kvale & Brinkmann (2021) note, a small number of strategically selected, information-rich informants can result in substantial depth of understanding. Although the selection was strategic and purposive, and gave good variation in roles and hence perspectives, the findings are not statistically generalizable. Rather, the study aims for analytical generalization which is to develop insights that may be transferable to similar municipal contexts (Yin, 2018).

Although the limited numbers of interview objects, there is no standard for sample size in qualitative research, it rather depends on the research aim and context (Kvale & Brinkmann, 2021). In this case, the number of suitable informants holding valuable insight was naturally limited due to the size of the case study municipality and the availability of staff (e.g due to turnover). A smaller sample size also allowed for a more in-depth analysis and manageable scope. Furthermore, it is possible to gain interesting insights from an analysis with few examples. Secondly, there will always be a risk of interpretative bias when analysing qualitative data. The researcher's preunderstanding and proximity to the field may influence which patterns are emphasized. Efforts were made to counteract this through reflexive practise, transparency in the analytical process, and the use of quotes that provide insight into the participants 'own words (Kvale & Brinkmann, 2021). Additionally, all interviews were conducted in Norwegian and later translated and analysed in English. Although every effort was made to preserve meaning in translation, some linguistic nuance may have been lost in the process.

One of the main limitations in this study is access to relevant and high-quality data from Stavanger Municipality. Municipalities often collect vast amounts of data, but the data may be incomplete, inconsistent or outdated which will affect the accuracy of the analysis. Some housing-related data may also not be publicly available due to privacy regulations or administrative restrictions. These factors may impact the study´s ability to provide precise and fully representative insights into municipal housing allocation.

Another limitation is a methodical constraint. Even though case studies provide in-depth insights, they have certain limitations as well. The findings may be context-specific, and not necessarily applicable to other municipalities. The study does not capture long term effects of BI implementation as there is a limited timeframe in the research. Due to constraint in data collection and access to stakeholders, some aspects of decision-making in municipal housing may not be fully analysed.

The generalizability of the research may be affected by the fact that the focus is on Stavanger Municipality. As the economic conditions, housing market characteristics and municipal governance structure may differ from other cities, this may limit the ability to generalize the findings, which suggests that additional studies in diverse municipalities context may be necessary to confirm broader applicability.

There may also be a limit to the actual implementation of BI tools, even if they are shown to be effective. Municipalities may lack the necessary IT infrastructure to or expertise to fully integrate BI tools. Public organisations may be slow to adopt new technologies due to bureaucratic processes, lack of digital readiness, or reluctance to change existing work procedures. Depending on the municipality's financial situation, it may not be feasible to invest in BI tools, training staff, and restructuring work processes.

These factors may limit the actual impact of BI adoption, even if the study demonstrates theoretical benefits. Despite these limitations, the study provides valuable insights into how BI is applied and experiences in public sector, offering a solid foundation for further reflection and development in the field.

5. Results and analysis

This chapter presents the core empirical findings from the case study of Stavanger Municipality. The results are presented thematically and are linked to the research questions. The data were collected through four semi-structured interviews and analysed using thematic analysis. The chapter focuses on describing what informants stated and how they experienced the role of BI in their work. The purpose of this chapter is to present the results in a systematic way, supported by direct quotes from the informants.

5.1 BI and enhanced decision-making in routine operations

This theme addresses Research question 1 and 2 by illustrating how BI contributes to improved transparency and more efficient decision-making in routine municipal housing processes

Across all interviews, informants described how Power BI helped create visibility into workflows. Several mentioned its usefulness in tracking handovers between phases such as key return, refurbishment, and re-letting:

"I go in myself and check the Power BI report to see how much of our allocated funds we have used." (Informant 1)

"With the dashboard, you see things clearer, like how many vacant units we have, how long they've been vacant, and what stage they are in. That’s useful for managing the flow." (Informant 3)

Informants noted that this overview helped them monitor operational activities more systematically:

"When we started using the Power BI model, it became clear that we could streamline things." (Informant 2)

"You can generate reports so detailed that you can justify in the next financial plan that we need to replace the roofs on 40 homes…" (Informant 4)

Others emphasized the ability to use the data to support requests or justify needs:

"We’ve been able to use the tool to visualize how many houses we have, and for example, the size of each unit." (Informant 3)

“I imagine better oversight and better knowledge of which groups live where, and whether we have a mix of building types and apartment sizes.” (Informant 1)

"It’s a really good tool—for example, we can look at the maintenance cycle on smoke detectors in all homes where people have lived for over 10 years." (Informant 4)

"I would really like more insight into how much regular renovations actually cost and how those costs develop." (Informant 1)

Some pointed out that BI could help tegorize work more efficiently:

"We could see that all renovations were treated the same. There was no system to assess: is this an easy, medium, or difficult job?" (Informant 2)

Despite its advantages, several informants noted that they depend on others to access insights:

"I use it, but it is others who interpret and make the data accessible for me." (Informant 3)

"You have to know who to ask if you want to get the numbers. It's not accessible to everyone." (Informant 2)

One informant reflected that the reporting led to actual restructuring:

"One of the biggest changes we've made is due to the report on rental loss and renovation time. It directly triggered reorganization to reduce turnaround time." (Informant 2)

“So it’s possible that Power BI helped us with that [reducing inefficiencies in vacancy periods].” (Informant 3)

These examples show that while BI contributes to better insight and routine decisions, access and interpretation are still unevenly distributed.

5.2 Uneven BI adoption and competence gaps

This theme relates directly to Research Question 4, highlighting barriers to BI adoption stemming from variations in digital competence, training, and access. Several informants pointed to uneven digital competence and limited training as key barriers to effective BI adoption.

All informants described a fragmented adoption of BI tools. Many rely on colleagues or Excel rather than using Power BI directly:

"We are vulnerable. Only a few people really know how to use and develop the BI tools." (Informant 2)

"Excel is still what most of us fall back on. It's familiar, even if it's less effective." (Informant 3)

"It relies heavily on Excel use. There are lots of lists, lots of room for error, and many people with editing access." (Informant 2)

"There's no onboarding process when you start. If someone doesn't show you how to use BI, you won't use it." (Informant 4)

One respondent expressed that he low adoption is not due to resistance:

"People don't resist BI because they don't want it. They just haven't been shown how to use it." (Informant 1)

Others pointed out that lack of training contributes to the uneven use:

"Some people use BI every day, others don't even know where the reports are stored." (Informant 3)

These quotes reflect an informal and inconsistent approach to digital learning, which shapes how BI is accessed and applied in daily routines.

5.3 BI in crisis situations

This theme addresses Research Question 3, exploring the limitations and absence of BI in the municipality's real-time response to crisis; one of them being the Ukrainan refugee influx crisis and the other a fire in student housing that suddenly displaced several residents. Even though all informants described the Ukrainian refugee influx as a key stress test of their operational systems, BI tools were surprisingly not used during the crisis response.

All informants confirmed that crisis response was managed manually:

"I honestly don't know what BI could have contributed with." (Informant 1, Ukraine crisis)

"We just had to solve things quickly and without BI. It was mostly phone calls and Excel." (Informant 2, fire crisis)

"We didn't have time to think about dashboards. It was all hands on deck." (Informant 1, Ukraine crisis)

Several respondents reflected on how BI could have helped, but was not embedded:

"We did use systems to stay in control, but there was a lot of manual work. If we had a BI system that could more easily show which homes were available, how many rooms they had, and whether they were adapted.»(Informant 2, fire crisis)

"It would have made it much quicker for our staff to assess who should go where." (Informant 2, fire crisis)

"If we had a BI system that could have shown us which homes were available, number of rooms, and whether they were adapted it would have saved us time during the refugee crisis." (Informant 2, Ukraine crisis)

"That kind of system could have helped us allocate better geographically. But in a crisis, you just have to act." (Informant 4, Ukraine crisis)

"I don’t know much about what such a system could have helped us with." (Informant 3, Ukraine crisis)

"It would have made it much quicker for our staff to assess who should go where." (Informant 2, fire crisis)

These responses highlight the absence of BI in emergency routines and suggest that while the tool existed, they were not integrated into the workflows that mattered most during either crisis. The responses point to a broader lack of preparedness and real-time integration of BI systems in situations where rapid coordination and housing decisions were needed.

5.4 Strategic vs operational use of BI

This theme further addresses Research Questions 1 and 4, examining how BI is used unevenly across operational and strategic contexts. The data indicate a clear contrast between how BI is used at operational versus strategic levels. While Power BI supports day-to-day coordination, it is rarely integrated into long-term planning or resource forecasting.

