

Improving Database Communication in Croydon Council

*Developing a Business Case for Procuring a Middleware System to
Improve Officer and Tenant Access to Housing Information*



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Improve Officer and Tenant Access to Housing Information*

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Submitted to
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Abstract

Croydon Council manages information regarding 120,000 dwellings and 16,100 tenants using its databases. Currently, limited data exchange exists between these databases and the Council's data visualization tool. This project recommends providing new software linking these systems to reduce costs, improve Council officers' work efficiency, and better serve tenants. Through interviews, questionnaires, and focus groups, we developed a business case in which we present our proposed middleware system that could provide data exchange and data visualization as the most feasible option.

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Executive Summary

The Department of Adult Services, Health and Housing (DASHH), the housing department within Croydon Council, strives to provide high-quality services to its 16,100 tenants. These efforts align with one of the Council’s Community Strategy priorities: “Delivering high quality public services and improving value for money.” The Council currently uses two databases and a visualization tool to manage information about Council properties and tenants:

- The Apex system contains information about the Council’s 120,000 dwellings and allows the Council to create renovation programs and monitor the energy ratings of Croydon’s buildings.
- The Open House Management System (OHMS) software includes data about the Council’s tenants, such as tenants’ rent accounts and the history of their requests for repairs to their dwellings.
- The Geographic Information System (GIS) software is a visualization tool that provides a geographic representation of information pertaining to the Council, such as property locations.

Both Council officers and social housing tenants face several challenges with using these systems. Since there is no continuous link between Apex and OHMS, there is inconsistent information within these databases, which leads to inefficiency in officers’ work. In addition, neither of these databases is dynamically connected with GIS, significantly limiting officers’ ability to geographically visualize housing data. Social housing tenants cannot access information about their dwellings by themselves and have a limited number of methods to track the status of their requests for repairs. These methods include calling into the Council’s Contact Centre or visiting the Council office.

This project developed a business case that identified, analyzed and recommended a “middleware” software system that could provide data exchange and data visualization to mitigate these issues. We identified services that these systems need to support through interviews, questionnaires, and focus groups with Council officers and social housing tenants in Croydon. This formal business case, which we submitted to Croydon Council in its standard format, appears in Appendix M of the full report.

Of the Council officers who responded to our questionnaire, 83% requested that a future system include a single interface to examine multiple sources of housing information, and 72% of respondents would like the system to contain consistent information across the current housing databases. Officers who responded to the questionnaire also believed that workshops and a mentorship program would provide the two best training resources for them to learn how to use this new system.

From our questionnaire to tenants, we learnt that 67% of respondents would use a web interface to access information about their own dwellings from the Council instead of contacting the Council directly. Such access promises a reduction in so-called avoidable contacts, contacts that make poor use of tenants' and officers' time. These tenants would like to view the status of their requests for housing repairs, information about their rent accounts, and schedules of planned maintenance – such as new kitchen installations and new bathroom installations – to appear in the web interface.

After collecting this information from officers and tenants, we presented three possible software approaches for accessing housing information:

Option 1: Do nothing – Continue to update and view housing information using Apex and OHMS, exporting summary data to Excel as necessary.

Option 2: Middleware system – Implement middleware that provides a single interface for viewing information from Apex and OHMS. The system also offers links for displaying this information in Excel and GIS.

Option 3: Integrated system – Migrate the information and functionality of Apex and OHMS into a centralized system, with the ability to view all this housing data using GIS.

We analyzed the advantages and weakness of each system and determined that “Option 2 – Middleware System” would be most feasible for Croydon Council to implement.

The middleware system would allow officers to access information from Apex, OHMS, and individually maintained spreadsheets by querying pieces of information in a single location. Officers could then view this information in an Excel spreadsheet or on a map using GIS, and they could run reports by themselves using more consistent and reliable data. The middleware would also provide a link to GIS without overloading the GIS database. Since the middleware system would have a new interface, the system would require training sessions to familiarize

Council officers with the software. The new software would be more expensive to procure than “Option 1 – Do nothing” but less expensive than “Option 3 – Integrated system.” It would be able to identify inconsistencies in data, but it could not prevent them.

We identified some of the risks and opportunities that the Council would face if they decided to implement and use the middleware system, such as staff members’ concerns about disclosure of sensitive information and officers’ difficulties in transitioning to the new system. We developed our recommendations for Council officers regarding the middleware system and web interface for tenants based on the data we had collected.

The middleware should provide officers with a user-friendly interface to access housing data from a single location and view this data geographically using GIS. By being able to access more consistent information, Council officers would be able to make better, more informed decisions and improve their work efficiency. In order to gain the advantages of the new system, Council officers should have access to a variety of training resources, such as workshops, mentorships, user groups, and manuals.

Tenants should be able to interact with an easy-to-use web interface that would connect to the middleware system to access information about their housing properties. By allowing tenants to access personal housing information as they need it, the Council would be able to reduce avoidable contacts. The Council should provide secure access to this information so that all tenant information remains private. To encourage tenants to use the web interface, the Council’s Tenant Consultation Team should offer tutorials and focus group sessions that would describe the benefits of using the online tool.

By improving Council officers’ work efficiency and encouraging tenant self-access to housing information, this middleware system would allow DASHH to fulfill one of the Council’s strategic priorities by “delivering high quality public services and improving value for money” and further advance the Council’s initiative to reduce avoidable contact situations.

Authorship

This project represents a joint effort on behalf of all group members. Each person contributed equally to every section of this report, including but not limited to research efforts, data compilation and analysis, and editing.

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1. Introduction

Because of the recent financial crisis, national governments have not been able to provide as much funding to local governments, instead encouraging them to become more financially self-sufficient (HM Treasury, 2011; HM Treasury, 2011; HM Treasury, 2012; HM Treasury, 2012; HM Treasury, n.d.). Croydon Council has created a set of strategic priorities to ensure that the borough benefits from all projects, including those of its housing department, the Department for Adult Services, Health and Housing (DASHH). Indeed, that pressure on DASHH is even greater because it has received additional external funding, which it must allocate effectively.

DASHH could satisfy one of the Council's strategic priorities, "Delivering high quality services and improving value for money," by improving the efficiency of its housing management system and making housing information accessible to tenants using a web interface ("Corporate Programme Office: Project and Risk Management Workshop," 2012). By accessing information online, tenants would not need to contact the Council's Contact Centre directly as often as before, therefore reducing avoidable contacts – those that make poor use of tenants' and officers' time – between Council staff and Croydon's tenants.

DASHH requires a well-organized and efficient housing database system to handle the state of its dwellings and satisfy the needs of its tenants. Croydon manages over 120,000 dwellings in Croydon and owns 14,000 of these properties (Croydon Council, 2011b; DASH, 2012; Taylor, 2012). Also, 16,100 tenants reside in Council-owned properties (DASHH, 2010). The Council currently uses one database, Apex, to manage information about Council properties and uses another database, Open House Management System (OHMS), to store information about tenants who live in these Council properties.

This cumbersome dual database system hinders officers' ability to work efficiently and respond effectively to tenants' requests. The databases that DASHH currently use contain overlapping and conflicting pieces of information, so officers must ask their colleagues to identify which data is appropriate to use for reporting. Some officers do not have access to one or both of the databases and need to include information from these databases in their reports. Therefore, they need to ask a manager in DASHH to collect the required information for them (Taylor, 2012). Also, as members of the Council's Contact Centre respond to requests for housing repairs from tenants, they cannot access information about the Council's upcoming

programs related to the tenant's dwelling. Therefore, the Contact Centre may recommend performing a repair on a home that the Council plans to renovate in the near future, creating unnecessary work for building repair contractors. We present further background information in Chapter 2.

To address the Council's needs, we collected opinions from officers and tenants to determine the services that the Council's housing database system should support using a methodology that we describe in Chapter 3. Officers would like a new system to present consistent data in a single location that includes a user-friendly interface. Also, they would appreciate having formal training and workshops as well as a mentorship program to learn how to use the new system. Tenants would use a web interface to access information about their requests for housing repairs, the Council's planned maintenance for their homes, and their accounts for renting properties from the Council. However, tenants expressed a strong desire to make the website secure so that their contact and financial information remains private. Tenants also expect the Council to maintain the Contact Centre so that tenants who do not have access to the Internet could still call the Council and receive satisfactory support from staff.

In Chapter 4, we describe several possible software solutions for the Council and its tenants to use for accessing housing information. Ultimately, we identified "middleware" software as our preferred option for the Council. This middleware software could serve as a single interface from which Council officers could access information from the two current housing databases. This middleware software could also allow them to view this information over a map of Croydon in the Council's Corporate Geographic Information System (GIS) software. Using a web interface that connects to the middleware system, tenants could access information about their own homes and rent accounts. We included estimated costs to acquire such middleware software from an external vendor, considering the expense of the software itself, licensing and support fees, and costs to consult with the Council and train its officers. We also discuss how the Council could use this middleware software to create more consistent housing data, plan programs for maintaining the Council's housing stock more effectively, and reduce the number of repeated requests for housing repairs from tenants.

In Chapter 5, we provide recommendations to the Council. These recommendations include: implementing a middleware system, providing training sessions for officers so that they could familiarize themselves with the new system easily, creating a secure, user-friendly web

interface for social tenants, and offering tenants training resources such as tutorials. We also include these recommendations in a formal business case, which we submitted to Croydon Council in its standard format, in Appendix M.

2. Background

This section presents the background information that we used to analyze the data we collected and to form conclusions and recommendations for Croydon Council in our business case. We begin by describing the pressures placed on local governments by the national government through reduced funding as well as the more specific pressures placed on the Department of Adult Services, Health and Housing (DASHH) by Croydon Council's Corporate Programming Office (CPO) through strategic priorities. We then discuss the complexities of social housing and Croydon's tenant population that DASHH manages along with the organizational structure of DASHH itself. We enumerate several programs and local initiatives that both Croydon Council as a whole and DASHH in particular have developed for providing better services to residents in Croydon. We also describe the housing information systems that DASHH currently uses and the obstacles that the department faces because of the inefficiencies that these systems present. Finally, we discuss several case studies about obstacles that several organizations have faced while implementing new technology and strategies for overcoming these obstacles. We incorporate these ideas into our business case, which appears in Appendix M.

2.1 Financial Situation

After the 2008 financial crisis, national and local governments have developed methods for aligning to key organizational priorities and decreasing spending. These methods include reducing funding to subsidiary agencies to achieve lower operating budgets and adopting sets of indicators to measure progress toward the organizations' financial goals.

2.1.1 Reduced Funding and Increased Initiatives from the National Government

As a result of the recent recession, national governments have reduced the amount of financial assistance they provide to local governments. The national government budget has fluctuated over the past three years, decreasing by 2% overall since Fiscal Year 2010. Because of these fluctuations, the government has directed less funding to housing services over the past few years (HM Treasury, 2011; HM Treasury, 2012; HM Treasury, n.d.).

The Liberal Democrats coalition, which gained power in Parliament during May 2010, has also encouraged local governments to become more financially self-sufficient. This new

government expressed its desire to “return decision-making powers [related to] housing...to local councils” and encouraged financial autonomy for community authorities (HM Government, 2010). As a result of the recent recession and national policy development, the national government has spent 10% less on social housing per year for the past three years, as Table 1 illustrates below.

Table 1. Trends in UK national budget 2010-2012 (HM Treasury, 2011; HM Treasury, 2012; HM Treasury, n.d.)

Fiscal Year	2010	2011	2012
Total budget (£ billion)	697	710	683
Amount spent on housing (£ billion)	27	24	21

In addition to these more direct pressures on local government agencies, the national government has recently applied additional pressure on local governments by introducing a series of National Indicators (NIs). These NIs measure how local agencies improve the quality of their local services while reducing costs. One such National Indicator, NI 14 (“Avoidable contact”), encourages local governments to actively prevent repeated contacts from their customers. The national government has estimated that 40% of calls to local governments include unnecessary requests for status or clarification of services that these local agencies provide (Local Government Improvement and Development (IDeA), 2010). A similar National Indicator, NI 179 (“Value for money”), requires local governments to save at least 3% annually by improving efficiency and value for money (Department for Communities and Local Government, 2011).

Some of the methods for improving value for money according to NI 179 include:

- Providing an equal or better level of service while reducing costs;
- Handling increased demand for services while avoiding proportional increases in costs;
- Reducing volume of procured goods as unit costs increase;
- Selling redundant assets (Communities and Local Government, 2009)

2.1.2 Pressure on DASHH from Croydon Council to Deliver Quality of Service

Despite the increased pressure and decreased funding from the national government, some local agencies, such as DASHH, have actually experienced *increases* in their budgets over the past year. The Council has established DASHH as one of the organization's most important departments. As of March 2011, the Council devotes 28% of its budget to housing, second only to education (35%) (Croydon Council, 2012). In spite of the diminishing funds available to its parent agencies, the budget for DASHH has increased over the past year because the department has received funding from external organizations (Pevan, 2012). Since DASHH received this external funding, the Corporate Programme Office (CPO) has placed additional pressure on DASHH to deliver services that align with the six priorities of the Council's Community Strategy, one of which is "Delivering high quality public services and improving value for money" ("Corporate Programme Office: Project and Risk Management Workshop," 2012).

2.2 The Complexities of Managing Croydon Housing

Croydon is one of the largest boroughs in London and therefore has numerous types of social housing properties and a diverse group of tenants. DASHH manages Croydon Council's social housing properties and tenants.

2.2.1 Complexity of Social Housing in Croydon

The Council's social housing stock is large and complex, and its tenants are numerous and diverse. Croydon Council owns about 14,000 properties and manages over 120,000 dwellings. These properties include houses, apartments, estates, and blocks – buildings that contain apartments (Croydon Council, 2011b; DASH, 2012; Taylor, 2012). In addition, DASHH provides housing services for 16,100 tenants and general housing advice for 2,600 households in 2010 (DASHH, 2010). Croydon has a population of 342,900 as of 2011, making the borough the largest town within Western Europe without city status (Greater London Authority (GLA), n.d.b; Croydon Strategic Partnership, 2011). About 21% of citizens in Croydon are under the age of 16, and about 35% of people are a part of a black and minority ethnic group (BME) (Greater London Authority (GLA), n.d.b; London Councils, 2011).

2.2.2 Structure of DASHH

DASHH has the largest employee base out of all of the departments within Croydon Council and contains a departmental structure that includes four divisions. DASHH employs 1,400 staff members (more than 10% of Croydon Council total) as of May 2010. As Figure 1 illustrates, these divisions provide a range of services, from interacting with tenants directly and planning programs to improving the quality of life for Croydon’s residents. See Appendix A for additional information about Croydon and DASHH.

