

**Facilitating CoStar Group's Customer Financial Data Migration to Newer Cloud
Technologies**

(Technical Paper)

**The Sociotechnical Transformation of Real Estate: Mutual Shaping of CRM Tools and
Industry Practices**

(STS Paper)

A Thesis Prospectus submitted to the

Faculty of the School of Engineering and Applied Science

University of Virginia

In Partial Fulfillment of the Requirements of the Degree

Bachelor of Science in Computer Science

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November 8th, 2024

On my honor as a University student, I have neither given nor received unauthorized aid on this
assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Customer Relationship Management (CRM) technologies have evolved significantly since their origin in the 1950s, shifting from manual record-keeping systems to sophisticated cloud-based platforms that enhance business operations and customer insights (Brontén, 2022). The COVID-19 pandemic accelerated this evolution, as remote work and rapidly changing customer behaviors pushed businesses to prioritize digital solutions. Within this new landscape, customer retention, data security, and adapting to digital trends have become increasingly important (Hey DAN Online, 2023). For instance, while the real estate industry had used some digital tools prior to the pandemic, the shift to CRM systems during COVID-19 represented a pivotal transformation, integrating advanced analytics and centralized data management in ways that fundamentally redefined industry practices and customer engagement. Many brokers and agencies began relying on data analytics companies like CoStar Group to remain competitive in the market. These companies provide tools that offer comprehensive property data, market trends, and predictive analytics, enabling real estate professionals to anticipate client needs and adjust their strategies effectively. CoStar's platforms, such as Homes.com, extend brokers' reach to a global audience while using advanced analytics to optimize property listings and pricing strategies. This shift has not only helped businesses maintain resilience during uncertain times but also fostered a transformation toward a more data-centric and proactive approach in real estate, where success increasingly depends on the integration of cutting-edge technology with traditional practices.

CRM systems now play a central role in real estate, helping agents understand customer needs, build long-term relationships, and enhance service delivery (Yadav et al., 2018). This transformation's impact is technical as well as social and operational in the realm of real estate, where CRM tools improve customer experiences and increase property accessibility. My research

investigates these shifts by examining how CRM tools have influenced real estate practices and vice versa.

For my technical project, I reflect on my summer internship at CoStar Group, where I developed a UI that streamlined customer financial data migration, improving internal operations, addressing exactly this issue. While my technical project explores the efficiencies of a new addition to CoStar's CRM technologies, my STS research addresses its broader societal impact, offering an exploration of CRM's role in the context of real estate practices. I hope to explore this question because while the transition to CRM systems has benefited firms by centralizing data and enabling more targeted client interactions, it has also introduced challenges, particularly for less tech-savvy agents or small firms with limited resources. CRM adoption demands a reconfiguration of traditional workflows to align with system requirements. Agents accustomed to in-person client management or manual record-keeping may find these tools inaccessible or overly complex, creating barriers to effective use. This research situates these dynamics within the broader sociotechnical transformation of real estate, exploring how CRM systems shape and are shaped by their users in a process of mutual adaptation.

Technical Research Problem

How can an intuitive user interface streamline the migration of financial data between legacy and cloud-based systems, enhancing accessibility and operational efficiency across technical and non-technical teams?

Background

Being a leading provider in the digital real estate market, CoStar Group continues to keep up with modern technologies, such as using cloud infrastructure to improve scalability and data

accessibility. In the summer of 2024, for instance, the company recognized the need to transition from legacy data storage systems (specifically Navision) to Oracle Cloud. However, this task required tedious hours of migration and technical knowledge on behalf of the backend teams, slowing business operations.

During my internship, my team and I recognized this issue and decided to develop a user interface (UI) aimed at addressing this gap by allowing internal customers (such as the finance teams who oversee customer financial transactions) to manage data migrations without technical knowledge. By minimizing the need for backend support, the UI reduced delays in data syncing and allowed internal non-technical users to manage operations. This project represents a critical step in bridging the divide between technical and non-technical functions in digital real estate, making financial data management more accessible and agile.

Current Knowledge and Gaps

Organizations moving data from legacy systems to cloud environments often face substantial hurdles, particularly in creating migration processes that are accessible to both technical and non-technical users. Research on cloud data migration highlights benefits like flexibility and scalability, especially when using parallel computing frameworks to handle large datasets (Rowe, 2011). However, studies, such as Fred Rowe's case study on migrating legacy applications to the cloud, indicate that the process of adapting legacy applications for cloud environments requires significant modifications, as well as ongoing configuration and maintenance, which adds complexity and cost. Similarly, Amin and Vadlamudi (2021) identify that while cloud migration can enhance operational flexibility, it also presents challenges such as impact analysis, security requirements, and high configuration costs, all of which complicate efforts to design user-friendly, accessible interfaces for non-technical users.