Many informants described Power BI as useful for tracking ongoing activities but not for strategic purposes:

"Right now, the BI reports help us manage operations, but I don’t think they inform strategic planning yet—not in a structured way." (Informant 3)

"We want a dashboard that everyone can see—one place where we agree on what the numbers are." (Informant 1)

Others explained that departments operate in silos:

"The departments each have their own logic. There is no shared understanding of what the data means." (Informant 4)

"I would really like more insight into how much regular renovations actually cost and how those costs develop." (Informant 1)

These statements reflect a clear division between the operational benefits of BI and the barriers to strategic integration.

6. Discussion

This chapter interprets the findings presented in chapter 5 by revisiting the research questions and linking them with relevant theories and literature. The aim is to assess what the empirical results reveal about the role and potential of BI in municipal housing management. While BIhas been widely studied in private sector contexts and some central government settings, there is a notable lack of research on its practical application in municipal services in Norway and the broader Scandinavian region. This thesis contributes to filling that gap by examining how BI is used or not used within a real-life municipal housing case. The findings offer grounded insight into how local public managers perceive, adapt to, and struggle with BI tools under constrained conditions, a context that has previously been underrepresented in the literature. The discussion is structured thematically around the four research questions, followed by a synthesis of cross-cutting insights and reflections on the study's theoretical contributions.

6.1 RQ1: How can BI tools transform municipal housing management with respect to decision-making, efficiency and adaptability in both routine operations and crisis scenarios?

The findings indicate that BI is perceived as potentially transformative by municipal employees at both strategic and operational levels. However, this perceived potential is not yet fully realized in practice. While some informants described how BI has improved visibility in routine operations, such as identifying bottlenecks in property renovation and monitoring vacancy durations, others revealed that they rely on second-hand interpretations of BI outputs rather than engaging directly with the tools themselves. This reflects a meaningful difference in user experience that is crucial for understanding BI adoption The finding aligns with Simon's theory of bounded rationality from 1957 (Simon, 1997), which suggests that even when data systems are available, decision-makers are constrained by limited information, time pressure, and organizational complexity, leading them to make "satisficing" rather than taking optimal decisions.

The informants' comments highlight a fragmented pattern of BI adoption. On one side one informant described the situation as follows: "I use it, but it is others who interpret and make the data accessible for me, which illustrates how BI tools, instead of serving as direct enabler of decision-making, often act as background support dependent on intermediaries. From the perspective of DSS literature (Pomerol & Adam, 2004), this indirect usage significantly reduces BI's capacity to support structured and transparent decision processes. When data must be filtered or manually interpreted by others, the benefits of real-time analytics and dashboard functionality are diluted. One the other side several informants emphasized specific operational benefits. Informant 1 explicitly stated: "I go in myself and check the Power BI report to see how much of our allocated funds we have used." Similarly, Informant 3 observed: "With the dashboard, you see things clearer, like how many vacant units we have, how long they've been vacant, and what stage they are in." These examples illustrate BI's role as a DSS, providing structured insights that facilitate timely and accurate responses to everyday operational issues (Pomerol & Adam, 2004).

Further empirical evidence highlights BI's impact in categorizing renovation projects and justifying financial decisions. Informant 2 stated: "We could see that all renovations were treated the same. There was no system to assess: is this an easy, medium, or difficult job?" Meanwhile, Informant 4 shared: "You can generate reports so detailed that you can justify in the next financial plan that we need to replace the roofs on 40 homes." Informant 1 also noted: "It's a great tool that allows us to, for example, follow up on the operating times for fire alarms and other safety systems." These quotes show that BI not only supports tactical decisions but also enables strategic planning.

Informant 1 described how BI introduced a new level of operational transparency: "Now we can see things we didn't even know we needed to ask about." This suggests a shift from reactive to proactive management, where BI not only reports on predefined metrics but also generates new insights that shape emerging priorities. From a bounded rationality perspective (Simon, 1997), this reflects the potential for BI tools to reduce uncertainty and extend decision-makers' cognitive capacity—particularly in resource-constrained public sector settings. Theoretically, this aligns with the assumption that BI can enable public managers to make more informed, forward-looking decisions (Kapucu & Ustun, 2018). However, the findings also reveal that this transformation is incomplete. In practice, crisis responses remained largely ad hoc and disconnected from digital systems. As one informant noted: "We just had to solve things quickly without BI. It was mostly phone calls and Excel." These accounts illustrate that BI tools have not yet been institutionalized in municipal routines, especially in time-sensitive scenarios. This challenges the assumptions embedded in models such as the OECD's (2019) vision for a data-driven public sector, which presumes that digital tools can be readily mobilized in both routine and emergency contexts.

However, a notable gap appears in crisis situations. Informants indicated that BI was not used during the Ukrainian refugee crisis or the fire in student housing. Informant 1 remarked: "We didn't have time to think about dashboards. It was all hands on deck." Informant 2 echoed: "It was mostly phone calls and Excel." The absence of BI in high-stress situations reveals that BI tools, though available, were not embedded in crisis workflows. From a DSS and bounded rationality perspective, this points to missed opportunities for structured decision support in urgent contexts. Informant 4 explained further: “In a crisis, you just have to act. There's no time to go into systems you're not used to using.” This quote reveals the importance of institutionalizing BI use ahead of time. UTAUT theory emphasizes that facilitating conditions including prior experience and system familiarity are crucial in determining technology use. When BI is not routinized, it is unlikely to be utilized in unplanned, high-stakes moments. Some informants expressed frustration about this lack of readiness. Informant 2 stated: “If we had a BI system that could have shown us which homes were available, number of rooms, and whether they were adapted, it would have saved us time during the crisis.” This retrospective awareness highlights the unrealized potential of BI in supporting rapid response.

The findings suggest a split in institutional readiness. While BI is clearly beneficial for operational oversight, its role in strategic and crisis contexts is still emerging. This divergence reveals fragmented integration of BI across units. Not all departments or individuals are equally positioned to leverage these tools. The fact that BI was bypassed during crises underscores its limited institutional embedding and routinization. Municipal BI success depends not only on access to dashboards, but on how deeply those tools are woven into everyday workflows and emergency procedures. Moreover, the contrast between those who use BI regularly and those who default to traditional methods during stress situations speaks to a broader cultural gap. Informant 3 reflected: "People don't resist BI because they don't want it. They just haven't been shown how to use it."and "Excel is still what most of us fall back on. It's familiar, even if it's less effective." This speaks to the low cognitive salience of BI tools in moments of pressure. According to Simon's bounded rationality, decision-makers under stress revert to heuristics and known practices, not necessarily optimal ones. BI tools need to be part of the reflexive toolkit if they are to be useful in crises. The significance of these findings lies in their illustration of digital duality: municipalities may be advanced in BI development but lag behind in BI usage culture. Stavanger's case suggests that while dashboards exist, they are not fully institutionalized. This points to a need for deeper organizational learning, more systematic integration of BI into planning and preparedness routines, and stronger emphasis on scenario-based training. Finally, variation between informants' perspectives also tells us something important. While some described BI as transformative, others barely used it. This disparity is analytically valuable. It highlights uneven adoption, varied user confidence, and the need for differentiated training strategies. It also reminds us that BI's value is not intrinsic, but it emerges through practice, leadership, and alignment with institutional goals.

In conclusion, BI tools hold significant potential to enhance decision-making, efficiency, and adaptability in both routine operations and crisis situations. Yet this potential remains unevenly realized. The findings demonstrate that BI is well-integrated in daily operations, but not in high-stakes response. The gap lies not in technology, but in organizational routines, preparedness, and digital culture. Bridging this divide requires not just better systems, but a reimagining of how municipalities train, structure, and embed decision-support tools into the heart of public service management.

6.2 RQ2: How can BI tools, such as like Power BI, support municipalities in making data-driven decisions for optimizing housing allocation and addressing inefficiencies?