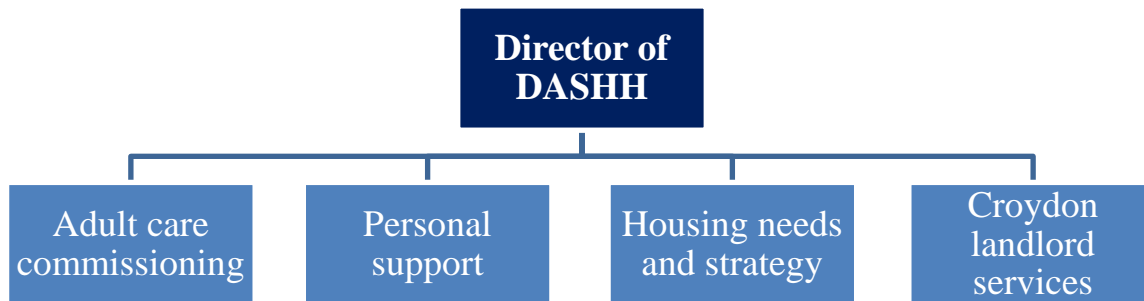


Figure 1. Structure of DASHH as of April 2012

2.2.3 Croydon’s Efforts to Improve Local Services

Croydon and DASHH have developed several programs for improving customer satisfaction. Croydon in particular has created a series of performance indicators for measuring progress towards better communication with borough residents.

2.2.4 Overall Council Initiatives

The Council has recently adopted and proposed several programs to improve customer satisfaction:

- **“One Croydon” website** – Places all customer services in one easy-to-access location for tenants who have the technical skills and resources necessary to access and navigate the Internet.
- **“Tell Us Once” service** – Allows residents to inform Croydon Council about a birth or death in their households only once, mitigating duplication of effort among staff members.

- **“Call Quality Monitoring” management** – Ensures that Council staff members will converse with their tenants “in [a] considerate and helpful manner” and use language that residents can understand easily. The Council also uses this quality monitoring across letters and emails to and from tenants (Croydon Council, 2010b).

The Council established a set of performance indicators to measure the Council’s progress towards improving customer service. Table 2 shows that Croydon has set up a series of performance indicators related to customer service as well as a quantitative goal for each of these indicators. The Council has improved its ability to interact with tenants through one-time conversations, but it continues to face challenges with providing service to tenants in a timely manner (Croydon Council, 2011d).

2.2.5 DASHH-Specific Initiatives

To receive feedback from tenants, DASHH has set up the following programs:

- Community Housing Panels
- Tenant & Leaseholder Panel
- Residents’ Associations and Forums
- Specialist Interest Groups & Panels
- Mystery Shopping
- Neighborhood Voice (Croydon Council, 2010d)

The department has recently taken additional strides to improve quality of service. According to Croydon’s Housing Strategy 2006-10 report, DASHH receives over 3,000 calls weekly and can respond to and manage about 50% of these. In order to better handle calls from tenants, the Council has created web pages for tenants to complete applications and share their opinions about the Council’s services (Croydon Council, 2007).

Table 2. Croydon Council Performance Indicators for customer service during Fiscal Year 2011

Indicator Code	Indicator Name	Indicator Description	Jan-Dec 2010 Actual Performance	Jan-Aug 2011 Ideal Performance	Jan-Aug 2011 Actual Performance
RCCSCC01	Access Croydon (all visitors) seen within 15 minutes	The percentage of Access Croydon visitors with whom the staff interacts within 15 minutes of arrival to the Council building.	83.24%	95%	77.65%
RCCSCC05	Contact Centre: % abandoned calls	The percentage of phone conversations where the customer ends the call before a Council staff member can respond to it	15.27%	12%	16.02%
RCCSCC09	Percentage of one and done transactions (Access Croydon and Contact Centre)	The percentage of phone conversations with tenants that do not require a follow-up call	54%	70%	59%

2.3 Current Housing Information Systems in DASHH

DASHH currently places its housing information into two systems – Apex and the Open House Management System (OHMS) – and uses visualization software called the Geographic Information System (GIS). The Council uses Apex to store housing property information, such as number of bedrooms and number of boilers. On the other hand, the Council uses OHMS to store information about the tenants themselves, such as tenants’ rent accounts, lease signing dates, and most recent repair dates. The Council uses GIS to display some of the information stored within these two systems on an interactive map of the Croydon borough.

DASHH encounters obstacles with Apex and OHMS. As Figure 2 illustrates, the two systems currently do not have a direct connection; therefore, officers need to access each database separately, leading to inconsistencies in shared pieces of information between the two databases. Also, some officers in DASHH do not have access to the databases but still require pieces of information from them. These officers need to complete a time-consuming process of requesting other officers to summarize this information in Excel spreadsheets. For example, the Council’s Contact Centre needs to communicate with the Responsive Repairs department to retrieve information regarding repairs because the team does not have access to Apex or OHMS. In addition, no continuous connection currently exists between these two databases and GIS, which prevents officers from geographically viewing data as it is updated.

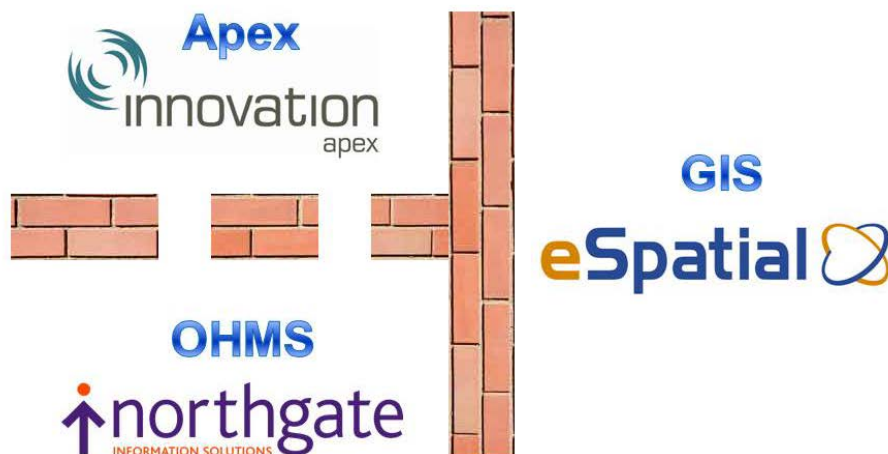


Figure 2. Lack of communication among Apex, OHMS, and GIS

Tenants also experience difficulty acquiring information about their properties which is stored within these systems. Because tenants do not have access to information about their properties from these databases, tenants currently need to call the Contact Centre repeatedly, increasing the length of call wait times. Also, some staff members in the Contact Centre have difficulty speaking some of the tenants' more than 100 native languages, which can cause staff to misinterpret tenants' needs (Croydon Council, 2010a).

2.4 Organizational Obstacles to Introducing New Technology

Workplace and organizational barriers lead to significant challenges as agencies attempt to implement and promote new technology. One of these barriers might be that organizations are hesitant to change because the proposed technology might not align well with their current corporate strategies. The introduction of new technology could challenge current business practices and upset users accustomed to the current systems (Committee on Enhancing the Internet for Health and Biomedical Applications: Technical Requirements and Implementation Strategies).

Eynon and Margetts (2007) rank "Workplace and organizational inflexibility" as one of the top four barriers to promoting eGovernment within an organization. (eGovernment is a form of digital communication between a governing body and its citizens.) They highlight how current organizational practices have been in place for many years and have served specific purposes. eGovernment meets resistance because it challenges these practices and proposes new methods of managing public services.

A case study from Estonia about implementing new systems identifies "administrative barriers, existing work practices, lack of motivation for changes," and hesitation from the IT department as major organizational barriers to the project. The IT managers expressed hesitation in allowing an external company into their own workplace. Another case study on an eVoting initiative in Spain called Madrid Participa mentioned a political group known as the Districts' Governing Bodies as one of the key sources of resistance to the promotion of the project. The new communication channels that allowed direct contact with tenants threatened the Governing Bodies' positions as political middlemen (DG Information Society and Media European Commission, 2007). To ease the transition to systems featuring new technology, organizations have adopted several methods – such as having a Chief Information Officer (CIO), developing

an Electoral Board, and providing regular evaluations of the IT induced benefits – to reduce staff and users' reluctance to change.

Eynon and Margetts emphasize that an organization can mitigate resistance to the usage of new technology by creating CIOs within the agency. These CIOs can reduce reluctance to change by not only managing the newly implemented technology but also by identifying the potential business value of the new system (2007). Siefert and McLoughlin mention in their report about eGovernment strategies that an effective CIO can significantly increase the chances of successfully introducing eGovernment. For the problems encountered by the governing council within the eVoting initiative, the council developed an Electoral Board. This Electoral Board was comprised of organizational representatives, local citizens, and experts that dealt with the technological and legal aspects of the project to aid in the promotion of the initiative (DG Information Society and Media European Commission, 2007).

In Bilgihan *et al.*'s discussion of barriers to information technology, the authors mention that “conducting regular evaluation of IT-induced benefits” can help promote new technology within the IT department. Bilgihan *et al.* also mention how companies can handle resistance from staff members by encouraging regular communication and collaboration as well as by identifying people who can help their colleagues learn about the new system (Bilgihan, Okumus, Nusair, & Cobanoglu, 2010). Promoters of the project in Estonia managed the IT department's reluctance to having an external vendor come into the company by providing them training so that they could develop the system themselves (DG Information Society and Media European Commission, 2007).

In Fincham's article about the relationship between consultants and clients, he highlights additional methods that companies can use to mitigate resistance to change:

1. **Ensuring that staff feels as if the organization is invested in them.** Staff members who train officers need to assist people in transitioning to a new system and make sure that their colleagues appreciate the value of the training staff's presence.
2. **Providing a vision of the benefits of using a new system.** This vision includes an end goal and the steps needed to achieve this objective.
3. **Including officers within the process.** People will accept changes more easily if they are regularly informed about the progress of the project and are commended for their progress in adjusting to these changes (Fincham, 1999).

For the purposes of improving communication between housing databases through implementation of a new technology, Croydon Council will need to consider these organizational obstacles. In particular, the Council could encounter resistance to changing to a new system and hesitation from the IT department regarding the procurement and implementation of the new system. The Council could apply the methods described above to address these concerns.

3. Methodology

For our project, we developed a business case (see Appendix M) outlining several desirable methods of providing communication among the currently-used systems from a single location. We completed the following objectives to fulfill this goal:

1. Create an inventory of Croydon Council’s databases;
2. Create an inventory of strategies used by other boroughs;
3. Identify (dis)advantages of the current database systems;
4. Identify (dis)advantages of possible future database systems;
5. Determine tenants’ opinions about a possible web interface;
6. Identify and assess the value of alternative options and make recommendations to Croydon Council for several feasible options.

To provide recommendations to Croydon Council, we examined the Council’s housing databases. We also determined opinions about the advantages and limitations of these systems. Finally, we determined expectations for services provided in the future system from officers and tenants through interviews, focus groups, and questionnaires. The methods that we used for each objective appear in Table 3.

Table 3. Methods used for each objective

Objectives	Documents/			
	Case Studies	Interviews	Focus Group	Questionnaire
Council’s databases	X	X		
Other boroughs’ databases	X	X		
Opinions of current systems		X	X	X
Opinions of potential future systems		X	X	X
Tenant opinions			X	X
Recommendations		X		X

3.1 Existing Documents and Case Studies

We examined existing documents to explore the structures of DASHH's housing information systems, especially shared pieces of information between Apex and OHMS (Objective 1). We also created an inventory of projects that borough councils across London have completed to improve housing management (Objective 2). In particular, we looked at case studies from the London Borough of Brent and the London Borough of Hounslow to better understand current geographic mapping software. This information helped us determine the pieces of database communication software that are compatible with these two databases and GIS.

3.2 Interviews

We conducted interviews throughout our research process to gather officers' opinions about the current systems. As shown in Table 4, these purposes specifically included: obtaining more information about the current use of databases in Croydon Council (Objectives 1 and 3) as well as in other borough councils within London (Objective 2), gathering opinions from Council staff about the need for a new system (Objective 4), and exploring the potential value that the middleware system would offer (Objective 6). Interviewees ranged from officers in Croydon Council who work with databases in their day-to-day work to officers from other boroughs. By exploring the project from such a variety of perspectives, we ensured that our business case presented options that satisfied the requirements of as many stakeholders as possible. After each interview, we asked the interviewee for recommendations about the people we should meet with next, fulfilling the prescription of the Snowball sampling process (Biernacki & Waldorf, 1981).

We interviewed 16 people, including officers in Croydon Council, officers outside of Croydon Council, and external vendors. We divided them into eight different groups to protect their privacy. We have listed these groups in Table 4, along with the objectives of our interviews with members of each group.

Table 4. Objectives for interviewing each group of Council officers

Group #	Group Name	Objectives
1	Stock Investment	To learn about their opinions regarding current housing databases and their expectation for the new system
2	Responsive Repairs	To learn about the relay of information among the Contact Centre, Responsive Repairs department, and the Planned Maintenance department
3	Tenant Consultation Team	To learn about how they interact with the housing databases and how tenants communicate with Croydon Council
4	Financial Services	To learn about how they interact with the current housing databases
5	Sustainable Development and Energy	To learn their opinions about GIS and how they interact with the databases
6	Corporate GIS/Corporate ICT	To learn about the feasibility of each option that we proposed
7	Other Boroughs in London (Brent and Hounslow)	To learn about how they implemented their new system and the obstacles they met during their implementation processes
8	External Vendors	To identify whether or not the vendor could provide our proposed middleware software and, if so, to identify the costs associated with implementation and maintenance

3.3 Focus Groups

We conducted a focus group with Council officers to better identify their different needs with using a new system (Objectives 3 and 4). We conducted another focus group with tenants to determine their opinions about the need for a web-based interface that they would use to interact with data from this new system (Objective 5). We invited Council officers to our focus group based on suggestions from our sponsor. This focus group included members from Groups 1, 2, and 5. Based on information provided to us by the Tenant Consultation Team, we were able to invite nine tenants with varying technological backgrounds. An officer of the Tenant Consultation Team helped facilitate this focus group with tenants. Feedback within both of these focus groups remained anonymous. A copy of the preamble and questions for each focus group appear in Appendix E.

3.4 Questionnaires

For our project, we distributed two questionnaires – one to officers and one to tenants – to determine their needs with the current and potential future database systems (Objectives 3, 4, and 6) as well as determining the services that tenants would expect to use in the web interface (Objective 5).