Although off-the-shelf data migration tools are available, they often lack the customization required for sensitive, high-stakes environments like CoStar's financial systems, where data accuracy and regulatory compliance are critical (Amin & Vadlamudi, 2021). These tools also typically fall short in offering intuitive, accessible UIs that bridge the gap between technical and non-technical teams. Furthermore, current research shows a gap in tools that prioritize both usability for diverse user groups and operational efficiency across departments (Rowe, 2011; Amin & Vadlamudi, 2021). This project seeks to fill this gap by designing an intuitive user interface specifically tailored to streamline financial data migration in CoStar's Web Enterprise CRM application, enabling broader accessibility and operational flexibility while maintaining data integrity and compliance. This simple and effective solution aims to bridge the identified knowledge gap and improve the efficiency of complex migration processes in real-world, high-demand contexts.

Methods

This project followed the software development lifecycle (SDLC) methodology, which provided a structured framework for moving the solution from an idea to deployment. The process included:

- Requirements Gathering: Engaged finance and backend teams to identify key migration tasks, data syncing challenges, and user needs for the UI interface.
- Design and Prototyping: Created mock-ups to ensure the interface was intuitive, with clear navigation and minimal technical jargon, suitable for non-technical users.
- Development: Built frontend components using React and collected endpoints from backend teams.

- Testing and Iteration: Performed testing with the testing teams to ensure data integrity, operational reliability, and ease of use. Initial tests were conducted with finance team members to refine the interface based on user feedback and usability testing.
- Deployment: Deployed the final product – finance teams began using the product the next day.

Expected Product or Result

The finance team started using the application almost immediately after deployment and noticeably reduced operational delays, improved accuracy in financial data syncing, and streamlined workflows across teams. Furthermore, the UI continues to serve as a case study for how UIs can reduce dependency on technical staff in other industries facing similar legacy-to-cloud transitions. By empowering non-technical users, this solution has enabled CoStar to respond more efficiently to the demands of a rapidly evolving digital real estate market.

STS Research Problem

How do CRM tools transform social and technical interactions in real estate, and what challenges emerge in aligning these systems with diverse stakeholder needs?

CRM tools have become essential in modernizing real estate, impacting both the technical workflows of data management and the social interactions fundamental to client relationships. This research examines how CRM tools create new protocols for interaction and collaboration in real estate, aligning diverse groups like agents, brokers, clients, and CRM providers in a shared network. This project explores the processes by which digital CRM tools shape, and are shaped by, the stakeholders who use them, particularly under the influence of recent trends in technology adoption accelerated by the COVID-19 pandemic. By applying Actor-Network Theory (ANT) concepts such as instauration and mobilization, this study will investigate how CRM systems

facilitate a cohesive network of interactions and redefine practices within real estate.

Background and Significance

The real estate industry has traditionally relied on interpersonal relationships and manual processes to manage client interactions. With the rise of CRM systems, real estate professionals now have tools to centralize data, automate outreach, and enhance customer engagement. CRM platforms like CoStar Group's Homes.com and Apartments.com offer advanced analytics and AI-driven recommendations, enabling brokers to adapt to client needs and market conditions efficiently.

The COVID-19 pandemic accelerated CRM adoption, as agencies relied on digital tools to maintain operations during disruptions. While these systems have improved efficiency and expanded market reach, they also require significant adjustments, particularly for agents less familiar with technology. This research examines how CRM tools transform traditional real estate practices into a sociotechnical system, highlighting both opportunities and challenges in aligning diverse stakeholder needs.

Literature Review

CRM systems are integral to modernizing the real estate industry, fostering efficiency in client interactions while transforming the practices and workflows of agents and brokers. Xu et al. (2002) argue that CRM adoption enhances operational productivity by streamlining information management, but this requires significant adjustments from users. The tools reconfigure work practices, pushing agents to adopt new routines and protocols. These transformations often leave certain stakeholders—particularly those less technologically proficient—struggling to adapt (Xu et al., 2002).