The second research question explores the extent to which BI supports municipalities in making data-driven decisions for optimizing housing allocation and addressing inefficiencies. The findings from this study show a partial but promising integration of BI tools into operational workflows, particularly in identifying delays in renovation processes and visualizing key metrics related to housing stock and turnover times. Informants describe how BI has helped them detect inefficiencies in workflows. For instance, by revealing delays between the return of keys and the initiation of renovation, and later, between completed renovation and allocation. This aligns well with the second-order code "Process optimization" found in Appendix B, linked to TAM´s construct of Perceived Usefulness (Davis, 1989). One interviewee noted: "When we started using the Power BI model, it became clear that we could streamline things." This sentiment reflects the instrumental role of BI in improving operational transparency. Informant 3 stated: "With the dashboard, you see things clearer, like how many vacant units we have, how long they've been vacant, and what stage they are in. That's useful for managing the flow." This aligns with DSS theory, emphasizing that timely, visual data supports better operational decisions (Pomerol & Adam, 2004). The ability to make inefficiencies visible supports bounded rationality theory by providing decision-makers with structured, real-time data, thereby lowering the cognitive burden traditionally associated with complex administrative processes (Simon, 1997). Crucially, one informant emphasized that insights from BI reports were a decisive factor in restructuring workflows to reduce time spent on critical handover tasks. This shows that BI is not only used retrospectively but has also been applied in a formative and forward-looking way. While most BI applications are used to report on past performance, this example illustrates its ability to influence organizational change and guide operational decisions.

Several informants noted that BI insights had prompted changes in procedures. Informant 2 remarked: "One of the biggest changes we've made is due to the report on rental loss and renovation time. It directly triggered reorganization to reduce turnaround time." These accounts show how BI is more than a passive monitoring tool; it can actively drive performance improvements. Informant 4 further noted: "You can generate reports so detailed that you can justify in the next financial plan that we need to replace the roofs on 40 homes." This demonstrates BI's strategic utility in budgeting and planning.

Moreover, BI provides decision-makers with a comprehensive view of available resources and housing diversity. Informant 1 reflected: "I imagine better oversight and better knowledge of which groups live where, and whether we have a mix of building types and apartment sizes." Such data enable municipalities to approach housing allocation more proactively and with better alignment between supply and needs.

Despite these successes, BI adoption remains uneven. Informant 2 commented: "You have to know who to ask if you want to get the numbers. It's not accessible to everyone." Informant 3 added: "I use it, but it is others who interpret and make the data accessible for me." These findings highlight a central theme in TAM and UTAUT: perceived ease of use and facilitating conditions are critical for uptake. When users depend on gatekeepers or lack access, engagement suffers. This creates a dependency structure within the organization, where a small group of BI-literate employees act as internal translators. Informant 4 described this situation as follows: "There are only a few who know the system. The rest of us ask them for help.” While such arrangements keep BI functional for those less familiar with it, they also slow down decision-making and prevent broader organizational learning.

The variation among departments in how BI is adopted is also analytically important. Some informants report high usage and strategic benefits, while others depend on verbal updates and Excel lists. This disparity reflects institutional inconsistency in digital adoption. It also raises questions about equity: are some units better supported in BI access and training than others? Are certain roles structurally excluded from developing data literacy? These inconsistencies matter—not just for internal efficiency, but for the fairness and representativeness of municipal decision-making.

From a bounded rationality perspective, these findings make sense. Under complexity and time constraints, decision-makers revert to familiar tools and workflows. Excel remains dominant not because it is optimal, but because it is routinized. Introducing BI into these environments requires more than access—it requires integration into existing routines and mindsets. Informant 1 noted: “You need to see how it helps in your actual work, or you won’t use it.”

However, there remains limited evidence that BI is actively used in prospective decision-making for tasks such as forecasting housing demand or simulating the impact of alternative allocation scenarios. The limitations are rooted in both system-level and organizational barriers. Informants highlighted a lack of access to cross-sectoral data, particularly from health and welfare services, and pointed to issues of fragmented data ownership. As Informant 4 stated: “We don't regularly get access to health information, but it has to be dumped manually.” This lack of real-time interoperability weakens BI’s potential as a DSS (Pomerol & Adam, 2004) and limits its strategic utility.

From a TAM perspective, this illustrates the tension between perceived usefulness and perceived ease of use. While many informants acknowledged BI’s value in theory, they also expressed frustration at the learning curve and lack of formal training. Informant 2 noted: “We are vulnerable. Only a few people really know how to use and develop the BI tools.” This creates a scenario where the tool’s usefulness is mediated through “gatekeepers,” reducing organization-wide engagement and knowledge diffusion. Moreover, the absence of shared dashboards across departments emerged as a major constraint. Informants called for a centralized data platform that offers synchronized insights into available housing, applicant data, and renovation progress. As Informant 1 explained: “We want a dashboard that everyone can see—one place where we agree on what the numbers are.” This desire for shared models aligns with Venkatesh and Davis’s (2000) TAM2 extension, which stresses the importance of social influence and institutional norms in shaping perceived system utility. The finding is also consistent with the UTAUT model (Venkatesh et al., 2003), which highlights facilitating conditions as key enablers of successful technology adoption.

A significant deviation from the theoretical expectation is the limited strategic use of BI for allocation planning. While literature such as Brynjolfsson & McElheran (2016) argues that data-driven systems enable optimization of resource use, the data from Stavanger suggest that BI is still primarily used in a descriptive, not prescriptive, capacity. The second-order code “Strategic decision gap” in Appendix B supports this, pointing to underutilization of BI in long-term planning and resource forecasting. Informants were aware of BI’s theoretical capabilities but noted the absence of integration into strategic planning cycles or policy-level decision-making. As Informant 1 stated: “We lack better control of what things cost and how that develops.” This disconnect raises important questions about the institutionalization of BI tools. Rather than being embedded across planning hierarchies, BI remains at the operational margins, activated primarily for reporting and monitoring. This limits its transformative potential and may lead to suboptimization, where decisions are improved in isolation but not across the housing system as a whole. From a Decision Theory lens, the promise of enhanced rationality through BI is weakened unless the organizational architecture supports full lifecycle decision engagement.

Tabell 4: BI use across decision levels in municipal housing management

Decision Level	**BI Usage Today**	**Ideal/Target BI Role**
Strategic Planning	Low	Forecasting demand, cost modeling, budgeting
Tactical Management	Moderate	Monitoring workflows, optimizing allocation
Operational Response	High (reactive)	Real-time tracking, response coordination

This figure captures the misalignment between current and potential BI use across different governance levels. It supports the argument that while Power BI enables visualization of key metrics, its influence on strategic resource optimization remains limited by structural and

cultural factors. The findings are in line with OECD (2019) assessments, which stress that data-driven public services require not only digital tools but a culture of data stewardship, where departments trust and share information seamlessly. The case of Stavanger illustrates how organizational silos and fragmented ownership models undermine these principles. While Power BI offers the infrastructure for better decision-making, the absence of cross-functional alignment and data governance policies constrains its institutional value. Additionally, these insights resonate with Elbashir et al. (2022) who argue that successful public sector BI adoption depends not only on technical capacity but also on top management support and knowledge diffusion across the organization. Without these enabling conditions, BI may reinforce existing hierarchies of expertise rather than democratize access to insights.
From a methodological standpoint, the strength of these findings lies in the range of roles among informants, from strategic managers to frontline operational staff. This diversity allowed the study to capture vertical variations in BI perceptions and usage. However, the findings may be context-specific, influenced by Stavanger's particular IT maturity, organizational culture, and housing challenges. Future research could validate these insights through comparative case studies, including municipalities with different levels of BI maturity.

The significance of the findings in this section lies in showing how uneven adoption creates different realities within the same organization. For those with access, BI is empowering and strategic; for those without, it remains abstract or inaccessible. This dichotomy can influence how decisions are made, who has influence, and how policy is shaped. Addressing this gap is not only a technical issue, but a matter of organizational justice and long-term institutional resilience.

To fully realize BI's potential for optimizing housing allocation and addressing inefficiencies, municipalities must move beyond fragmented implementation. This includes fostering a shared BI culture, providing systematic training across roles, and ensuring that BI tools are relevant to the specific tasks of diverse professional groups. Aligning BI functionality with real decision-making contexts—through user-driven dashboards, transparent metrics, and automated updates—will help bridge the gap between potential and actual impact.

6.3 RQ3: How can BI improve municipal crisis response strategies, specifically during housing demand shocks such as refugee influxes?