We sent the tenant questionnaire by post to 297 residents and distributed the officer questionnaire online to 25 Council staff members. Members of the Tenant Consultation Team provided us a list of the tenants who were interested in completing a questionnaire and helped us in developing questions for this questionnaire. We distributed our officer questionnaire through SurveyMonkey. Our project liaison recommended a list of officers in DASHH who would be closely related to our project to use as respondents.

Responses from both of these questionnaires remained anonymous. We received a 72% response rate for the officer questionnaire and a 19% response rate for the tenant questionnaire. A copy of the questionnaire that we distributed to officers in Croydon and the questionnaire that we sent to social housing tenants appear in Appendix K and Appendix I, respectively.

4. Data & Analysis

Based on data collected using methods mentioned in the previous chapter, we present several analyses, including those of the project's key stakeholders, the similarities and differences in topics covered during our interviews with Council officers, and results from questionnaires we distributed to officers and tenants. As we conducted these analyses, we recognized several recurring challenges regarding the current system. Taking these challenges into account, we proposed three possible solutions, which appear in the Options Analysis. After considering the advantages and disadvantages of each option, we selected Option 2 – Middleware System as the most feasible option for the Council to consider implementing. We present a Cost Analysis and Risk Analysis for this option near the end of this chapter.

4.1 Stakeholder Analysis of Council Officers

The majority of the six groups of highly involved Council officers we interviewed support our Database Communication project because they could envision how a new system would benefit their day-to-day work. Table 5 summarizes their roles, levels of involvement, motivation, and other factors as suggested by our sponsor liaison. The table shows that members of the Information and Communications Technology (ICT) team have high influence on the business case for this project because they would be implementing the new system and would have administrative rights to change the information stored within the GIS database. This table also shows that other teams that we interviewed have lower influence because their involvement with the housing databases is less direct. The financial team is more concerned with the consistency of the information within the databases to decide on housing stock rents, and the Tenant Consultation Team uses its own database to keep track of the varying needs of Council tenants.

The Council would encounter several procurement and technical constraints as it developed a new system. Based on our conversations with the ICT team, if the Council chose not to develop the new system in-house, it would establish a contract with an external vendor, which would incur a significant cost for the Council. The ICT team also mentioned several technical constraints associated with developing the new system, such as: data cleansing, security rights,

data updating, data replication, data format conversions, and maintenance of the new system. These constraints would lead to a very time-consuming and expensive development process.

In order for the business case to be promoted up the Council hierarchy, the project would require significant support from the Corporate GIS and Corporate ICT teams. The Corporate GIS team and Corporate ICT team have the most experience with developing business cases of software solutions. Therefore, significant endorsement from them would prove to Council executives that the system options we present are indeed feasible.

Table 5. Analysis of project stakeholders

Group	Department	Involvement	Influence	Supporter	Motivation and Comments
1	Stock Investment Members	High	High	Yes	<ul style="list-style-type: none"> • Communications between Apex and OHMS • Consistency in data • System with capability to complete multiple queries simultaneously • System to pinpoint inconsistencies in data • System to have user-friendly interface • GIS display necessary information • Single interface • Tenants having more access
2	Responsive Repairs Member	High	Medium	Yes	<ul style="list-style-type: none"> • Easier access to information with fewer restrictions • Photo capability for issue description • Online tool with more information open to tenants
3	Tenant Consultation Team Member	High	Low	Yes	<ul style="list-style-type: none"> • Prefer their databases interacting with Apex and OHMS • Online tool with more information open to tenants
4	Financial Services Member	High	Low	Yes	<ul style="list-style-type: none"> • Communication between databases • Note-taking and history-tracking capabilities
5	Sustainable Development and Energy Member	High	Medium	Yes	<ul style="list-style-type: none"> • Consolidation of data • Communication with GIS
6	Corporate GIS/ Corporate ICT Members	High	High	Yes, with conditions	<ul style="list-style-type: none"> • Interaction of GIS with middleware solution • Interaction of databases with middleware solution

4.2 Discussions of Current and Future Systems with Council Officers

During our discussions with officers within Croydon Council, most of them explained that the current housing databases contain inconsistent data that officers update irregularly because not every staff member has access to the databases. The officers also expressed the need for a new system to provide access to more consistent housing data using a single interface and the capability to view this information geospatially using GIS. We also conducted several interviews with Council officers from other boroughs where we learned about the interactive map tools that they use to identify patterns and analyze geographic regions.

4.2.1 Discussions with Officers within Croydon Council

We have conducted a series of interviews with Council officers to better understand the state of the housing management systems that the Council currently uses and to identify the services that a new system should support. A summary of our findings from our interviews appears in Table 6 on the following page, and more extensive summaries from each interview appear in Appendix C. Another summary of the similarities and differences among ideas regarding the problems associated with the current systems and the expectations for a future system appear in Table 7.

Since information appears in two different databases, officers within DASHH are having difficulty managing their data and accessing the information they need. Based on our interviews, the two databases have separate functions and operate independently despite containing some overlapping information. To mitigate this issue, Mr. Taylor (Asset Management Officer), currently needs to locate inconsistencies manually within the data and modify the information accordingly. This long process introduces time delays in analyzing this information.

Officers encounter significant difficulties in viewing housing information using GIS because there is no direct link between GIS and the databases. In order to view information on GIS, officers must first complete a time-consuming process of manually converting the information from database format to GIS format. GIS is not updated continuously but rather at night, causing time delays for officers who have to verify the data the following morning before they can analyze it.

Table 6. Findings from Interviews with Council officers

Group #	Group Name	Difficulties with Current System	Expectations of a New System	Note
1	Stock Investment	<ul style="list-style-type: none"> • Consistency in data • Need to construct summary spreadsheets manually using Excel upon requests from other officers 	<ul style="list-style-type: none"> • Communications between Apex and OHMS • Have a system with capability to complete multiple queries simultaneously • System to pinpoint inconsistencies in data • System to have user-friendly interface • Use GIS to display necessary information • Single interface 	N/A
2	Responsive Repairs	<ul style="list-style-type: none"> • Lack of information, leading to maintenance repair conflicts • OHMS has limited capabilities and restrictions • Limited access to information and external companies make changes to the database; no two-way exchange of information 	<ul style="list-style-type: none"> • Easier access to information with less restrictions • Photo capability for description of housing issues • More information available to tenants 	<ul style="list-style-type: none"> • Uses OHMS but not Apex
3	Tenant Consultation Team	<ul style="list-style-type: none"> • Not all tenants have Internet access • Current website is not user-friendly; therefore, tenants do not use it often 	<ul style="list-style-type: none"> • Would prefer their databases interacting with Apex and OHMS 	<ul style="list-style-type: none"> • Tenants prefer face-to-face communication • Uses neither Apex nor OHMS • Sounding Board has its own database

4	Financial Services	<ul style="list-style-type: none"> • Inconsistency in data within the OHMS system and Apex • Irregular updating • Lack of data cleansing when data migration took place and periodically on live • GIS is slow to use and has limited data • Lack of capability to keep track of history of changes 	<ul style="list-style-type: none"> • Middleware solution that linked data from each system • Note-taking/History tracking capability 	<ul style="list-style-type: none"> • Financial team has its own Oracle database • Uses OHMS but not Apex • People have view- only access; therefore, cannot modify the data
5	Sustainable Development and Energy	<ul style="list-style-type: none"> • Currently need to ask Carl to retrieve information • Patchy and incomplete data for private housing stock • Limited functions in GIS 	<ul style="list-style-type: none"> • Consolidation of data • Would like to use GIS to see all information he needs • Middleware solution that allows representation of data in GIS 	<ul style="list-style-type: none"> • Need data from OHMS and Apex but has limited interaction with these systems

Table 7. Summary of Trends within Interviews with Council Officers

	Similarities	Differences
Difficulties with Current System	<ul style="list-style-type: none"> • Inconsistent data • Irregular updating of data • Limited access to databases • Limited functionalities of current system 	<ul style="list-style-type: none"> • Limited functions in GIS • Need to construct summary spreadsheets manually using Excel upon requests from other officers • GIS responds to input after significant delays
Expectations of a New System	<ul style="list-style-type: none"> • Consolidation of data • A middleware solution that allows representation of data in GIS • System to have user-friendly interface 	<ul style="list-style-type: none"> • Photo capability for description of housing • Note-taking/History tracking capability • Access to data with less restrictions

During our focus group featuring Council officers, they all agreed that a new system would reduce inconsistencies in housing information and allow them to visualize data using GIS, increasing their work efficiency. Such strong consensus shows the extent of support for this project from different departments in the Council. A more detailed summary of this focus group appears in Appendix H.

4.2.2 Discussions with Officers outside Croydon Council

We conducted an interview with Hounslow Council and completed an email exchange with Brent Council to better understand how these organizations use their geographic mapping systems. Traffic officials in Hounslow use a tool called ParkMap, which includes a visual display of traffic restrictions and links to the legal background of these policies. These officials use ParkMap to identify patterns in these restrictions. In Brent, officers use a product called StatMap Earthlight to view information from Brent’s two property-related databases on a map of the borough. Officers can then use this map to access the properties of different buildings and even analyze geopolitical units in the borough.

4.3 Communication with Social Housing Tenants

We distributed a questionnaire included in Appendix I to 297 social housing tenants, and we received 67 responses (22.6% response rate). We also conducted a focus group with nine

social housing tenants in Croydon. A summary of our discussion with them appears in Appendix F.

We have provided an analysis of the above results, particularly regarding existing communications with the Council and tenants' expectations of a web interface that would interact with a middleware system, in the following section.

4.3.1 Existing Sources of Communication

Through our questionnaire (Appendix J), we learnt that the Council's tenants are satisfied with the current communication channels but can still see room for improvement. Of the 67 people who replied to our questionnaire, 84% suggested that they were "fairly satisfied" or "very satisfied" with current channels of communication, 12% of people were "neither satisfied nor dissatisfied," and only 3% were "fairly dissatisfied," with no one choosing "very dissatisfied" (see Figure 3 and Table 14).

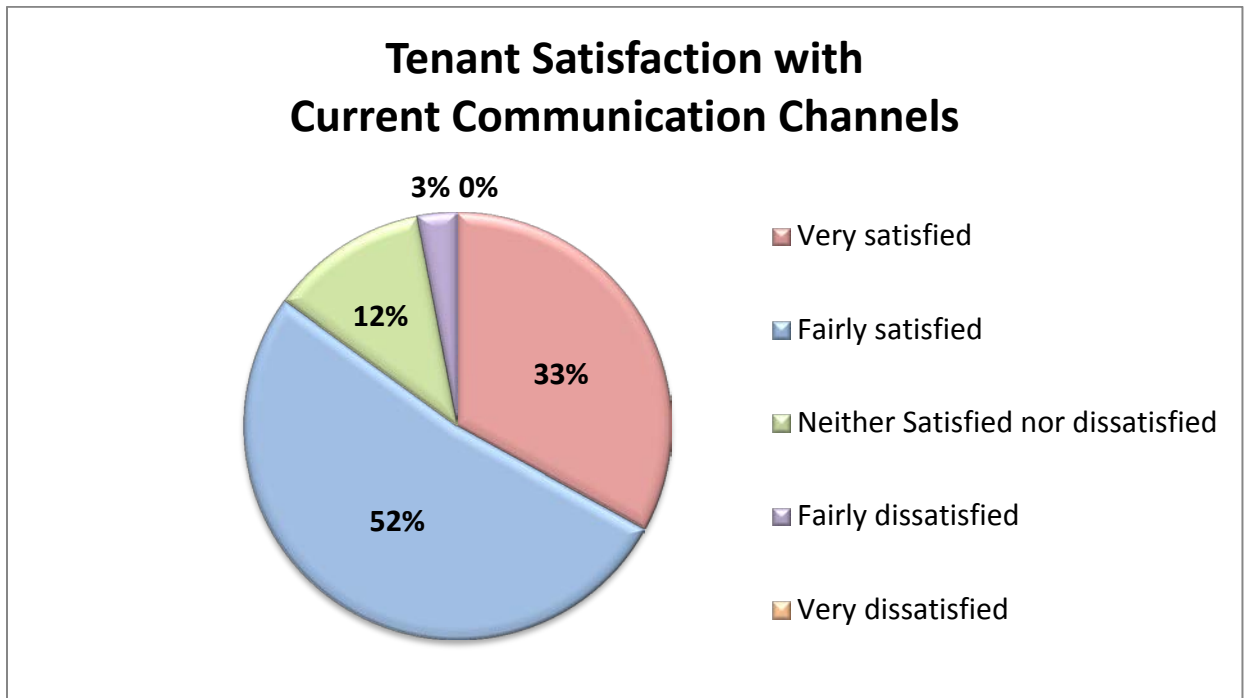


Figure 3. Tenant satisfaction with current channels of communication with the Council

During our focus group, tenants were satisfied with the recent reduction in call waiting time –approximately from 20 minutes to 6 minutes. Tenants responded enthusiastically over the prospect of accessing information online. However, they also expressed a desire to keep the current channels of communication open. In particular, one tenant mentioned that the Council should keep phone lines to the Contact Centre open so that tenants who do not have access to the Internet could still communicate their concerns regarding their dwellings and rent accounts to the Council.

4.3.2 Tenants Expectations

Tenants would like to use an online portal to access their housing information. Of the 67 people who responded to our questionnaire, 60% claimed that they would like an online tool allowing them to access housing information and applications, while 30% responded with “no,” and 10% did not respond (see Figure 4 and Table 17). If such a large proportion of tenants used a web interface instead of calling the Contact Centre, the Council would receive far fewer phone calls, especially repeated phone calls, therefore reducing the number of avoidable contacts. Furthermore, out of 18 respondents who currently do not access to the Internet, 39% would still like the ability to access their information online.