Zhou et al. (2010) highlight how CRM systems enable real estate professionals to execute more

effective marketing strategies and enhance client retention by analyzing customer data. However, these tools also increase reliance on technology, sometimes at the expense of traditional interpersonal interactions. The pandemic amplified this reliance, as digital technologies became the primary means of client communication and property showcasing (Kania & Kmiec, 2022). Flowers (2021) similarly notes that CRM tools, like other digital technologies, became essential for maintaining relationships during the pandemic, forcing real estate professionals to pivot quickly to virtual platforms.

Despite these advantages, aligning CRM systems with the workflows of non-technical users remains a persistent challenge. Khan et al. (2024) emphasize the importance of CRM systems in enhancing customer experiences, particularly in industries undergoing digital transformation. They highlight the need for tools that are not only functional but also user-friendly and accessible to diverse stakeholders. Nguyen (2021) echoes this concern, noting that while CRM innovations boost firm resilience, their implementation often exacerbates disparities among users with varying levels of technical expertise.

Existing literature demonstrates how CRM systems foster operational and strategic benefits, yet they fail to address the marginalization of less tech-savvy users. This research seeks to address this gap by applying Actor-Network Theory (ANT) to examine how CRM systems reorganize the relationships between agents, brokers, and clients in real estate. By exploring the sociotechnical dynamics underpinning CRM adoption, this study will shed light on the inclusivity challenges posed by these systems and propose pathways for more equitable integration.

Theoretical Framework: Actor-Network Theory (ANT)

Actor-Network Theory (ANT) is a useful framework for understanding how CRM tools transform real estate as a sociotechnical system. The concept of *Instauration* highlights how CRM

tools establish new interaction protocols and reshape roles, relationships, and expectations within the industry. In simpler terms, it's not just about adding a new tool or system but about how that tool fundamentally transforms the way people work and interact. Stakeholders actively influence CRM development through feedback, driving the tools' evolution to better meet users' needs. This iterative process reflects how the relationship between CRM systems and users is dynamic, continually adapting to each other's needs. For example, when CRM tools were introduced in real estate, they didn't merely replace manual record-keeping; they redefined how agents communicate with clients, prioritize leads, and manage properties. This transformation involved rebuilding workflows, expectations, and even professional roles around the new capabilities of CRM technology. The reciprocal influence between stakeholders and CRM tools demonstrates how these systems both shape and are shaped by the interactions within the real estate ecosystem.

Methods: Evidence Collection and Analysis

This research adopts a mixed-methods approach, combining case studies, content analysis, and secondary data sources to explore the sociotechnical impacts of CRM adoption in real estate. The methods are designed to provide depth by focusing on specific cases and technologies while drawing broader insights about industry-wide trends.

Case Studies:

The research will focus on specific CRM platforms, such as CoStar Group's Homes.com, to analyze how these tools influence real estate practices. These case studies will investigate how CRM adoption reshapes workflows, client relationships, and decision-making processes. By narrowing the scope to prominent technologies and real estate firms, the analysis will provide a detailed understanding of the sociotechnical transformations CRM tools bring to this industry.

Content Analysis:

The study will review secondary and tertiary sources, including scholarly articles, industry trade publications, news reports, and press releases. This approach will help identify trends, challenges, and the broader implications of CRM tools in real estate. Content will be analyzed to uncover recurring themes, such as usability issues for non-technical users, the effects of CRM on market dynamics, and the role of data analytics in decision-making.

Supplementary Sources:

Primary data, such as published interviews with real estate professionals, industry surveys, and reports from CRM software companies, will complement the case studies and content analysis. If feasible, interviews with real estate agents or brokers who use CRM tools could be incorporated to gain first-hand insights. Any interviews or surveys conducted will adhere to UVA's Institutional Review Board (IRB) guidelines to ensure ethical research practices.

This approach balances depth and breadth by examining a focused subset of CRM technologies while situating them within the larger industry context. The findings will contribute to a nuanced understanding of how CRM tools drive sociotechnical change in real estate.

Conclusion

In conclusion, this research highlights the significant impact of CRM tools on the real estate industry, illustrating how these systems not only improve operational efficiency but also reshape the social interactions and practices of stakeholders. Through the Actor-Network Theory, the study shows that CRM tools foster a dynamic, evolving network where both technical and non-technical users influence each other's practices and expectations. The COVID-19 pandemic accelerated CRM adoption, pushing real estate professionals to adapt to digital tools to maintain client relationships. While CRM systems have revolutionized the industry, challenges remain in aligning these tools with diverse user needs, particularly for non-technical users. This research offers

valuable insights into how CRM tools are transforming real estate, emphasizing the interplay between technology and social practices in creating a more cohesive, efficient, and adaptable industry.

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