The third research question addresses one of the most revealing gaps between theoretical potential and empirical reality in the current study: the role of BI tools in municipal crisis response. While existing literature and theoretical frameworks such as Decision Theory and Technology Acceptance Models (TAM/UTAUT) argue for the value of real-time, data-driven coordination during crises (Simon, 1997; Drennan et al., 2014; Venkatesh et al., 2003), the findings from Stavanger Municipality suggest that these ideals have not yet materialized in practice. During the Ukrainian refugee crisis and the student housing fire incident, none of the four informants reported that BI tools were actively used for crisis coordination, planning, or monitoring. Instead, decisions were made through manual, improvised methods: telephone calls, Excel sheets, and ad hoc conversations. One informant summarized it concisely: “We just had to solve things quickly, without BI. It was mostly phone calls and Excel.” This anecdote captures a critical deviation from the logic of structured, evidence-based governance and points to a crisis application gap, a concept explicitly coded in Appendix B and associated with the failure to activate BI tools during emergencies despite their availability. From a DSS perspective, this signals a missed opportunity. Ideally, BI should support rapid and informed decisions during emergencies by providing real-time data on housing availability, resource allocation, and demographic needs. Informant 2 reflected: “If we had a BI system that could have shown us which homes were available, number of rooms, and whether they were adapted, it would have saved us time.” Informant 4 added: “Things like geographic distribution—we could have used it for that. But in a crisis, you just have to act.” This highlights the unrealized potential of BI to improve coordination, reduce duplication, and expedite placement decisions.

The interviews also reveal differing understandings of BI’s role in crises. While some informants articulated clear ideas of how BI could have contributed, others were uncertain. Informant 3 admitted: “I don’t know much about what such a system could have helped us with.” This inconsistency suggests that BI tools are not institutionally visible in crisis scenarios. According to the UTAUT, perceived relevance and user experience influence whether a system is accessed during time-sensitive operations. If BI has not been part of crisis training or prior simulations, staff will likely default to informal coordination tools.

From a bounded rationality perspective (Simon, 1997) these findings are not surprising. Crisis environments are typified by uncertainty, information overload, and time pressure, all of which amplify decision-makers' reliance on heuristics and reduce their capacity to engage with complex tools. However, the point of modern BI systems is precisely to mitigate these limitations: to serve as real-time cognitive extensions that offer actionable insight, thereby shifting municipalities from reactive to proactive crisis management (Kapucu & Ustun, 2018). The fact that BI was not used during a real-life crisis suggests that either the tools were not prepared for such use, or that organizational readiness was insufficient.

This implementation failure aligns with multiple second-order codes in Appendix B:
"Crisis decision barrier" reflects the absence of user training or familiarity with BI dashboards during high-pressure events. "Missed BI opportunity" in Appendix A underlines how BI infrastructure existed but was not leveraged. "Crisis decision barrier" captures how organizational fragmentation and manual workarounds dominate when digital systems are not embedded into workflows. Together, these codes suggest that the barriers were not technical alone, but also cultural and procedural. As TAM and UTAUT literature emphasizes, perceived usefulness and ease of use are necessary but not sufficient for adoption, especially under stress. Facilitating conditions, such as organizational policies, interdepartmental coordination, and simulation exercises, are essential to normalize the use of BI in emergency scenarios (Venkatesh & Davis, 2000).

This gap has several governance-level implications. Firstly, it questions the degree to which municipalities have adopted the OECD (2019) vision of the "data-driven public sector", which requires that digital tools be embedded into daily and emergency processes. Secondly, it challenges the assumption that technical tools automatically produce better outcomes. Without integration into routines, training, and preparedness exercises, BI systems remain unutilized even in the moments they are needed most. To address this, municipalities should adopt scenario-based BI development, where crisis dashboards are built and tested in advance, tailored to specific contingencies such as refugee influxes, fires, or infrastructure failures. These systems should include key indicators like available housing units by type and location, social service capacity, and predicted timelines for renovation. A proposed visualization could be:

Tabell 5: Crisis-ready BI dashboard – Key metrics

Metric	Description	Update Frequency
Available Housing Units	By size, location, accessibility	Real-time (daily feed)
Ongoing Renovations	Properties under repair + estimated readiness	Daily
Incoming Housing Requests	From refugees or social services	Daily
Emergency Stock Reserve	Properties held in reserve for urgent need	Weekly

By establishing such dashboards in advance, municipalities can reduce their dependence on manual coordination and gain a scalable, transparent crisis response system. This would also support data transparency and accountability which are two core values in public service ethics.

The case from Stavanger illustrates a common problem in public sector innovation: tools exist, but organizational culture and preparedness do not. While Crisis Management Theory and DSS literature stress the need for real-time intelligence (Drennan et al., 2014; Power, 2008), the mere presence of a BI tool is not enough. The system must be institutionalized, woven into crisis protocols, supported by leadership, and practiced in simulations. The finding also supports Duvier et al. (2018), who emphasize that technological tools must be accompanied by a learning culture, change management, and internal incentives for adoption. Interestingly, the municipality has shown a willingness to experiment with AI-driven inspection tools and collaborative dashboards in routine settings. This signals a technological openness that could be extended to crisis contexts if supported by leadership and policy alignment.

The study's strength lies in its ability to capture lived experiences during a real crisis, a rare opportunity in public sector research. Informants provided rich descriptions of both the process and the emotional realities of high-stakes housing work. However, the data is limited by being retrospective; the crisis had already occurred, and there were no direct observations of decision-making during the acute phase. Additionally, as a single-case study, findings may not generalize across municipalities with different digital maturity levels or political contexts. Nonetheless, the findings offer critical insights for future institutional design: BI adoption must extend beyond routine performance monitoring into high-pressure environments. This requires investment not only in tools but in organizational routines, training infrastructures, and cross-departmental alignment. The significance of these findings is that they show how digitalt systems require cultural as well as technical embedding. BI has the potential to improve crisis response by enabling faster, more informed, and more equitable decisions. But for this to happen, municipalities must embed BI in their preparedness planning, not only by building systems, but by rehearsing their use. In this way, BI can become a trusted part of the emergency toolkit, not just an operational luxury for ordinary times.

6.4 RQ4: What are the practical barriers and opportunities in adopting BI tools in municipal housing management?

The fourth research question brings into focus the broader structural, cultural, and organizational dynamics that influence the adoption of BI in the municipal housing sector. The empirical data from Stavanger Municipality highlights a landscape of both barriers and emerging opportunities, offering a nuanced picture of BI implementation in a public governance setting.

The findings identify several barriers: technical fragmentation, competence gaps, lack of ownership and legal (GDPR) concerns. However, the Stavanger case also shows cultural and governance-related barriers that are less frequently discussed. One of the most frequently mentioned barriers across the interviews was organizational fragmentation. Informants emphasized how different departments such as housing, social services, property maintenance, and health operate with separate systems, data sources, and mandates. This echoes the theoretical code "Organizational fragmentation" from Appendix B and aligns closely with both the TAM and the UTAUT, which emphasize the importance of facilitating conditions and system interoperability (Venkatesh et al., 2003). As Informant 3 explained: "There are many different systems, and they don't communicate well. You have to retrieve the numbers manually." This lack of technical integration not only delays data access but also creates conflicting data sources, undermining trust in the information provided. The result is a situation where data-driven decisions cannot be confidently made, despite the presence of BI infrastructure. In such an environment, decision-makers revert to manual processes or rely on individual interpretations of static reports, practices which are the very opposite of what BI aims to enable.

Another persistent challenge is uneven digital competence. Several informants noted that only a small number of staff have the skills to use or develop BI dashboards, creating a bottleneck in access to insights. Informant 2 noted: "We are vulnerable. Only a few people really know how to use and develop the BI tools." This aligns with TAM's construct of perceived ease of use (Davis, 1989), and also matches the "Crisis decision barrier" code from Appendix B. Without broad-based training and user confidence, even the most advanced systems remain underutilized.

A third significant barrier is unclear ownership and governance of BI initiatives. Informants described how responsibility for BI development often falls between units, with no clear mandate or strategic alignment. This issue, while less frequently addressed in classical TAM literature, is extensively discussed in public sector innovation studies, such as those by Duvier et al. (2018), who emphasize the role of institutional leadership in championing digital change. Without ownership, BI becomes a secondary tool, used sporadically and without strategic impact. Also, one of the informants stated "I go in Power BI myself to see how much of our funds we have disposable» which shows that there is an opportunity to expand BI use for strategic decisions.

Finally, legal concerns such as GDPR and data-sharing restrictions were mentioned as barriers to integrating sensitive datasets across departments. While these concerns are valid, they also highlight a need for better data governance frameworks that balance privacy with analytical utility, an issue addressed by the OECD (2019) and echoed in recent BI readiness frameworks (Elbashir et al., 2022).

Despite these challenges, the empirical material also points to several promising opportunities. One is the growing strategic awareness of BI's potential. Informants at the strategic level explicitly called for more advanced and integrated use of BI, not only for tracking key performance indicators but also for informing budgetary and allocation decisions. This reflects the theoretical code "Strategic budgeting" from Appendix B, which combines Decision Theory and DSS logic to argue for data-informed forecasting and financial planning (Simon, 1997; OECD, 2019).