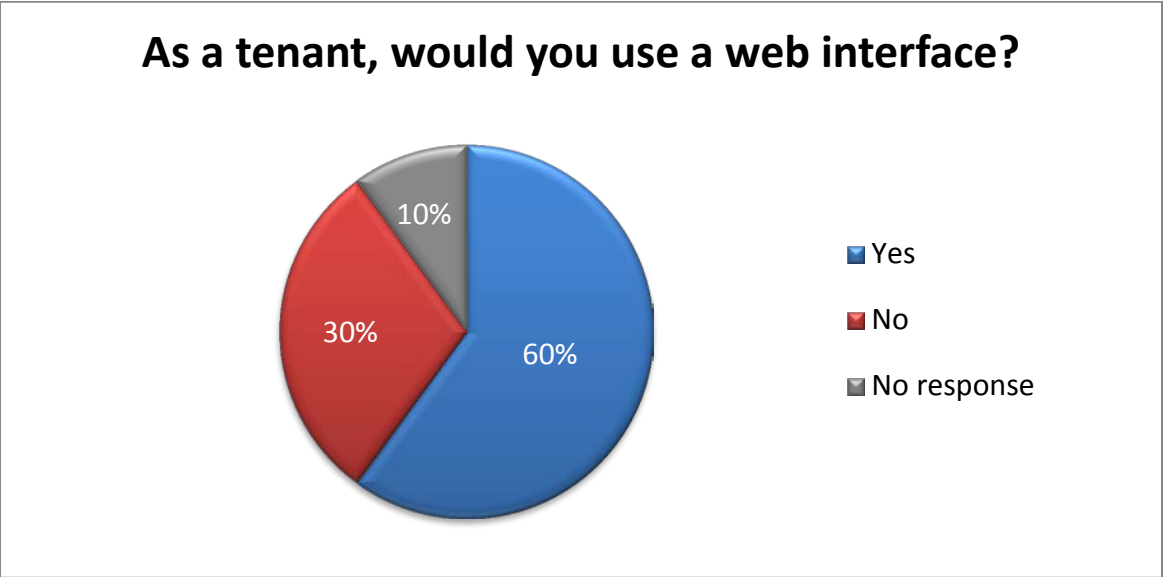


Figure 4. Tenants’ willingness to use a web interface to access information about own homes

This online portal will be a web interface providing tenants with secure self-access to information related to housing services such as: planned maintenance, rent account information, status of short-term repairs, and minutes from meetings with the Council. Based on our

questionnaire to tenants, 88% of respondents currently contact the Council for information regarding status of repairs, 25% request rent account information, and only 12% inquire about planned maintenance projects, such as new kitchens and new bathrooms (see Table 12). When we questioned tenants who would like to use the web interface about services they would like this interface to support, 90% of them would like to track their requests for short-term repairs, 75% would like to see information regarding their rent accounts, 68% would like to view information about planned maintenance to their dwellings, and 15% provided other requests, such as viewing minutes of Tenant Consultation Team meetings and information about disability services (see Table 18). Based on these results, the online tool needs to allow tenants to access information about their rent accounts and planned maintenance more quickly and easily than through the Contact Centre. Tenants would also like the new tool to provide contact information of Council officers as well as minutes from meetings with the Tenant Consultation Team.

This web interface needs to be readily accessible and easy to understand. Of the tenants who completed the questionnaire, 27% of them do not have access to the Internet either at their home, on their phone, or at any public location (see Table 15). Also, tenants in our focus group suggested that there should be access to the Internet in public areas.

During our focus group, we found that most tenants raised concerns over the technical capabilities of borough citizens. They were very concerned with older tenants not being able to use this new tool because of their lack of knowledge in using computers. Therefore, they insisted that the new tool should have a very simple interface so that tenants who lack technical proficiency could still learn how to use this new system. One tenant even suggested that the Council install touch screens throughout Council buildings because it would allow tenants who do not have access to Internet to use the web interface. The Council could provide training sessions and tutorials for the online tool so that tenants could learn how to access information about their homes and accounts.

4.4 Services to Offer for Council Officers

We distributed a questionnaire (Appendix K) to 25 staff members in Croydon Council, 72% of whom responded. Through our questionnaire (Appendix L), we learnt that officers expect the new system to offer the following services: a single, user-friendly interface, consistent data, and visualization of data. When we asked officers about the key services that the new

system should include, 83% of the 18 respondents showed that they would like to use a single interface to access housing information, 72% of them would like the data in both systems to be consistent, 67% requested that the interface be user-friendly, and 50% want to visualize housing information graphically (see Figure 5 and Table 22).

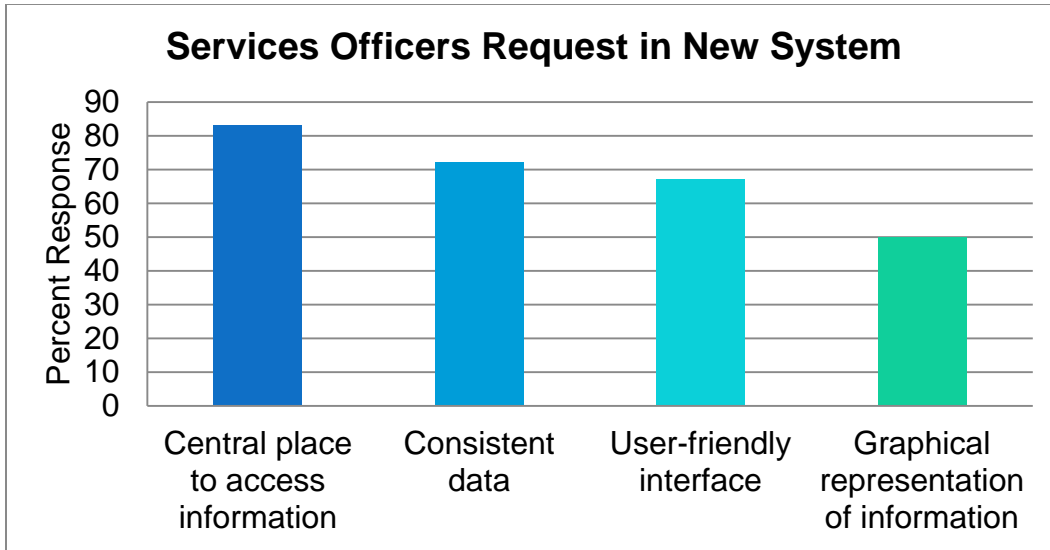


Figure 5. Services to include in new system based on responses to officer questionnaire

Most officers also expressed an interest in training and workshops to ease their transition into using a new system. Of the 18 respondents, 78% claimed that they would like to use training sessions or workshops to learn how to use the new system, 56% said that a mentorship or super user program would be useful, and 33% requested video tutorials or user manuals as future references (see Table 23).

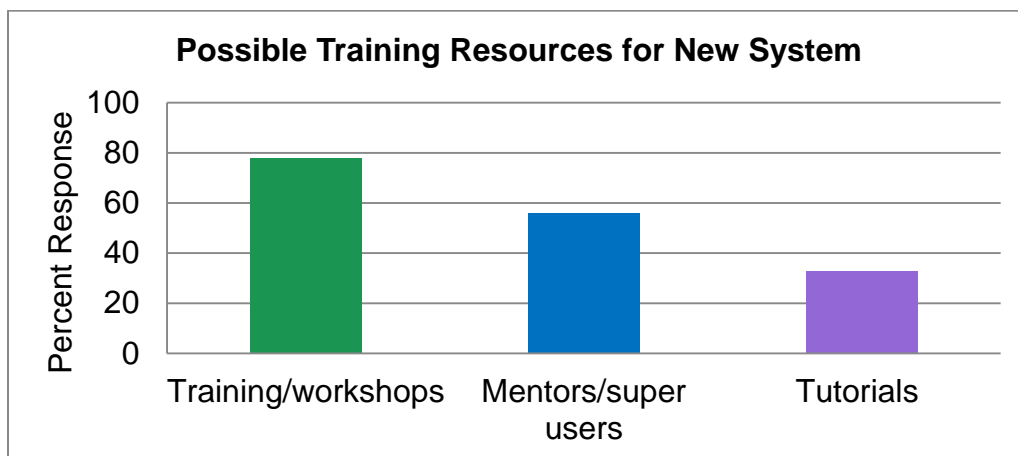


Figure 6. Training resources to provide for new system based on responses to officer questionnaire

4.5 Analysis of Potential System Option

We took three options into consideration for our business case (see Appendix M), including Option 1 – Do nothing – and two potential solutions which could help mitigate issues with the current system, as listed below:

- **Option 1: Do nothing** – Continue to update and view housing information using Apex and OHMS, exporting summary data to Excel as necessary.
- **Option 2: Middleware system** – Implement middleware that provides a single interface for viewing information from Apex and OHMS. The system also offers links for displaying this information in Excel and GIS.
- **Option 3: Integrated system** – Migrate the information and functionality of Apex and OHMS into a centralized system, with the ability to view all this housing data using GIS.

We discuss the main advantages, main weaknesses, and impact of each of these options in our Options Analysis below. Our conclusion is that Option 2 – Middleware system – is the most feasible option for Croydon Council.

4.5.1 Option 1 – Do Nothing

A visual representation of the current housing management system appears in Figure 7 below:

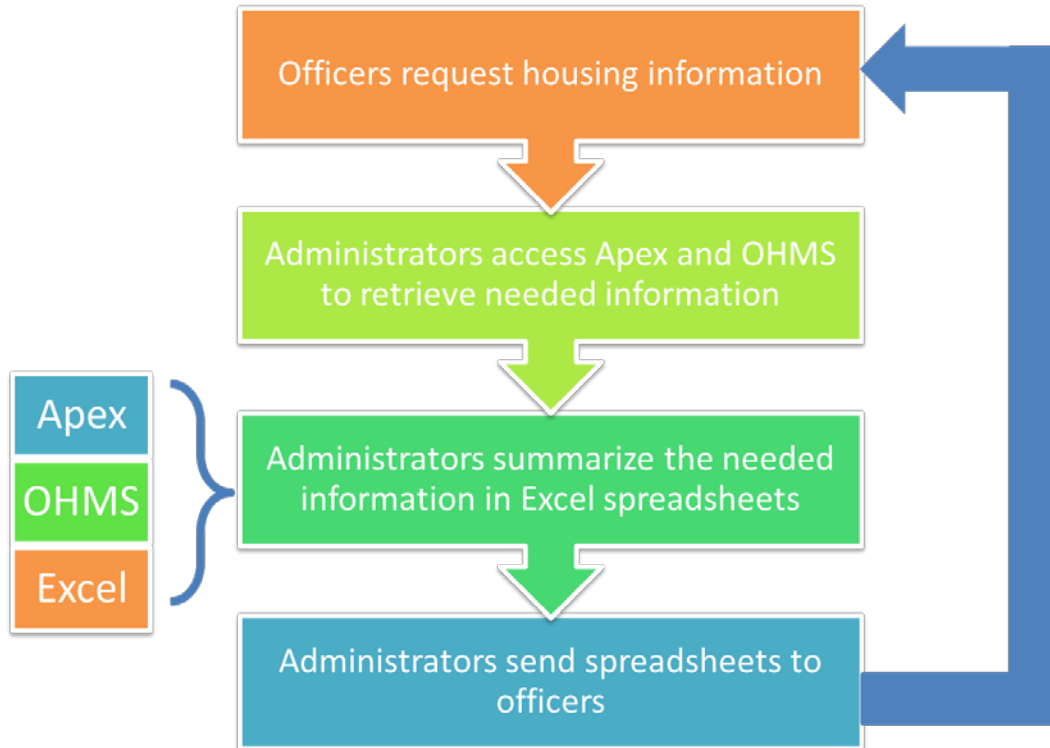


Figure 7. Visual representation of Option 1 – Do Nothing

When officers do not have access to the Apex and OHMS databases, they have to request officers who do have access to these systems to retrieve the information they need. These officers with access to the databases then export the relevant data from Apex and OHMS and summarize this information in Excel spreadsheets. The officers with access to the databases can then relay these spreadsheets back to the officers who initially requested the data.

4.5.2 Option 2 – Middleware System

A schematic of the middleware system and the relay of information appear below in Figure 8:

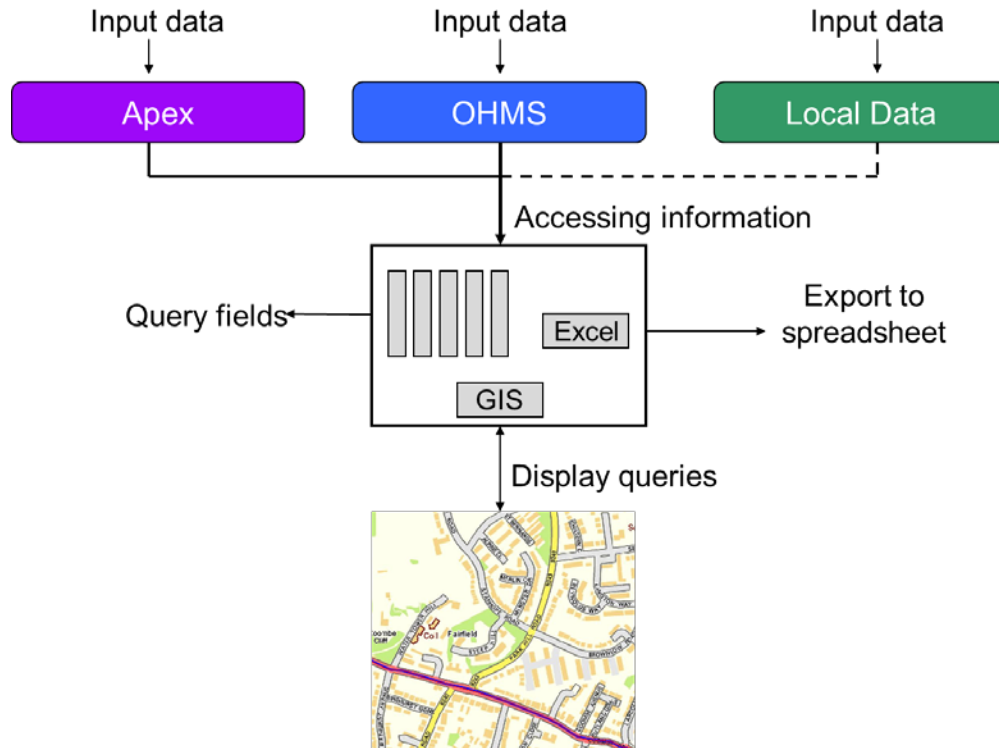


Figure 8. Visual representation of Option 2 – Middleware System [Updated]

This picture shows the relay of information using Option 2 – Middleware System. As shown, the three systems – Apex, OHMS and local data – would still remain intact, and users could continue to input data within these three systems. The middleware would provide an additional layer for allowing officers to access the data in three independent systems from a single location. The system would also be able to identify inconsistencies among the databases so that officers could make changes accordingly. Users could then export the data into Excel spreadsheets or temporarily view the data using GIS. The interface would be very simple and allow users who are less familiar with Apex and OHMS to view the information that they require without needing to contact someone who is more accustomed to using these databases.

4.5.3 Option 3 – Integrated System

A visual representation of option 3 appears below in Figure 9:

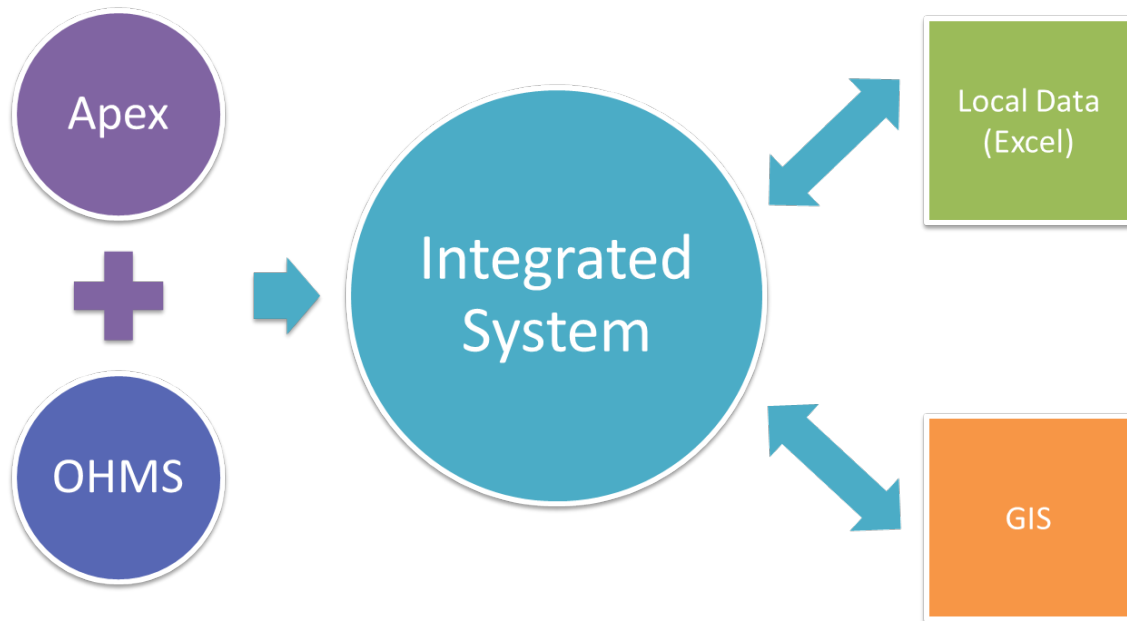


Figure 9. Visual representation of Option 3 -- Integrated System

This diagram represents a system that would feature a single database containing all the information stored within the Apex and OHMS databases. This system would also be able to provide all the functionalities of these databases and offer a direct, continuous link to the GIS software and local data in Excel. Since the data would be stored in one single location, officers would not experience any inconsistencies in information. The system would also support a user-friendly interface that officers could learn to use quickly and easily, especially with support from training materials.

4.5.4 Options Analysis

Based on the results collected from our options analysis (Table 8), we recommend Option 2 – Middleware System as the most feasible solution for Croydon Council. Even though choosing Option 1 – Do Nothing would not present any immediate costs to the Council, DASHH officers would continue to face the challenges with the current systems, including disparity in information, inconsistency in data, and the lack of a dynamic link to GIS. Option 3 – Integrated System would provide the same impacts and similar outcomes as Option 2 but would be significantly more expensive; Option 3 would cost more than £250,000 for implementation while Option 2 would cost only about £64,700 to implement. In addition, Option 3 would have a lengthier implementation timescale because of the extensive effort required for data cleansing and data migration, while Option 2 would not require any data cleansing or data migration. Option 3 would introduce an entirely new system, completely replacing Apex and OHMS. Therefore, the new interface would require training for all DASHH officers. Option 2 would also require training but because Apex and OHMS would still remain intact, DASHH officers could continue using the old systems as they learn to use the new interface, creating an easier transition process into the new system.

Table 8. Options Analysis for Possible Database Communication Systems

Option #	Short Description	Main Advantages	Main Weaknesses	Conclusion/Impact if Chosen
1	<p>Do nothing – Continue to update and view housing management information from Apex and OHMS, exporting summaries to Excel as necessary.</p>	<ul style="list-style-type: none"> • Officers know how to use the current housing management system • No immediate cost • No short-term disruption or change 	<ul style="list-style-type: none"> • Housing data remains inconsistent • Time delays in reporting information • Officers cannot access information from both databases at the same time • No continuous communication between current databases and GIS, leading to discontinuous updating of GIS 	<ul style="list-style-type: none"> • Still could not view information using GIS • Difficulty in using combinations of data to conduct analyses
2	<p>Middleware system (preferred) – Implement a middleware that serves as a single interface for querying information from Apex and OHMS. Also offers links for displaying this information using Excel or GIS.</p>	<ul style="list-style-type: none"> • User-friendly interface • Offers temporary views of GIS without overloading system storage space • Reduction in report delays • Access to all databases from a single location • Could identify inconsistencies 	<ul style="list-style-type: none"> • Data inconsistencies still possible • Data security concerns • Costly • New system will require training 	<ul style="list-style-type: none"> • Improved data quality • Improved data management • Improved employee efficiency
3	<p>Integrated system – Migrate the information and functionality of Apex and OHMS into a centralized system, with the ability to view data using GIS</p>	<ul style="list-style-type: none"> • One single, coherent database with functionalities of Apex and OHMS • No inconsistencies in data • No time delays in file conversion and data updating • Continuous updates to GIS 	<ul style="list-style-type: none"> • Very costly (commission, design and procurement, at least £250,000) • Extensively long implementation process • Data security concerns • New system might require training 	<ul style="list-style-type: none"> • Improved data quality • Improved data management • Improved employee efficiency

4.5.5 Cost Analysis of Option 2 (Middleware System)

We conducted an interview with an external vendor to determine estimates for the cost of procuring a middleware system. Table 9 includes cost estimates only from this external vendor and excludes in-house costs, such as the number of hours that ICT staff dedicates to the implementation process. The middleware software license would represent only about 40% of the cost of the system over the first three years of use. The non-production environment, where developers could test the features of the middleware system, costs 50% of the license fee. After developers have finished implementing the system, the vendor would offer training sessions featuring one-on-one interaction. This vendor does not set a definite limit on the number of users who could attend each of these training sessions but recommends a maximum of eight users. As people use the system, the vendor would offer maintenance and troubleshooting support for the system at 20 to 30 percent of the licensing cost per year.

Table 9. Middleware system cost estimation

Items	Price
License (engine and CPUs)	£31,000
Connectors to existing systems	£12,000
Non-production environment	£15,500
Support (per year)	£6,200-£9,300
Consultants (1 day, 1 person)	£1,500
Training (1 day, 8 people)	£2,800
Minimum Total Cost during First Year	£69,000
Minimum Total Cost over 3 Years	£81,400

If the Council procured a middleware system from the external vendor described above, it would incur the vast majority of costs during the first year, as Figure 10 shows below. In subsequent years, the Council would pay only the support and maintenance fee from the vendor.

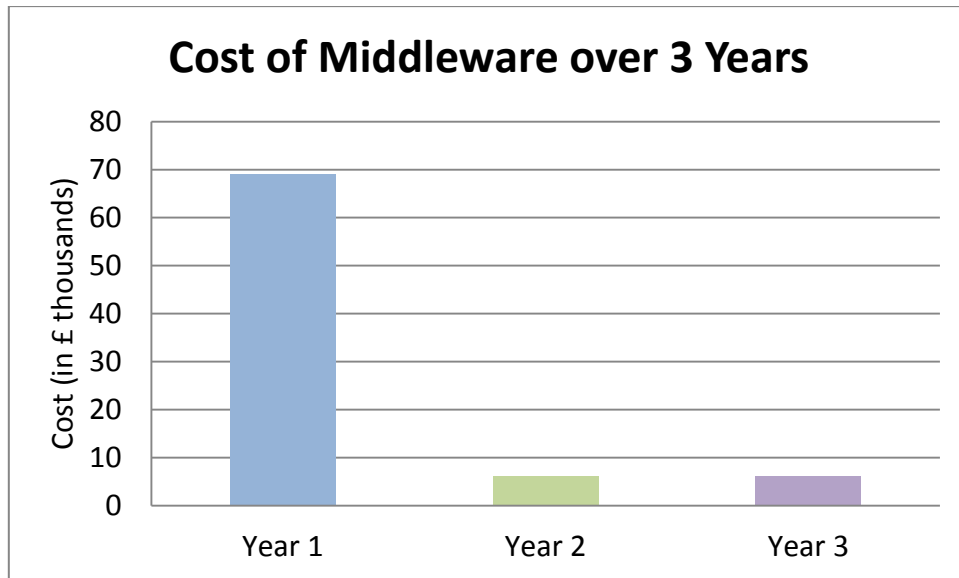


Figure 10. Varying estimates of costs of middleware system from external vendor over first 3 years

4.5.6 Risk Analysis of Option 2 (Middleware System)

As we spoke with Council officers, particularly those from the ICT and GIS teams, we identified several risks that the Council would face if they decided to implement the middleware system as well as the impacts of these risks on the Council (see Table 10). One of the major risks with implementation is the ICT team's hesitation with disclosing sensitive information. Their reluctance to provide external vendors with private information would lead to delays in the implementation process. Another key concern would involve the level of difficulty officers would experience when they complete the transition to the new system. If the middleware were too complicated to use, the system would be underused and would not deliver as much business value to the Council.

Table 10. Analysis of risks associated with implementing middleware system

Risk #	Risk Description	Impacts
1	Implementation issues (power failure, delayed schedule, changing opinions among stakeholders)	Prolonged project time, which leads to more cost
2	Disclosure of sensitive information by external vendor	Data compromised
3	Differences in opinions between external vendors and officers	Delay or discontinuity of project
4	Decreased funding or increased costs	Incomplete implementation
5	Officers find it too difficult to use the system	Middleware is underused
6	Maintenance takes a long time to complete	Problems could not be fixed immediately, causing delays in work
7	Excessive work to produce consistent data	Increased costs, delay of project
8	Council inexperienced with types of middleware similar to the one proposed for this project	Lack of ability to fix problems with middleware independently
9	System costs outweigh benefits	System no longer viable
10	Data inconsistency appears in web interface	Less satisfying experience for tenants

5. Conclusions & Recommendations

Our recommendations are based on the following major conclusions from our analysis:

- Officers would be more likely to use a new system if it were to offer a single, user-friendly interface, consistency in housing data, and visualization of data using GIS;
- The majority of tenants would like to use a web interface to access their housing information;
- Council management needs broad support from the Housing Stock Management, Corporate ICT, and Corporate GIS teams to successfully implement the system

The following sections recommend future actions for Croydon Council. We begin by suggesting a middleware system that officers could use to view information from two different databases using a single interface. We then recommend several factors to consider when implementing the web interface for social housing tenants. By following these recommendations, the Council could better improve officers' work efficiency and tenants' satisfaction. The formal business case that we submitted to Croydon Council in its standard format (see Appendix M) is based upon these recommendations.

5.1 Recommendations for the New System for Council Officers

Currently, there is no continuous link between Apex and OHMS, which leads to duplicate or inconsistent data between these two databases. In addition, both of these databases do not have a dynamic connection with GIS. These challenges decrease Council officers' work efficiency. We formed two recommendations to address these challenges:

- DASHH should strongly consider implementing a middleware system that would mitigate the challenges officers encounter with the current housing systems;
- Croydon Council management should ensure that the project gains strong support from members of the ICT team before beginning the implementation process;
- Croydon Council should offer training resources for the new system before having officers use the system.

The following paragraphs include further information regarding these recommendations.

1. DASHH should strongly consider implementing a middleware system that would mitigate the challenges officers encounter with the current housing systems.

A middleware system could address current challenges by offering:

- A user-friendly single interface
- Support for temporary GIS sessions without overloading GIS
- A reasonable cost of implementation and operation

DASHH should strongly consider a single, user-friendly interface to view housing information so that officers in Croydon Council who are not familiar with Apex and OHMS could still retrieve this data easily. Our questionnaire to officers showed that 83% of respondents believe that Council officers need a single interface to view information, and 67% agree that the interface needs to be user-friendly. This simple and easy-to-use interface would reduce delays in reporting information for all officers, even those who are unfamiliar with the Council's current housing systems.

A new middleware system should offer a dynamic link between the two housing databases – Apex and OHMS – and GIS, which could allow officers to analyze housing data more easily and to view information as their colleagues update it. Based on results from our questionnaire to officers, 50% of respondents would like the new system to present housing information graphically. From our interviews, we found that officers would like the middleware to connect with GIS so that they could visually determine the trends of some selected pieces of housing information.

In addition, GIS should support temporary sessions, which could avoid overloading the GIS software. Since officers would see only the information they requested in GIS, they would receive a more concise overview of this data, allowing them to make better decisions regarding Council projects.

The cost of the middleware system is about 33% of the integrated system's cost. This lower price would reduce the expenses of Croydon Council in alignment with its "Value for Money" priority.

2. Croydon Council management should ensure that the project gains strong support from members of the ICT team before beginning the implementation process.

Members of the ICT team manage the implementation of information technology projects in Croydon Council and, therefore, the project requires their support. Based on our

stakeholder analysis, the ICT team has one of the highest influences in our project. This team possesses the most technical skills and resources within the Council and would best understand the value of introducing the middleware system into the Council. By supporting the project, the ICT team would encourage Council management to procure a middleware system from an external vendor.

3. Croydon Council should offer training resources for the new system before having officers use the system.

Croydon Council should offer several training resources – such as workshops, super users, mentors, tutorials and manuals – to allow officers an easier transition to the new system (Figure 11). Officers may overcome their resistance to change to the middleware system after they understand its new functionalities and easy-to-use interface.

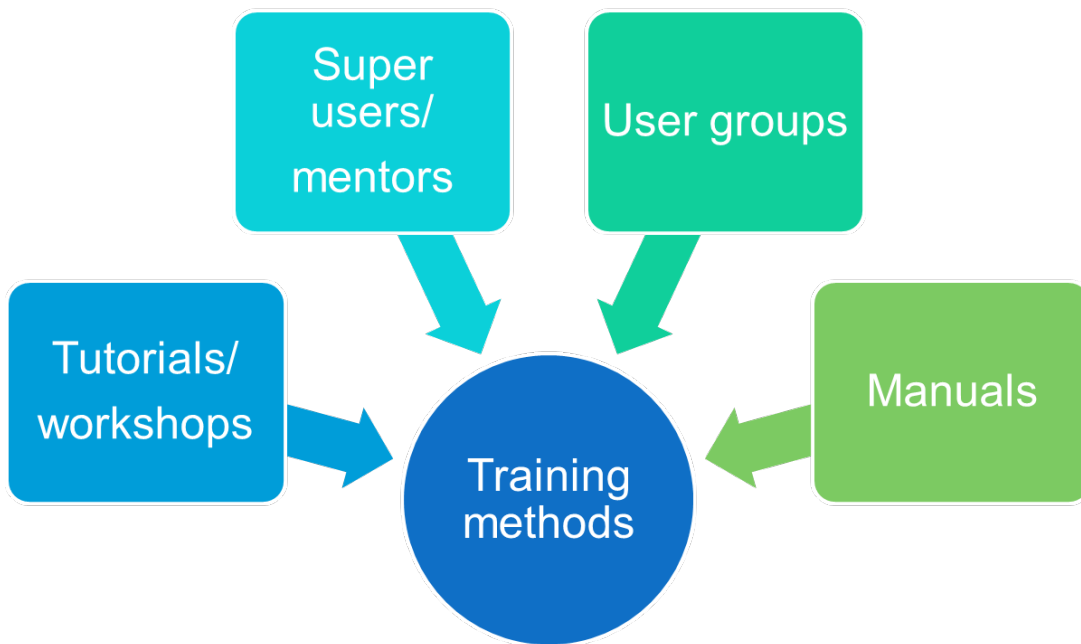


Figure 11. Training resources Croydon Council could use to educate officers about using the middleware system

Based on our Cost Analysis, we realize that having external vendors train all officers would be very expensive (at least £100,000). Therefore, we recommend that the Council have an external vendor train only a few of its officers to serve as “super users” of the middleware

system. These super users could then lead in-house training sessions with the other officers that would use the system.