Another opportunity is technological innovation. The municipality is already involved in pilot projects using AI-driven tools for property inspection and predictive maintenance, such as the collaboration with Wenn Properties. These initiatives reflect a cultural openness to experimentation and align with public sector innovation literature (Brynjolfsson & McElheran, 2016). They also suggest a path forward for integrating BI and AI tools to automate certain decision-making processes and shift resources from manual tracking to strategic planning.

There is also evidence of a gradual cultural shift toward data-driven thinking. Informants expressed a clear desire for shared dashboards and more transparent communication of performance metrics. As Informant 1 noted: "We want a dashboard that everyone can see—one place where we agree on what the numbers are." This aspiration corresponds with the UTAUT model's emphasis on social influence and shared mental models, which can drive broader acceptance of BI tools if organizational support and leadership are in place (Venkatesh et al., 2003).

The combination of barriers and opportunities suggests that Stavanger Municipality, like many others, stands at a crossroad. BI implementation has thus far been incremental and reactive, addressing specific pain points such as delays in renovation or reporting needs. But its full potential as a strategic tool for planning, forecasting, and crisis coordination remains unrealized. Moving forward will require a deliberate shift from tactical fixes to institutional transformation. This transformation must be supported by formalized BI governance structures, with clearly assigned responsibility across departments, widespread competence-building efforts, including onboarding, workshops, and mentoring. Furthermore, there needs to be interoperability frameworks, enabling secure and lawful data-sharing across silos and strategic alignment, ensuring BI tools are connected to municipal goals for equity, efficiency, and adaptability.

Tabell 6: Barriers and opportunities matrix

Dimension	Barrier	Opportunity
Technical	Fragmented systems, lack of integration	AI-driven inspection, pilot programs
Organizational	No clear BI ownership, inconsistent routines	Strategic interest from management
Cultural	Low competence and confidence in using BI	Growing desire for shared dashboards and transparency
Legal/Governance	GDPR concerns limiting data-sharing	Potential for data governance frameworks and legal clarity

The fourth research question underscores a central paradox in digital governance: technology is not the bottleneck, but people, processes, and policies are. BI tools are present, and their value is recognized, but they are not yet embedded in the institutional fabric of municipal housing management. This insight reinforces core claims in TAM, UTAUT, and Decision Theory. Namely, that adoption and impact are shaped not just by system design, but by organizational readiness, cultural mindset, and strategic leadership.

The significance of these findings lies in their ability to highlight what happens when modern digital tools are introduced into traditional public sector systems. Rather than seamlessly improving performance, BI tools often clash with existing workflows, skill levels, and decision cultures. This thesis reveals the organizational and cultural friction that must be addressed before such tools can reach their full transformative potential in municipal governance.

6.5 Reflection of diverging experiences of BI adoption

While all informants acknowledged the potential of BI to improve municipal housing management, their individual experiences and levels of engagement with BI tools differed considerably. These differences reflect more than personal preferences. They are shaped by the informants' organizational roles, technological competence, and the institutional structures they operate within.

From the perspective of the TAM, variations in perceived usefulness and perceived ease of use explain much of the divergence. For instance, operational managers emphasized BI's ability to track bottlenecks and visualize key performance metrics, whereas strategic leaders expressed frustration with fragmented data and a lack of cross-departmental integration. Informant 2 noted: "We are vulnerable. Only a few people really know how to use and develop the BI tools," indicating low perceived ease of use and limited organizational support which are both crucial barriers according to UTAUT (Venkatesh et al., 2003).

These differences are also visible through the lens of bounded rationality. Informants operating under tight deadlines or during crises reverted to manual systems like Excel and phone calls, even when BI infrastructure existed. As Simon (1997) explains, decision-makers faced with time constraints and limited information tend to "satisfice" rather than optimize, so they are choosing workable, rather than ideal, solutions. Thus, differences in BI use across roles are not simply behavioural, but stem from structural and contextual constraints.
Finally, the social influence and facilitating conditions constructs from UTAUT offer further explanation. Some informants described BI as a tool used by a few "gatekeepers," which limits widespread adoption and trust. Informant 1's comment: "We want a dashboard that everyone can see, one place where we agree on what the numbers are" reflects a desire for shared mental models that are currently absent, preventing BI from becoming a collective decision-making platform.
In sum, these divergences demonstrate that BI adoption in the public sector is not uniform; it is filtered through roles, competencies, and institutional norms. For successful implementation, municipalities must not only provide tools but also foster shared understanding, inclusive access, and a culture of data-driven collaboration.

6.6 Synthesis and theoretical contribution

This study set out to explore how BI can support decision-making, efficiency, and adaptability in municipal housing management, both in routine and crisis contexts. Through four targeted research questions, qualitative interview data, and a theoretically grounded framework drawing on Decision Theory, Technology Acceptance Model (TAM), and UTAUT, several cross-cutting insights have emerged that together form the analytical core of this section. This section synthesizes findings across all themes to reinforce insights relevant to all four research questions

Across all research questions, a consistent picture emerged: while BI tools are conceptually aligned with improved decision-making and efficiency in public sector housing, their actual application remains fragmented and underutilized. Each informant acknowledged the value of data-driven insights, yet the institutionalization of BI usage varied significantly across roles, tasks, and contexts. In routine operations, BI is primarily used to track workflows, particularly in property renovation and vacancy reduction. In contrast, strategic planning and crisis response show a clear absence of integrated BI support, despite significant potential. This gap between potential and practice appears in all four research questions:

In RQ1, BI was seen as theoretically valuable for improving efficiency and responsiveness, but actual decision-making often relied on experience or intermediated interpretation of dashboards.

RQ2 revealed the partial integration of BI in optimizing housing allocation but also showed that true predictive and prescriptive analytics are missing.

RQ3 highlighted a complete breakdown in BI usage during crisis events, exposing a lack of preparedness and integration.

RQ4 uncovered the systemic and cultural barriers to BI adoption, including competence gaps, unclear governance, and fragmented systems.

Synthesizing these patterns suggests that the main constraint is not technological but institutional. Tools are available, interest exists, and use cases are evident, but BI is not yet embedded into workflows, decision hierarchies, or emergency protocols. This gap reflects what can be termed an adoption-to-impact divide: municipalities may adopt BI tools, but the conditions for sustained, impactful use are absent or incomplete.

Theoretically, this study contributes in two main ways:

Extending decision theory into municipal housing contexts

The concept of bounded rationality (Simon, 1957) has traditionally been applied to high-level decision-making under uncertainty. This study shows how it manifests in day-to-day housing management. The empirical material reveals that public managers, even when equipped with advanced BI tools, often revert to satisficing behavior due to incomplete data, time constraints, and organizational silos. The case from Stavanger thus illustrates how bounded rationality is not merely a cognitive phenomenon, but one rooted in institutional structures and digital maturity. The study reaffirms Simon's insights, while also extending them to the public housing domain, where the stakes of delayed or suboptimal decisions directly impact vulnerable residents.

Contextualizing TAM and UTAUT in the public sector

While TAM and UTAUT have often been applied in corporate or technology-heavy settings, this study demonstrates their relevance and limitations in a municipal governance context. Constructs such as perceived usefulness, ease of use, and facilitating conditions are clearly visible in the informants' experiences. However, this study also highlights the importance of cross-departmental ownership, intersystem integration, and policy alignment, which go beyond what TAM or UTAUT alone can explain. In this sense, the findings support the call for extended or hybrid models that incorporate organizational readiness, culture, and legal infrastructure as core components of public sector digital transformation. Moreover, the case illustrates that technology acceptance is highly dependent on institutional trust and shared mental models. Informants emphasized the importance of having "one place where we agree on the numbers" which is a sentiment that reflects not only data needs but also a desire for collaborative governance, a topic not sufficiently covered in traditional TAM literature.

Across the four themes, a few cross-cutting issues stand out: BI tools are underutilized in strategic planning and crisis management. Organizational fragmentation and lack of ownership hinder integration. Perceived usefulness is high, but ease of use and access are uneven. Digital literacy varies widely among staff, leading to dependency on intermediaries.

There is interest in BI but limited structured training and no coordinated data strategy.
These findings form the basis for the discussion in the next chapter.

7. Conclusion

This qualitative case study of Stavanger Municipality explored the role of Business Intelligence (BI) in municipal housing management, addressing four research questions concerning decision-making, operational efficiency, crisis response, and barriers and opportunities for BI adoption. By examining these dynamics in a Norwegian municipal context, the study contributes to the limited research on BI's application in the Norwegian public sector, particularly in communal housing management, where literature on crisis situations and data-driven decision-making is sparse. Through semi-structured interviews with four key informants, the findings reveal that BI, particularly Power BI, enhances routine operations but remains underutilized in strategic planning and crisis scenarios, highlighting a gap between potential and practice.

7.1 Summary of findings

RQ1: How can BI tools transform municipal housing management with respect to decision-making, efficiency, and adaptability in both routine operations and crisis scenarios?
BI significantly improves routine decision-making by providing transparent insights into housing workflows. Informants emphasized that Power BI dashboards enabled tracking of vacant units and renovation stages, reducing inefficiencies such as prolonged vacancy periods. For instance, Informant 3 noted, "With the dashboard, you see things clearer, like how many vacant units we have, how long they've been vacant, and what stage they are in. That's useful for managing the flow." This aligns with Decision Theory's concept of bounded rationality (Simon, 1997), as BI reduces uncertainty by structuring complex data. However, during crises like the Ukrainian refugee influx, BI was not utilized, with informants relying on manual methods like phone calls and Excel, indicating limited adaptability in emergency contexts.

RQ2: How can BI tools, such as Power BI, support municipalities in making data-driven decisions for optimizing housing allocation and addressing inefficiencies?
Power BI supports data-driven decisions by identifying operational bottlenecks, such as delays in renovations, and aiding budgetary planning through detailed reports. Informant 2 highlighted, "One of the biggest changes we've made is due to the report on rental loss and renovation time. It directly triggered reorganization to reduce turnaround time." This

demonstrates BI’s role in streamlining housing allocation in a Norwegian municipal context, where such applications are underexplored. However, BI’s use remains primarily descriptive, with limited predictive analytics due to fragmented data systems and uneven access across staff.

RQ3: How can BI improve municipal crisis response strategies, specifically during housing demand shocks such as refugee influxes?
The study found no active use of BI during crises, such as the Ukrainian refugee influx or a student housing fire, despite its potential to enhance coordination. Informants relied on ad hoc manual coordination, with Informant 2 reflecting, "We just had to solve things quickly without BI. It was mostly phone calls and Excel." Retrospective insights suggested that pre-configured BI dashboards showing available housing units, room counts, and accessibility features could have expedited allocation. This finding is particularly significant given the scarcity of research on BI in crisis management within Scandinavian public sectors, highlighting an area where this study contributes new insights.

RQ4: What are the practical barriers and opportunities in adopting BI tools in municipal housing management?
Key barriers to BI adoption include organizational fragmentation, limited digital competence, unclear governance, and GDPR-related data-sharing constraints. Informant 2 noted, "We are vulnerable. Only a few people really know how to use and develop the BI tools," highlighting dependency on a small group of proficient staff. Opportunities include growing strategic interest, pilot projects with AI-driven tools, and a desire for shared dashboards. These findings add to the sparse literature on BI adoption in Norwegian and Scandinavian municipalities.
Practically, the findings suggest that municipalities can enhance BI’s value by establishing formal governance structures to ensure accountability, investing in training to build digital capacity, developing scenario-based dashboards for crisis preparedness, and promoting interoperable systems with legal frameworks for secure data-sharing. By addressing these areas, municipalities can shift from fragmented to proactive housing management, optimizing resources for public value.

7.2 Limitations and future research

The study's single-case design and small sample of four informants, while strategically selected for depth, limit statistical generalizability. The retrospective analysis of the Ukrainian refugee crisis relies on informants' recollections, potentially missing real-time nuances. Findings may be context-specific to Stavanger's economic and organizational setting, and translation from Norwegian to English risked losing linguistic subtleties. Data access constraints, due to incomplete or restricted municipal records, further limited comprehensive analysis of housing allocation.
Given the limited research on BI in Scandinavian public sector crisis management, future studies should pursue longitudinal designs to track BI implementation over time. Comparative analyses across municipalities with varying digital maturity could identify contextual enablers and barriers. Exploring citizen perspectives on data-driven governance, examining GDPR's impact on data integration, and testing crisis-specific BI dashboards in simulated scenarios would further enhance understanding of BI's role in municipal housing management.

This thesis has shown that BI, when effectively implemented, can be powerful enablers of efficient, equitable, and responsive public service delivery. In the context of municipal housing, BI has the potential to help decision-makers allocate scarce resources, anticipate demand fluctuations, and respond rapidly in times of crisis. However, this potential can only be realized when technology is supported by governance, competence, and a culture of data use.

For Stavanger municipality, and others facing similar challenges, the path forward involves more than dashboards and digital tools. It requires leadership commitment, interdepartmental coordination, and a willingness to treat BI as an integral part of public value creation. In doing so, municipalities can ensure that vulnerable residents are served not just efficiently, but intelligently, fairly, and with resilience in the face of future uncertainty.

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Appendix A: Codebook

Quote from transcript	First-order code	Second-order code	Link to research question
"Jeg går jo inn selv og ser i Power BI rapporten for å se hvor mye vi har disponert av våres tildelte midler." (Informant 1)	Checking budget via Power BI	Routine decision support	RQ1: BI aids operational decision-making by providing budget clarity. RQ4: Opportunity to expand BI use for strategic decisions.
"Noe mer innsyn i hva særlig oppussinger jevnlig koster og vært kostnadsutviklingen der skulle jeg gjerne hatt en løpende tilbakemelding på." (Informant 1)	Wanting cost trend insights	Strategic decision gap	RQ1: BI could improve strategic decisions on renovation budgets. RQ2: Supports data-driven resource allocation.
"Ser jo for meg bedre oversikt og bedre kjennskap til hvilke grupper bor hvor og har vi spredning av forskjellige bygningstype og leilighets boligstørrelser." (Informant 1)	Visualizing demographic data	Allocation decision tool	RQ1: BI enhances decision-making by clarifying housing demographics. RQ2: Optimizes housing allocation through data visualization. RQ4: Opportunity for BI-driven planning.
"Jeg vet sannelig ikke hva BI skulle bidratt med «[in Ukraine crisis]. (Informant 1)	Unclear BI crisis role	Crisis decision uncertainty	RQ3: Reflects limited awareness of BI's potential in crisis response. RQ4: Barrier of knowledge gaps in crisis application.
"Et av de største hovedsatsingene vi har hatt innen dette	Reducing vacancy via BI	Efficiency-driven decisions	RQ1: BI transformed decision-making by streamlining vacancy

er det som går på leietap og istandsettelsestid, og den rapporten har på en måte vært direkte utslagsgivende i omorganisering av arbeidet for å redusere tidsbruk." (Informant 2)			processes. RQ2: Directly addresses inefficiencies in housing turnover.
"Så var det det, vi kunne se at alle istandsettinger ble behandlet likt. Det var ingen system for å vurdere: er dette en lett, middels eller vanskelig jobb?" (Informant 2)	Categorizing renovations	Process optimization	RQ1: BI enabled smarter decision-making by identifying process flaws. RQ2: Improved resource allocation for renovations.
*"***Det baserer seg tungt på excel bruk. Det er mye, mye lister, mye feilmarginer, mange aktører og personer som er inne og har skrivetilgang."** (Informant 2, Ukraine crisis)	Error-prone manual lists	Crisis decision barrier	RQ3: Manual processes hindered effective crisis decisions. RQ4: Barrier of outdated tools limiting BI adoption.
"Der brukte vi jo systemer for å ha kontroll, men det var mye manuelt arbeid, så hvis vi hadde hatt et BI system som på en måte hadde lettere vist oss hvilke boliger sto tilgjengelig, antall rom og	Manual crisis allocation	Missed BI opportunity	RQ3: BI could have sped up crisis housing decisions. RQ1: Shows need for adaptable BI tools in emergencies.

tilrettelagt…" (Informant 2, fire crisis)			
"Så da har man kunnet bruke det verktøyet til å kunne synliggjøre hvor mange boliger vi har, og størrelsen på boligen for eksempel." (Informant 3)	Mapping housing stock	Allocation clarity	RQ1: BI supports decision-making by visualizing available housing. RQ2: Facilitates data-driven allocation decisions. RQ3: Could apply to crisis allocation needs.
"Så mulig at Power BI ha hjulpet oss med det [reducing inefficiencies in vacancy periods]." (Informant 3)	BI for vacancy reduction	Efficiency potential	RQ1: BI could enhance decisions to minimize vacant periods. RQ2: Addresses inefficiencies in housing use.
″Jeg kan ikke så veldig mye om hva et sånt system kunne hjulpet oss med [in crisis response]." (Informant 3)	Limited crisis BI knowledge	Crisis application gap	RQ3: Uncertainty limits BI's crisis decision-making potential. RQ4: Barrier of insufficient training or awareness.
"Så hadde det gjort det mye kjappere for våre arbeidere å vurdere hvem som skulle hvor." (Informant 2, fire crisis)	Speeding up allocation	Crisis decision efficiency	RQ3: BI could accelerate housing decisions in emergencies. RQ1: Enhances adaptability in crisis scenarios.
"Det er et kjempegodt verktøy der vi kan for eksempel … driftstider på brannmeldere på alle som har bodd	Tracking maintenance needs	Operational decisions	RQ1: BI informs routine maintenance decisions. RQ4: Opportunity to expand BI for proactive management.