Although we have looked only at DASHH's applications of using this middleware system, the system could provide connections to databases in other departments within the Council, provided that the Council allocated more funds toward forming these connections. The system could support these additional links because it could provide a single interface to access multiple sources of information, not limited to the ones available to officers in DASHH.

5.2 Recommendations for the Web Interface for Tenants

Social housing tenants cannot yet access information about their dwellings by themselves. Currently, they have only a limited number of methods to track the status of their requests for repairs, such as calling the Council's Contact Centre or visiting the Council office. To alleviate the pressure that the Contact Centre currently faces, we suggest that Croydon Council should consider:

- Creating a web interface for tenants to access housing information;
- Providing training resources to teach tenants how to use the web interface;
- Offering free access to the web interface using touch screens in public areas;
- Keeping its phone lines to the Contact Centre open for tenants to use.

1. Croydon Council should consider creating a web interface for tenants to access housing information.

As described in our Data and Analysis section, 60% of respondents would like to use a web interface, 30% would not like to use it, and 10% of respondents did not answer the question. During our focus group with tenants, participants explained that the majority of their calls to Croydon Council involve requests for the status of their repairs and updates regarding their rent account. If the web interface could provide tenants with this information, the Council might not receive as many calls from residents, therefore reducing the number of avoidable contacts in the Council. With this reduction in contacts, staff members would be able to devote more energy to answering the more substantial questions that residents might have for them.

Croydon Council should make the web interface easy to use, considering the diversity of tenants. The web interface should be easy for tenants to navigate to attract more interest

from users (Cober, Brown, Levy, Cober, & Kepping, 2003). According to Croydon Council's workforce profile for year 2009-2010, citizens in Croydon speak more than 100 languages. Therefore, the web interface should incorporate pictures and translations of text so that tenants who speak different languages could understand information within the web interface (Croydon Council, 2010a).

2. Croydon Council should consider providing training resources to teach tenants how to use the web interface.

These training resources would teach tenants how to use the web interface. Because of the possibility of varying levels of technical proficiency among Council tenants, having user manuals and video tutorials available to all tenants would assist them in using the web interface more effectively. Tenants could then pass along this newfound knowledge to their social housing neighbors.

During Sounding Board and Tenant Consultation Team meetings, Croydon Council should invite tenants to test the web interface during the pre-release phase of the project to ensure that they could successfully navigate the interface. Based on comments from tenants during these meetings, the Council could then revise its training materials for tenants to address their most commonly expressed concerns.

3. Croydon Council should consider offering free access to the web interface using touch screens in public areas.

Of the 18 respondents to our tenant questionnaire who currently do not have access to the Internet, 39% would like to use the web interface to access information about their homes if they could have access to the Internet. Therefore, the Council should provide Internet access in public areas for residents. In our focus group with tenants, participants suggested that the Council could provide residents with convenient access to the web interface by installing touch screens in widely-used public areas. The Council would need to guarantee that these public areas would provide secure access to the web interface.

4. Croydon Council should consider keeping its phone lines to the Contact Centre open for tenants to use.

Based on our interview with members of the Tenant Consultation Team, only about one-third of Council tenants use email on a regular basis. Also, many social housing tenants in Croydon do not have the skills or resources needed to use a web interface regularly and

would prefer to call the Contact Centre to request information. Even the tenants who would use an online tool may still wish to communicate with the Council using more traditional methods in certain situations, such as asking for help in navigating the web interface or more specific concerns that the web interface might not be able to address. The introduction of a web interface would provide an additional method for tenants to communicate with the Council, but the Council should keep its phone lines open to continue satisfying all of its tenants' needs.

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Appendix A: Sponsor Description

Greater London comprises 32 boroughs or local government authorities. The London Borough of Croydon is one of the 19 outer boroughs and is located in the southern part of the city (Figure 12. Map of London's boroughs with Croydon highlighted in blue). The Borough was formed on April 1, 1965, mostly from the former territory of the County Borough of Croydon (Croydon Council, n.d.). It encompasses an area of 87 km² and, as of 2011, has a population of almost 342,900, which makes it the second-most populated borough in London (Greater London Authority (GLA), n.d.b) and the largest



Figure 12. Map of London's boroughs with Croydon highlighted in blue (London Council, n.d.)

town within Western Europe without city status (Croydon Strategic Partnership, 2011). Apart from being heavily populated, the borough is very young demographically, with about 21% of its population being under the age of 16 (Greater London Authority (GLA), n.d.b). The borough's population is also ethnically diverse, with black and minority ethnic groups (BME) making up about 35% of the total. Although the borough has one of the lowest unemployment rates within London (4.4%), the work force consists mostly of unskilled or low-wage laborers (Croydon Observatory, n.d.; Gocmen & Ventura, 2010; London Councils, 2011)

The Greater London Authority (GLA) is the strategic authority for London and provides opportunities for economic, social, and environmental development within the city (Greater London Authority (GLA), n.d.a). The GLA works closely with the local councils of the 32 boroughs in London (Greater London Authority (GLA), n.d.c). Croydon is governed by the Croydon Council, which caters to residents by providing various public services, such as street clean-up and maintenance as well as the collection of waste and recycling (Croydon Council, 2011a). It has about 10,500 staff members, making it the leading employer in the borough. The Council receives most of its funding from the central government and receives about £285 million in revenue annually, mostly from taxes and businesses (Figure 13.

Revenue received by the Croydon Council in 2009-2010 (Croydon Council, 2011a)). The Council spends most of this revenue on education and housing (Figure 14).

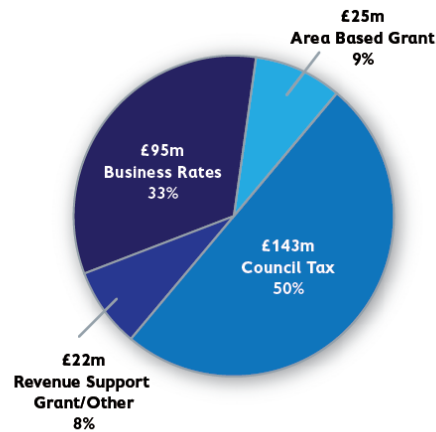


Figure 13. Revenue received by the Croydon Council in 2009-2010 (Croydon Council, 2011a)







Services	Pence	
Corporate Services Such as – finance and legal services performance, Human Resources and other head office related costs	0.03	
Cultural, Environmental and Planning Services Such as - libraries, waste and recycling and regenerating the borough	0.06	
Highways, Roads and Transport Services Such as – maintaining highways, fixing pot holes, gritting and parking services	0.05	
Education Such as – schools and other services for our youth and those with specialist educational needs	0.39	
Housing Such as – maintenance, repairs and housing benefits	0.29	
Social Services Such as – care services for the elderly and disabled people	0.17	

Figure 14. Croydon Council’s allotment of each £1 of revenue in 2009-2010 (Croydon Council, 2011a)

The Croydon Council is composed of 70 councilors elected from 24 wards. The Conservative Party holds the majority within the Council, with 37 councilors, compared with

33 representing the Labour Party. As shown in Figure 15, the Conservative councillors are primarily from the more affluent southern part of the borough, while the Labour councillors represent the wards in the north that tend to be less affluent and have higher numbers of BME groups.

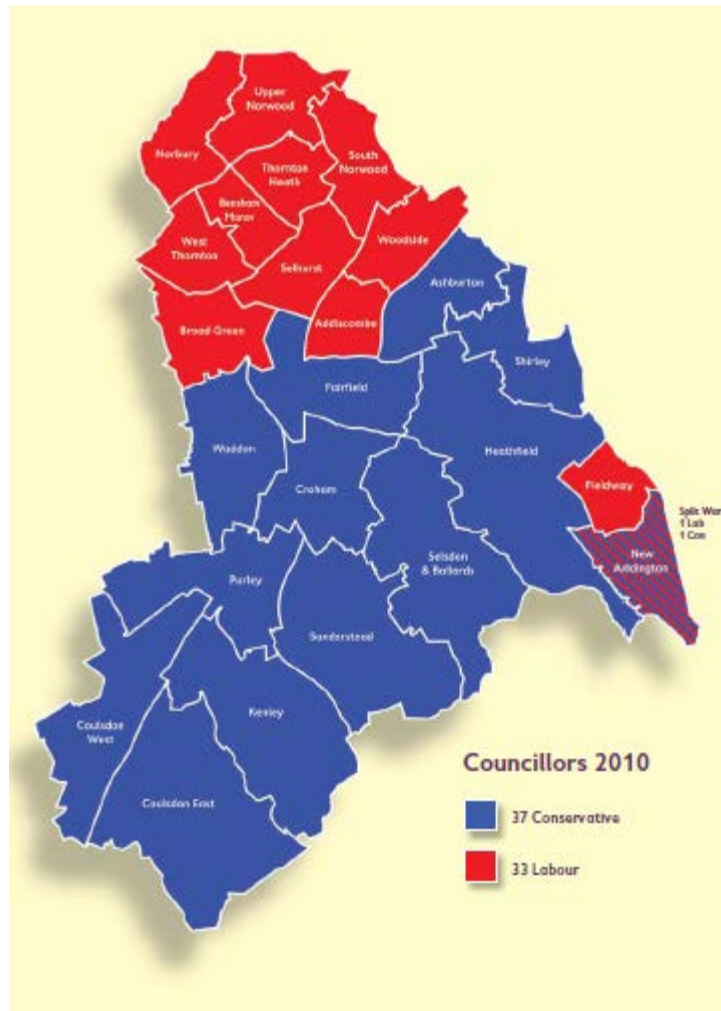


Figure 15. Political affiliation of Croydon wards in 2010 (Croydon Council, 2011f)

The councillors elect a mayor, a deputy mayor, and a leader each year from among their ranks. During annual meetings, the councillors decide on the members of the committees, sub-committees, working parties and outside bodies. In general, the borough council can be divided into three political functions – Executive, Committees, and Scrutiny, as shown in Figure 16. The Executive includes the leader and cabinet of nine other councillors, who form policies and provide recommendations to the Council. The Executive also provides management and financial advice to the directors of the borough’s nine departments. To be more productive and efficient, the Full Council has delegated various responsibilities to six

non-executive committees: the Corporate Services Committee, the Pension Committee, the Licensing Committee, the Strategic Planning Committee, the Planning Committee, and the Standards Committee (Croydon Council, 2011c). Councilors in these committees solicit input from citizens, council officers, and others about concerns or problems within the borough and help to identify potential solutions. The Scrutiny and Overview Committee serves to provide accountability for the executive department's decisions, and it works with other agencies in Croydon to improve the socioeconomic status of residents (Croydon Council, 2010c). All councilors may receive a standard amount of compensation, but they are not considered officers of the Council (Croydon Council, 2011c).

There are nine departments within the borough, each administrated by a non-elected Council employee known as the director. The chief executive, who receives directions from the Council leader and cabinet, oversees all of them (Figure 17) (Operation Black Vote, 2010). Our project will be lodged with the Department of Adult Services, Health and Housing (DASHH).

For FY2012, the Croydon Council has allotted a budget of £118 million to DASHH, and the department therefore receives more funding than any other department in the Council (Croydon Council, 2011e). DASHH offers various services for Croydon's residents, particularly low-income and vulnerable individuals. In 2010, DASHH provided housing services for 16,100 tenants and general housing advice for 2,600 households. DASHH has the largest employee base out of all the departments within the Croydon Council, with 1,400 employees as of May 2010 (DASHH, 2010).