der lenger enn 10 år…" (Informant 4)			
"Du kan gjerne ta ut så gode rapporter at man i neste HØP kan man melde inn at man spesifikt trenger å skifte yttertak på 40 boliger…" (Informant 4)	Budget planning with BI	Strategic budgeting	RQ1: BI enables precise long-term financial decisions. RQ2: Optimizes resource allocation for maintenance.
"Sånne ting kunne vi brukt det til [geographic allocation in crisis]. Men i en krise kan du gjerne ikke ta hensyn til alt heller, så da må du bare." (Informant 4)	Limited crisis BI use	Crisis decision constraint	RQ3: BI could support geographic decisions, but crisis urgency limits its use. RQ4: Barrier of time pressure in emergencies.
"With the dashboard, you see things clearer, like how many vacant units we have, how long they've been vacant, and what stage they are in. That's useful for managing the flow." (Informant 3)	Speeding up allocation	Operational coordination	RQ1: Supports day-to-day decision-making on housing turnover. RQ2: Informs adjustments in resource allocation.
"When we started using the Power BI model, it became clear that we could streamline things." (Informant 2)	Workflow transparency	Process optimization	RQ1: BI enabled greater efficiency in routine decision-making.

"I use it, but it is others who interpret and make the data accessible for me." (Informant 3)	BI gatekeeping Reliance on intermediaries	Access dependency Decision-making and BI integration	RQ4: Limited BI access undermines broader adoption and learning. RQ1: BI aids operational decision-making but depends on intermediary interpretation. RQ4: Barrier due to access dependency.
"You have to know who to ask if you want to get the numbers. It's not accessible to everyone." (Informant 2)	Informal BI access	Access inequality	RQ4: Unequal access constrains organization-wide BI use.
"We are vulnerable. Only a few people really know how to use and develop the BI tools." (Informant 2)	Low BI capacity	Training deficit	RQ4: Limited internal expertise threatens sustainable BI adoption.
"Excel is still what most of us fall back on. It's familiar, even if it's less effective." (Informant 3)	Excel dependency	Outdated practices	RQ4: Reluctance to shift from legacy tools slows BI integration.
"There's no onboarding process when you start. If someone doesn't show you how to use BI, you won't use it." (Informant 4)	Lack of BI onboarding	Adoption barrier	RQ4: Absence of structured training hinders user engagement.

"People don’t resist BI because they don’t want it. They just haven’t been shown how to use it." (Informant 1)	Missing BI enablement	Adoption opportunity	RQ4: Improving training may unlock latent demand for BI use.
"I honestly don't know what BI could have contributed with." (Informant 1, Ukraine crisis)	Unclear BI crisis role Lack of BI crisis awareness	Crisis decision uncertainty Tool underutilization	RQ3: Reflects limited awareness and underutilization of BI in crisis response. RQ4: Barrier of insufficient training.
"We just had to solve things quickly and without BI. It was mostly phone calls and Excel." (Informant 2, fire crisis)	Manual crisis response	Informal coordination	RQ3: Reliance on traditional tools undermined crisis decision speed.
"We didn't have time to think about dashboards. It was all hands on deck." (Informant 1, Ukraine crisis)	Dashboard inaction	Tool underutilization	RQ3: BI was not embedded in crisis procedures.
"If we had a BI system that could have shown us which homes were available, number of rooms, and whether they were adapted it would have saved us time during the refugee crisis." (Informant 2, Ukraine crisis)	Need for BI overview	Allocation efficiency	RQ3: BI could streamline matching during crisis allocation. RQ1: Potential for enhanced adaptability.

"It would have made it much quicker for our staff to assess who should go where." (Informant 2, fire crisis)	Faster crisis allocation	Decision speed	RQ3: BI could improve crisis response logistics. RQ1: BI improves operational response capacity.
"Right now, the BI reports help us manage operations, but I don't think they inform strategic planning yet, not in a structured way." (Informant 3)	Strategic BI gap Limited strategic BI use	Planning limitation Strategic decision gap	RQ1: Strategic use of BI remains underdeveloped. RQ4: BI not institutionalized across decision levels.
"The departments each have their own logic. There is no shared understanding of what the data means." (Informant 4)	Fragmented data culture	Organizational misalignment	RQ4: Siloed structures hinder integrated BI use.

Appendix B –Theoretical Linkage Matrix

Second-order code (Theme)	Related theory	Interpretation	Supporting literature
Routine and Operational Decision Support	Decision Support Systems (DSS); Bounded Rationality	BI tools like Power BI enhance routine decision-making and integration by providing structured data on budgets and housing stock, reducing uncertainty and supporting decision-making processes, though often reliant on intermediaries. .	Simon (1997); Pomerol & Adam (2004); Höchtl et al. (2021)
Efficiency and Process Optimization	Decision Support Systems (DSS); Bounded Rationality Technology Acceptance Model (TAM)	BI improves efficiency by identifying bottlenecks and optimizing processes, such as reducing vacancy periods and streamlining renovations .BI acts as a decision support system to enhance resource allocation.	Simon (1997); Pomerol & Adam (2004); Brynjolfsson & McElheran (2016) (Davis, 1989).
Allocation and Crisis Decision Efficiency	Crisis Management Theory; Bounded Rationality	BI could enhance housing allocation in routine and crisis contexts by providing real-time data on availability and demographics (e.g., "Allocation clarity", "Allocation efficiency", "Crisis decision efficiency"). Its underuse in crises reflects reliance on	Drennan et al. (2014); Kapucu & Ustun (2018); Simon (1997)

		ad-hoc decisions under pressure.	
Strategic Decision Limitations	Decision Support Systems (DSS); Bounded Rationality	BI's potential for strategic planning, including planning limitations and strategic budgeting, is underdeveloped due to limited integration, hindering long-term decision-making. .	Simon (1997); Pomerol & Adam (2004)
Crisis Decision Barriers	Crisis Management Theory; Bounded Rationality	Manual processes and lack of BI awareness, including crisis decision uncertainty and tool underutilization, hinder effective crisis response, reflecting reliance on ad-hoc decisions under pressure.	Drennan et al. (2014); Kapucu & Ustun (2018); Simon (1997)
BI Adoption Barriers	Technology Acceptance Model (TAM)	Limited training, access dependency, and low BI capacity impede adoption (e.g., "Training deficit", "Access dependency", "Adoption barrier", "Outdated practices"). Ease of use and perceived usefulness are critical for user engagement, per TAM and UTAUT.	Davis (1989); Venkatesh & Davis (2000); Venkatesh et al. (2003); Wirtz et al. (2019)
BI Adoption Opportunities	Technology Acceptance Model (TAM)	Growing interest in BI and pilot projects indicate adoption potential (e.g., "Adoption opportunity", "Missed BI	Davis (1989); Venkatesh & Davis (2000); Venkatesh et al. (2003); Wirtz et al. (2019)

		opportunity"). Training and user-friendly interfaces can enhance BI use, aligning with TAM's focus on perceived benefits and UTAUT's facilitating conditions.	
Organizational and Data Integration Challenges	Technology Acceptance Model (TAM); Crisis Management Theory	Fragmented data systems and siloed structures limit BI's effectiveness (e.g., "Organizational misalignment", "Access inequality"). User adoption, interdepartmental coordination, and data governance are needed to reduce decision-making uncertainty.	Davis (1989); Venkatesh et al. (2003); Drennan et al. (2014); Wirtz et al. (2019)

Appendix C- Informant overview

Informant	**Role**	**Responsibility area**
Informant 1	Property manager	Overall property strategy
Informant 2	Section manager	Operative and strategic responsible for municipal housing management
Informant 3	Team leader	Refugee housing responsible and coordination
Informant 4	Operations manager	Operational housing follow-up and team leadership for staff

Appendix D- Intervjuguide

Tema: Bruk av Business Intelligence (BI) i kommunal boligforvaltning

Innledning
I denne masteroppgaven undersøker jeg hvordan Business Intelligence (BI) kan støtte kommunal boligforvaltning, med særlig fokus på beslutningstaking, effektivitet og krisehåndtering.