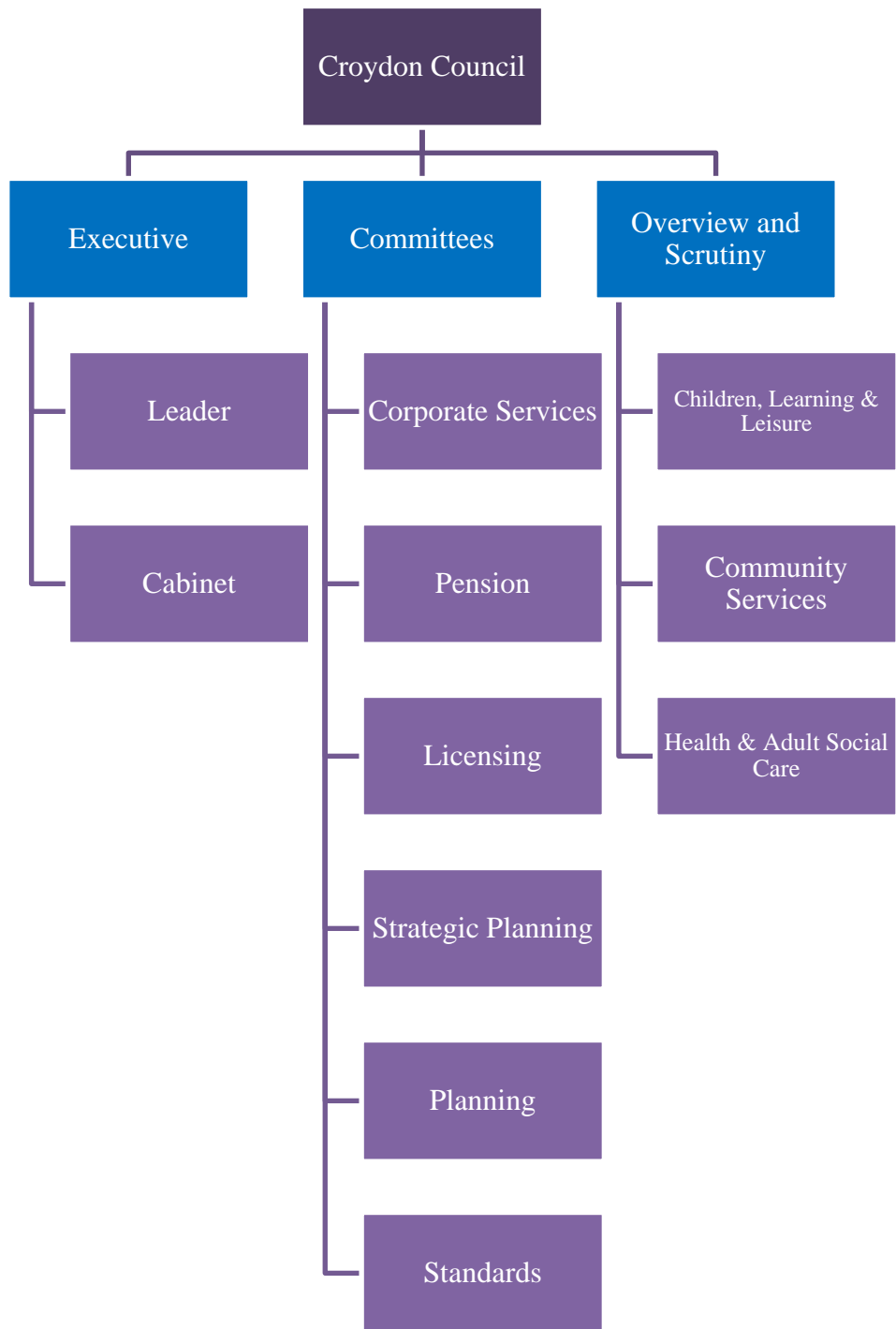


Figure 16. Structure of Croydon Council (Croydon Council, 2011c)

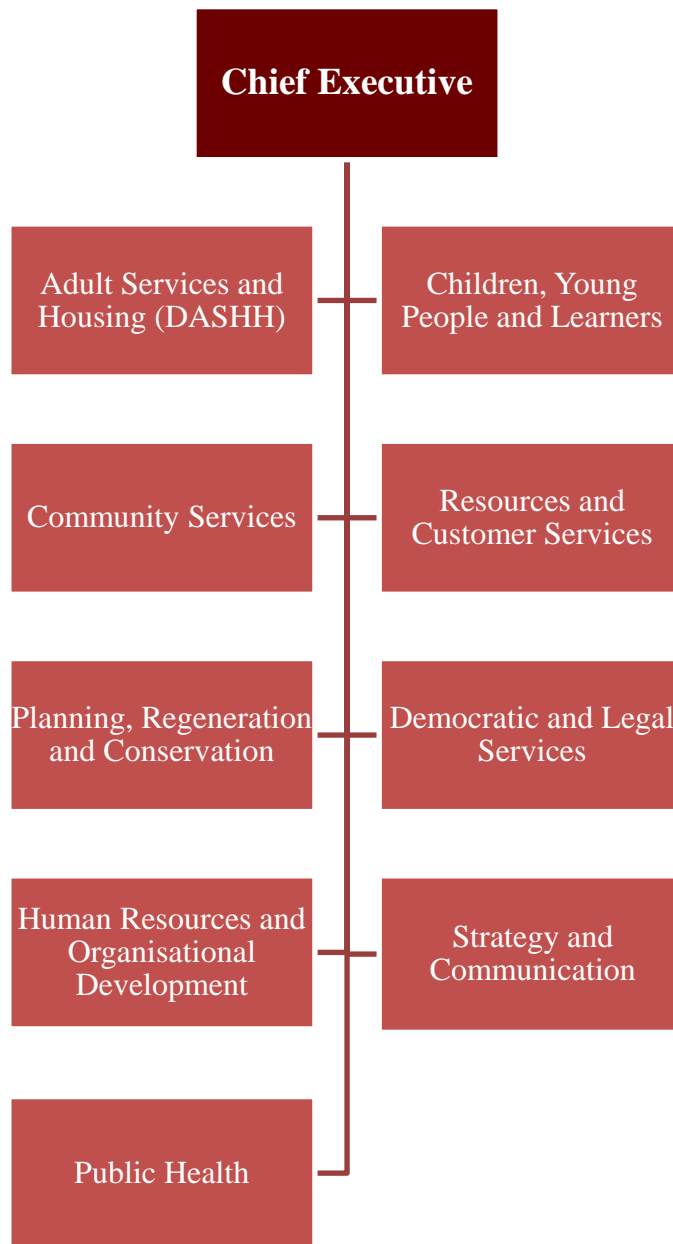


Figure 17. Management Structure of the Croydon Council (Operation Black Vote, 2010)

Figure 18 lists the four divisions within DASHH and the two other associations (the Southwest London Housing partnership or SWLHP and the Healthy Croydon Support Unit) that work with the department.

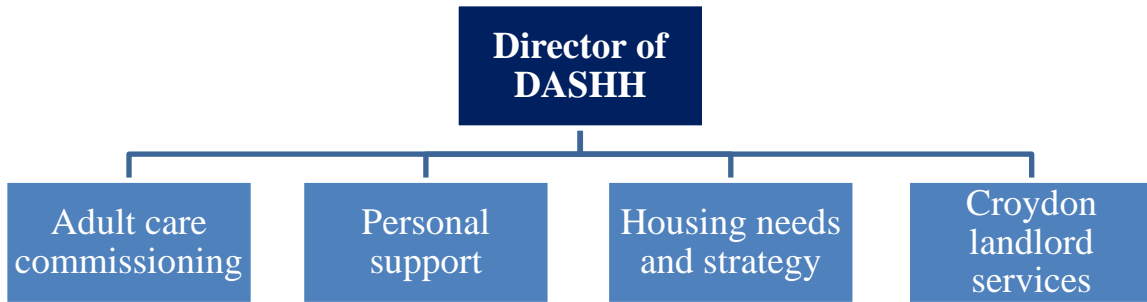


Figure 18. Organization of the Department of Adult Services and Housing (Croydon Council, 2012)

In addition to providing targeted services through its divisions, DASHH receives funding from the National Affordable Housing partnership and the Greater London Authority (GLA) as a member of the Southwest London Housing partnership (SWLHP). DASHH uses the proceeds from National Affordable Housing partnership to provide low-cost home rentals and purchases. The department uses money from the GLA to move citizens into vacant buildings and improve existing buildings within the private sector (DASHH, 2010).

Appendix B: Preamble for Interviews

Thank you for taking the time to speak with us today.

We are a group of students from WPI conducting research in partnership with the Department for Adult Services and Housing (DASHH) within the Croydon Council. DASHH has information about housing maintenance scattered across different databases that cannot connect with one another. This setup leads to difficulties in synchronizing information about housing maintenance and forces employees to respond to similar repair requests from tenants through phone calls and mail. The objective of our project is to develop a business case for integrating the information within each database into a centralized tool, such as GIS, and reduce the number of avoidable contact situations with tenants.

If you feel uncomfortable at any time during this interview, you may refuse to answer a question or leave the interview entirely.

Before we begin, may we have your consent to record this interview? Your insights into the following questions will provide significant contributions to our research.

Appendix C: Interview Questions

Responsive Repairs

1. What services should an improvement of the current system or an integration of these systems provide?
2. Do you know any useful contacts from other councils who we should talk to?
3. How many calls do you answer every day?
4. Do you have anyone specific we should talk to in the Contact Center?
5. If the interface for accessing housing management changed, would you be open to change, or would you still want to use the current system?
6. Do you text their mobile device?
7. Do you use CRM?
8. Does CRM take care of updating the appointment lists?

Tenant Consultation Team

1. Do all of them have access to a computer? To the Internet?
2. How comfortable do tenants seem with the communication options currently available to them with regards to housing repairs and maintenance (mail, call centre)?
3. What topics should we cover in a focus group featuring tenants who regularly attend tenant consultation team meetings?
4. How do tenants currently contact the Council?
5. How many people should we survey?
6. Can you please look at the survey we have developed?
7. When do you think would be an appropriate time to organize a focus group?

Corporate ICT

1. Can you please tell us about previous ICT projects that have been involved with data migration and data integration?
2. What are some of the common issues that usually develop involving these projects?
3. What factors should we consider in developing an ICT involved business case?
4. Can you mention other boroughs or organizations that have done similar projects?
5. How many different databases does DASHH have?

Financial Services

1. Can you tell us about your interaction with the databases?
2. What specific adaptations would you like to see?
3. Are you in contact with tenants?
4. Do you have another database to manage the financial data?
5. Have you encountered any difficulties within OHMS?
6. Can you think of any other boroughs that are working with integrated database systems?
7. Can OHMS give you the functionality that Apex can give you?
8. Why can't the OHMS data be housed within Apex?

Sustainable Development and Energy

1. What methods do the council's databases use to represent addresses for different houses?
2. Can you elaborate on your interaction with the databases?
3. Are there any other inconveniences with the current systems that you experience?
4. What services would you like the new system to provide
5. Can you mention other boroughs or organizations that have done similar projects?
6. Would you like to be a part of the focus group we intend on having?
7. What do you think about having a dashboard that pulled information from the different databases and relayed the information onto GIS?
8. Do you know where the Council's GIS software currently pulls its information from?
9. How do you currently see the data on GIS?

Corporate GIS

1. Could you elaborate on how GIS currently works with Apex and OHMS? Is there any backstage database that supports GIS currently?
2. How is data currently updated on GIS?
3. This is the system we envisioned (Present the draft of our schematic), and we are wondering if it is feasible? How can we improve this system?
4. What factors do we need to consider in terms of middleware solutions?
5. What are some common issues with the implementation of communication between GIS and databases?

6. How do you currently work with eSpatial?
7. Were you involved in the setup of the Oracle database that links with GIS?
8. If we envisioned a large database that contained all the functionality of APEX and OHMS, what are some of the restrictions and limitations that would disallow this database from being created?

Other Boroughs in London

1. Can we look at the system?
2. Can you give us a brief introduction about the structure of database and interaction with GIS?
 - a. Did you use one access point or a centralized integrated system?
 - b. How is the data updated? (real-time/incrementally)
 - c. Have you applied this system across other departments/fields? If so, how did you link those databases with GIS?
3. Have you encountered any problems with the system?
4. What are the opinions of employees and tenants about the new system?
5. Which software vendors did you consider before finalizing decision?
6. When looking for vendors, what factors did you consider most significant?

Appendix D: Summaries of Interviews with Council Officers

March 16, 2012: Interview with Responsive Repairs

- Differences between responsive and planned. Carl and Judy work with planned maintenance like external repairs improvement of stock, we deal with day to day requests such as leaky pipes.
- Most of the information is within OHMS for us. Should be history of repairs within OHMS. Have a lot of information available to us, only difficulty is that if somebody requests a job and maintenance has already be planned then there might be a conflict.
- We don't receive that many calls asking for information that contact center cant get, we might call Carl. More likely to make the call than to get the call.
- Speak to team managers, but even some people who are on the phones. Contact center manager is Natasha Patterson, she could direct you to team leaders. Request through carl and Judy.
- Did some work with Carl before. NI 14 gave us stats. Carl simplified excel spreadsheet which is now available to all contact center officers. Has been an improvement I the number of calls received by the back office because contact center now has more information available to us.
- We only use OHMS, but if we need information about stock we ask Carl. Bob's tea carries out planned maintenance work. Not really accessing the information through databases easier to just ask people about projects.
- OHMS is quite clunky, improvement costs money. Don't have unlimited rights. Restricted and limited capabilities. Will do what it needs to do until people put the information in the databases.
- If they can see the benefit of it then they will be willing to change as long as they see the benefit.
- Useful if they could look at repairs that they have already raised. Long way away from online requests. Would like tenants to see information that tenants had already called about. We do text to mobile devices.
- Internal complaints term uses CRM. CRM is a quick interaction does not give enough information. Not about which tenants calls the council.
- OHMS uses two external databases. Limited access to information and changes that external companies make to the databases. No two way exchange.

- Richmond housing partnership, called ICT consultants to create their own integrated system. Trying to build mobile app. Kia, has already built an iPhone app that does most of these functions. App has ability to attach photo through MMS and automatically updates the system online.
- Would like tenants to have the ability to text pictures to Council, to understand the projects required.
- Might be useful to talk with would be someone from our ICT team that understands the limitations with OHMS.

March 16, 2012: Interview with Tenant Consultation Team members

- Not all of them have internet access. Less than 50%. Email addresses for about a third but do bounce back. Keep in mind that they might be vulnerable and disabled so try to gauge that when you're thinking about websites.
- Face to face surveys, postal surveys, phone surveys. Most people call in then email and then visit. Focus groups would be best option.
- Invite people who have internet access. Could possibly send questions by text?
- Council itself does not do a lot of training, central government does most of the free training and we encourage the tenants to take these classes.
- Tenants feel more comfortable speaking with officers face to face even if it is time consuming. PR.
- Satisfaction surveys vary. We have meeting evaluations, which have really high satisfaction.
- People still don't like the website that much. Website not user-friendly. 30 people coming to focus group on Monday.
- Leaseholders have to pay for their repairs so they may be very interested in this part of the project. Pinpoint, interactive setting. Have some post its to put on the wall.
- Need to think about the right people needed? Might just send out a poll
- Can you give us an example of a positive experience that you have had with a different organization. Might be good to give a small description of what the tool would look like.
- Standard quality age groups: age brackets. Very often: constantly: daily, monthly, weekly
- Be more specific! Instead of DASHH put housing services. How about putting repair requests, planned maintenance (e.g. kitchen, baths), transfers and exchanges, tenancy issues, neighborhood services (e.g. street cleaning)
- No opinion. Be more specific with housing services, Have 1-2 open-ended questions. Would you like to have access to information online? do a list of options
- Keep it to the thing you want to talk about and have it as simple as possible. People won't know what a web interface is. Thinking about being more interactive
- Do survey first and ask them whether or not you would be interested in a focus group
- Mail them out first and then you can call them to do a recheck. Need a cover letter. Need a little thank you compensation. Give yourselves two weeks for replies.

- Make a note of you're going to cover during the focus group. We don't use OHMS at all. Have our own access database for the sounding board. Would love something that interacts with the system. Would be very beneficial for us. Everything would feed into the systems. Haven't bought any expensive systems.