Med BI mener jeg verktøy og prosesser for å samle, analysere og visualisere store datamengder – både historiske og sanntidsdata – for å ta bedre beslutninger. Et eksempel er Power BI, som brukes til å kombinere data fra ulike kilder og gjøre informasjonen mer tilgjengelig og delbar.

Jeg ønsker å høre om dine erfaringer med bruk av data og BI-verktøy i ditt arbeid, både i daglig drift og i krisesituasjoner. Samtalen er delt inn i tre hovedtemaer, men du står fritt til å trekke inn det du mener er viktig.

Tema 1: Erfaring og bruk av BI i boligforvaltning

- Kan du fortelle litt om din rolle i organisasjonen og hva som er dine hovedoppgaver?
- Hvor lenge har du jobbet i denne stillingen, og har du erfaring fra tidligere roller knyttet til boligforvaltning?
- Hvordan vil du beskrive din erfaring med bruk av data og BI-verktøy, som Power BI, i ditt arbeid?
- Hvordan bruker dere data i boligforvaltningen i dag? Hvilke verktøy benytter dere?
- Har BI endret hvordan du jobber og tar beslutninger? Er det områder i arbeidet ditt som ikke bruker BI – og hvordan opplever du forskjellen i beslutningstaking der?
- Har BI bidratt til å redusere ineffektivitet, som lange tomgangsperioder eller feilallokering av boliger?
- Hvilke data eller nøkkeltall opplever du som viktigst i boligforvaltningen?

Tema 2: BI i krisehåndtering og organisatorisk tilpasning

- Har du vært involvert i håndtering av kriser, som flyktningkrisen fra Ukraina? Hva var din rolle?
- Hvordan ble BI brukt under denne krisen? Kan du dele konkrete eksempler?
- Har BI blitt brukt for å forutsi eller forberede lignende kriser tidligere?
- Hva kunne vært gjort annerledes med tanke på bruk av BI i slike situasjoner?
- Hvilken rolle mener du BI kan spille i fremtidig krisehåndtering og økt tilpasningsevne?

Tema 3: Muligheter, barrierer og fremtidig potensial

- Hva ser du som de største mulighetene for å bruke BI i kommunal boligforvaltning fremover?
- Hvilke utfordringer eller barrierer møter dere i bruken av BI (teknologisk, organisatorisk, kulturelt)?
- Hvordan ville du adressert disse utfordringene for å sikre en vellykket implementering?
- Hvordan vurderer du kommunens digitale modenhet for å ta i bruk avanserte BI-verktøy?
- Hvordan kan BI bidra til bedre transparens og ansvarlighet i boligforvaltning?

- Brukes det andre digitale verktøy eller teknologier, som AI, i boligforvaltningen? Kan du si litt om det?

Appendix E-Informasjonsskriv

Vil du delta i forskningsprosjektet

How can data driven insights enhance resource allocation and crisis response in public sector organisations? A case study of the strategic use of business intelligence in municipal housing management.

Formålet med prosjektet
Dette er en forespørsel til deg om du vil delta i et forskningsprosjekt. Formålet med prosjektet er min masteroppgave i strategi og ledelse, og har som mål å undersøke hvordan business intelligence (BI)-verktøy kan bidra til bedre ressursallokering og krisehåndtering i kommunal boligforvaltning. Ved å bruke Stavanger kommune som case, vil jeg studere hvordan BI kan støtte datadrevne beslutninger, redusere ineffektivitet og fremme mer bærekraftige og rettferdige boligstrategier. Resultatene vil bidra til økt forståelse av BI-verktøyets potensial i offentlig sektor, spesielt i håndteringen av boligkriser.

Hvorfor får du spørsmål om å delta?
Du får denne forespørselen fordi du har direkte erfaring med og ansvar for kommunal boligforvaltning.

Hvem er ansvarlig for forskningsprosjektet?
Handelshøyskolen ved UIS er ansvarlig for personopplysningene som blir behandlet i prosjektet.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta, eller hvis du senere velger å be om å få dine opplysninger slettet.

Hva innebærer det for deg å delta?
Jeg vil samle inn data gjennom semi-strukturerte intervjuer. Dette betyr at vi vil ha en samtale hvor jeg stiller spørsmål knyttet til dine erfaringer med bruk av business intelligence (BI) i kommunal boligforvaltning, krisehåndtering og relaterte temaer.
Omfang:
Intervjuet vil vare i ca. 30–60 minutter og kan gjennomføres fysisk eller digitalt, avhengig av hva som passer best for deg.
Personopplysninger som samles inn:
Jeg vil samle inn grunnleggende opplysninger som navn, stilling og kontaktinformasjon, samt informasjon du deler under intervjuet som er relevant for temaene i masteroppgaven. Ingen sensitive personopplysninger vil bli samlet inn.

Registrering av opplysninger:
Intervjuet vil bli lydopptatt (med ditt samtykke) for å sikre at jeg får med alle detaljer. Opptaket vil kun brukes til transkribering og analyse. Alle data lagres sikkert, og personlige opplysninger anonymiseres i rapporteringen.
Andre kilder:
Jeg vil ikke samle inn opplysninger om deg fra andre kilder enn intervjuet.
Deltakelse er frivillig, og du kan når som helst trekke deg uten å oppgi grunn. Ved spørsmål eller behov for mer informasjon, er det bare å ta kontakt.

Kort om personvern
Vi vil bare bruke opplysningene om deg til formålene vi har beskrevet i dette skrivet. Vi behandler personopplysningene konfidensielt og i samsvar med personvernregelverket. Du kan lese mer utfyllende om personvern under*.

Med vennlig hilsen

Andrew Robert Johnson (Forsker/veileder)

Trude Lønseth

- Du kan lese mer om personvern på neste side.

Utdypende om personvern – hvordan vi oppbevarer og bruker dine opplysninger
Tilgang til personopplysninger:
Kun jeg som student og min veileder ved [universitet/institusjonens navn] vil ha tilgang til de innsamlede personopplysningene. Ingen eksterne forskere eller tredjeparter vil få tilgang til dataene.
Tiltak for å sikre personopplysningene:
Navn og kontaktopplysninger vil bli erstattet med en unik kode som lagres på en separat liste, adskilt fra øvrige data. Datamaterialet (lydopptak og transkripsjoner) vil bli lagret på en kryptert og passordbeskyttet enhet, som kun jeg har tilgang til. Eventuelle papirnotater vil bli oppbevart i låst skap.
Identifisering og publisering:
Deltakerne vil ikke kunne bli gjenkjent i den endelige publikasjonen. Alle data som publiseres, vil bli anonymisert slik at ingen uttalelser kan spores tilbake til enkeltpersoner.
Andre aktører:
Det vil ikke være noen andre databehandlere eller institusjoner involvert i innsamling, bearbeiding eller lagring av data.
Behandling utenfor EU:
Alle data vil bli behandlet og lagret innenfor EU/EØS-området, og det vil ikke benyttes skytjenester eller andre løsninger utenfor dette området.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysningene om deg basert på ditt samtykke.

På oppdrag fra Handelshøyskolen ved Universiteteti Sravanger har personverntjenestene ved Sikt – Kunnskapssektorens tjenesteleverandør, vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?
Prosjektet vil etter planen avsluttes 20.mai 2025

Opplysningene vil da slettes.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til å be om innsyn i dataene vi behandler om deg, be om at dataene blir rettet eller slettet, og til å protestere mot behandlingen Hvis du kontakter oss for å utøve dine rettigheter, vil du høre fra oss innen en måned. Vi vil gi en forklaring hvis vi ikke kan identifisere deg eller hvis dine rettigheter ikke kan utøves. Du har også rett til å klage til Datatilsynet om hvordan vi behandler dine data.

Hvis du har spørsmål eller vil utøve dine rettigheter, ta kontakt med:
Andrew Robert Johnson, andrew.r.johnson@uis.no
Personvernombud ved UIS, personvernombud@uis.no

Hvis du har spørsmål knyttet til Sikts vurdering av prosjektet, kan du ta kontakt på epost: personverntjenester@sikt.no, eller på telefon: 73 98 40 40.

Jeg har mottatt og forstått informasjon om prosjektet «How can data driven insights enhance resource allocation and crisis response in public sector organisations? A case study of the strategic use of business intelligence in municipal housing management»
og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)