March 16 2012: Interview with Corporate ICT member

- Not a programmer, don't design things, just manage the stuff and set up projects
Delivery manager, other teams have already assessed the feasibility of the project:
what can we do with this project?
- When they have worked out the high level solution then we look at how much it's
going to cost us. Write up a business case based on the benefits vs. cost understanding.
Usually led by IT solution team
- Some things are just very complex therefore harder to find a solution for which might
have other issues. Much more risk of things not being a successful. Startup phase
crucial to understand the solution.
- Always pressure, because people want things fast. IT is difficult because you need time
to understand the project. Project will start slipping after you discover new problems.
Have an accurate assessment of the project while developing the business case.
- Benefits include efficiency and process improvement. Also service improvement thing,
i.e. services that we provide to our customers.
- Maybe some new regulations show up and we need to worry about them. If we can
have the person calling into the council find the solution themselves it would help
drive the efficiency game
- Various levels of cost categories: people are most expensive resources, external
contractors cost, internal resources we can get for free. Infrastructure? Do we need new
servers, new hardware, new applications, do we need licenses, one of license of per
user, on- going costs: who's going to maintain the project, upgrades,
- When we ask Capgemini to work on a project, we be would charged money based on
the amount of effort required to complete the task. Could possibly need to increase
staff or decrease staff because of cost and benefits,
- Use planning tools such as Microsoft project. Don't use anything more sophisticated
than that. Have a number of systems with this ambitious aim to share a data, need to
think about the information available in the central device, business driver should be
key!
- Create a requirements specification, what is the requirement? What is the business
driver for that project? How are we going to do it? Data is going to be transferred from
two systems: what is the IT method required to accomplish this?
- Does it have to be a real-time interface? Do they need to instant? Or can it be a batch
interface where one system would create an extract file and the other system picks it up
at the end of each day.

- Batch interface simpler and cheaper to organize, real-time ones more challenging. Lots of modern systems are set up to standardize things APIs. Transfer of services. Whether the suppliers have standard APIs and if you can buy them.
- Interface projects failed not because they didn't have APIs, what is so crucial to the project is to understand the data is being transferred. Send information from one system to the other as long as they are similar UPRNs. Might be merging the same type of data also important
- Crucial to look at the detail of the information, is the data actually going to make sense once you transfer it. If there is too much data that needs to be standardized. Get an understanding of the structures
- Is there some mapping that is needed? So something simpler? Might be good to have a diagram that shows the source systems and depict what the systems do at a higher level.
- Would need to make changes to GIS and therefore would need outside help. eSpatial would be the best people to talk to. A lot of guess work

March 19, 2012: Interview with Financial Services Member

- Involvement with the OHMS system. Property information held in descriptors such as bed sizes and age of property. Below that you have repairs, rent house modules. Issue is that attributes in Apex are sometimes inconsistent, and not similar to the OHMS descriptors.
- Rent restructuring, value of the property. APEX has been in existence for a while and we have found lots of inconsistencies in the data. A common set of data that would link all this data that is consistent and up to date.
- Adaptations: chair lift, widened doorways. No one is updating the system. Link between types of properties and the rent accounts. Have to check the databases for consistencies.
- Oracle keeps all budget information, but to get that information we would need to take information exported from OHMS for which we would need to update OHMS. When we set our rents we look at the information in OHMS.
- Not a lot of data cleansing took place when data migration took place. Use GIS for property queries to see exactly where the property sits and whether that fits in the property types in that area. Slow system.
- When you change the descriptors no notes field to keep track of changes.
- People have view only access, cannot modify the data. Each modification capability allotted to whoever has the information.

March 28, 2012: Interview with Members of Corporate GIS

- No connectivity between OHMS and GIS. No connection between GIS and Apex and OHMS. Very difficult to do. GIS identifies properties using UPRNs. Apex and OHMS use UPRNs. Try to figure out LLPG with UPRN
- Key point is to understand that we use land property ids, and need for manual verification. Should look into another current project to create an asset management database and how it is going to sit with this database
- Are very close to finalizing the product. Some sort of integration between that system and GIS. If it's a council wide project focus on that one
- Provide us with shape, a picture in tif format and then we load it into GIS. Would need to provide us with the files. AYA external view
- Mixture of Google Maps and XML. AYA is closer to your product. We don't know how to validate whether or not you actually own the property. Multiple systems for different purposes
- GIS has static data that is loaded into an oracle database, we communicate with Accolade. We would need to expand the entire database. A lot of eSpatial involvement
- We would need to involve them for a lot of change. Most of the work was done by eSpatial. Are doing more than eSpatial
- Configuring our own maps that we weren't doing before. Need to have more control and for that to happen we would need to talk with both companies Capgemini and eSpatial
- Standard relationship with general support and maintenance but if it is a functionality issue then we need to contact them more extensively. We own the data or buy them from other sources.
- eSpatial looks over their own iSmart. Building the front end for the large database. Inputting data into GIS would be quite complicated. Access rights come into play
- Constraints such as: how much data is going to come in and a possibility of crashing the system. Element of security access, need to have an internal security checking system which would require Capgemini to come and change security rights
- We have a config file. Actually use TOAD to manipulate the data but don't do that often because if somebody changes it then we would be doing it live which could corrupt the databases
- Need to run SQL scripts on TOAD. Another program is also used to convert files into a format that can be logged onto GIS

- Will cost a lot of money. Looking to create table that would just pull the system
- So look into frequency of data, how is it going to be uploaded, is it supposed to be done overnight. Done as a batch process. We need to do a lot of data checking if there is a third party software
- And us having to refresh the data. Need to add the back up and server. Problem of batch runs failing. Need an internal checking system to check whether we have the same property
- Should have one source of truth LLPG. Should have used LLPG for GIS. If council had used LLPG then it would be easier. Will need the checking system to match

April 13, 2012: Meeting with Member of Corporate ICT

- As a project manager: had heard of middleware but don't know what it is. Is it feasible? Middleware can mean lots of different things
- Assists in the transfer. Quite sophisticated system. Very expensive. Do some better diligence on the costs

Option 2

- Apex and Ohms Costs involved: Apex costs annually: maintenance: 3000-50000 (20000), maintenance for Ohms and GIS, Interfaces will be built, adding costs
- Need to have people internally to have a better understanding of it. Not only implementation costs but also costs over 5 years. Total cost of ownership

Option 3

- GIS is a corporate system used by everyone in the council. Came in three-four years ago. Looking after council stock a big thing. Purchase cost. Migration is a big process over 5 years though you will have two less systems
- Savings in options 3 versus support costs for option 2. Training cost. If you have consistent data then you can have the web portal for tenants
- Need to have some sort of data consolidation. Systems rationalization. Across the council there are 1000 different systems. 400 of them are business systems
- Others are subsets of them. Way too much money being spent to different suppliers. Some systems are not even used. Some systems do similar things and have duplicate functionality
- Sensible for us to get rid of one and use the other one. Options 3 is not true systems rationalization but is supporting the principal of less suppliers and overheads and maintenance
- Preliminary recommendation is option 2 Have a costs paragraph and make reference to how you have not been obtain an accurate assessment of the costs
- Middleware is sophisticated and will likely be a costly one. Have a systematic cleaning of data you'll have more assurance of the data
- Need to have the problem in the title. Need to have a short paragraph at a higher level of what the problem is
- Instead of saying they cannot perform multiple queries its just that the data is among different systems and because of that

- Main user group will continue to use the existing systems but people interested in the queries will use the middleware. We're not retraining everyone else but we're only retraining a limited group.
- In option 3 you need to mention how there would still be an interface to GIS. Ideal system single coherent accurate systems that allows data reporting very quickly
- Big implementation project. Doing it is a lot of work but can be offset by savings in having fewer systems to support. Need to remove server downtime. Long-term goal is to have a consistent data set

Risks

- Work to produce consistent data sets becomes excessive causing delays. No one is accustomed to this project so that itself is a risk
- Risk around interfaces: risk of implementing a system which requires an disproportionate amount of support for the product it is providing
- Interface systems require more support. Adding a lot of complexity in the product which will add more support costs
- Initially only a small group of people would use this. Inconsistencies of the data can impact quality of experience of the web portal

Appendix E: Preamble and Questions for Focus Group with Tenants

Preamble

Thank you for taking the time to talk with us today.

We are a group of students from a university in the United States who are completing research with Croydon Council during this March and April. This discussion will help us understand your concerns about communicating with the Council and how you would like these to be improved for the future. The discussion will remain confidential and will be an aid for our project, but will hopefully lead to future service improvements.

Before we begin, we would like to let you know that this discussion will be more suitable for people who use the Internet, but you are welcome to stay even if you do not use the Internet.

Questions

1. How do you currently contact Croydon Council to request information regarding the Council's housing services?
2. Describe an experience you have had with contacting the Croydon Council that has had a positive outcome.
3. Imagine that the Croydon Council updated its website so that you could access information about services relating to your own home. Would you use this service on the website?
 - a. If so, what types of information would you expect to be able to access by using this tool?

Appendix F: Summary of Comments from Focus Group with Tenants

9 participants' methods of contacting Council

- 5 use email
- 9 use phone
- 1 uses mail

Primary forms of communication include phone and email

- Sometimes, hard for them to contact Council staff members over phone
- Suitable to send email only for specific types of questions (those that are easier to explain or require a simpler answer from the Council)
- Cannot ask questions through the Internet

Use email to receive better responses in writing

- Don't need to worry about whether request was received
- Cannot be put on hold
 - Wait time on phone dependent on department that tenants contact, but has decreased significantly overall (from an average wait time of 20 minutes a few years ago to an average of 6 minutes currently)
- Can take pictures of housing component that needs repair, send through email

Considerations for web interface

- Private password for security
- Needs to be accessible and easy to navigate
- Council should offer balance in services between phones and Internet
- Offer public Internet access, with training as necessary from Council staff
- Could pursue personal mobile phones or touch screens at a community center or other secure locations as other methods of accessing interface
- Keep in mind that many elderly people do not know how to use computers
- Some tenants do not know how to use the Council's "One Croydon" website

Benefits of web interface

- Easier system online leads to fewer phone conversations needed
- Online services could be used to get information, fill out applications

Appendix G: Preamble and Questions for Focus Group with Officers

Preamble

Thank you for taking the time to speak with us today.

We are a group of students from Worcester Polytechnic Institute (WPI) completing research in partnership with DASHH. As a follow-up to the interviews we conducted with you, we would like to lead a focus group with you this afternoon to better understand how the new system could provide services to benefit your day-to-day work.

Your feedback will remain anonymous and be of great use to us as we continue to develop our business case for DASHH.

Questions

1. What processes do you currently use to relay information about housing services between your team and other teams in DASHH?
2. We have provided for you a possible design of the middleware solution. What services would you like to see included in this new system?
3. How could this new system benefit your day-to-day work and contribute to the Council's strategic priorities?

Appendix H: Summary of Comments from Focus Group with Officers

Question 1: What processes do you currently use to relay information about housing services between your team and other teams in DASHH?

Send out spreadsheets to people. Planned maintenance schedules, adjusted to a particular audience. The schedule is sent when I send it, which means they soon are out of date. Need to change the spreadsheets myself, have to understand the criteria requested in a time consuming responses. Ongoing updates make it difficult for me to track the information.

Have to contact stock investment to gain access to spreadsheets. No system to make sure the information provided matches up with the information on the maps. Information needed has to be based on the geographic areas, but only addresses are provided and therefore visual map would be useful.

Stuff due to be carried out we would need to talk to stock investment but because it is static data therefore it soon goes out of date. Information relay with the contact center such as issues and information related to properties. Flood and fire in some properties and therefore we need to let contact center know immediately about planned maintenance therefore tenants are not requesting repairs on stuff that has already been planned. Contact center don't know who to pass through to check which inspection is going on, on which property. Have to phone around to find out who is going to be responsible because tenants don't necessarily make sure to check who came and worked on the project.

Question 2: We have provided for you a possible design of the middleware system [Option 2 – Middleware System]. What services would you like to see included in this new system?

Build some report from one place rather than having to do three four things, such as relating information that isn't in my area without me having to know who needs this information, and wouldn't need to chase people anymore. GIS linkage. Central hub of where I can find anything else.

Not much of an advantage for the responsive side of things. We're not going to get people to check for information in multiple areas. In the long run it would be beneficial, but it will be difficult for them. More useful for our back office, who are getting multiple requests about this area. Don't see the front end using it as much, but back office could use effectively. Need to check the schedule as well so that the schedule doesn't say something and we've already been to that location multiple times. Just allowing us to do a little more forward planning, but then we would need for someone to look at it proactively. Information is scattered at the moment.

Question 3: How could this new system benefit your day-to-day work and contribute to the Council's strategic priorities?

Two key ones would be tenant access issues reducing avoidable contacts alleviating pressure on the contact center. More cost saving measures in terms of planned maintenance. Looking at the demand on the services we apply.

The funders who provide the money, need quick information on the properties and locations. The green deal. Funding for side insulation is becoming increasingly important.

Opening up another access channel to the tenants, so that the contact center can deal with the more complex calls. Addressing the issues of where the right information is because of a lot of inconsistent duplicate information. This would alleviate staff time because people would know where to look.

Selling point for the council would be the tenant access, but also back office people allowing to their jobs more easily because it would allow them to do their work themselves rather than having to go through multiple people.

Appendix I: Questionnaire to Tenants

Communication Survey, Croydon housing services

The Council is committed to providing good service to our residents. To help us improve our services in the future, please take a few moments to complete this questionnaire. We would like to know how you feel about contacting us about housing services and possible ways to make improvements

1. How many times on average do you contact housing services each month?

- Daily
- Two or three times a week
- weekly
- Two or three times a month
- Once a month
- Less often than once a month

2. Why do you usually contact housing services? (Please tick all that apply)

- Repairs requests
- Information on planned investment in your home or block (eg kitchens, bathrooms, windows)
- Information about your rent account
- Any other reason

please write other reasons here

3. How do you currently contact housing services? (please tick all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Phone call | <input type="checkbox"/> Internet eg email or website |
| <input type="checkbox"/> Text message | <input type="checkbox"/> Post |
| <input type="checkbox"/> visit to the council office | <input type="checkbox"/> Other |

Please write other methods here

4. How satisfied are you with the ways you are currently able to contact us regarding housing services?

- Very satisfied*
- Fairly satisfied*
- neither satisfied nor dissatisfied*
- Fairly dissatisfied*
- Very dissatisfied*

5. Where do you have access to the internet? (please tick all that apply)

- I do not have access to the internet*
- In my home*
- On my mobile phone*
- At a public location (eg library)*
- Other*

Please write other locations here

6. If you have access to the internet, how often do you use it?

- Daily*
- Weekly*
- Two or three times a month*
- Once a month*
- Less often than once a month*

7. If you were able to directly access information about your home on a secure site online would you use it? (eg your rent account, planned maintenance)

- Yes* *No*

8. If you said 'yes' to question 7, what information would you be interested in seeing? (please tick all that apply)

- Repairs - status of current and history of past requests*
- Information about planned investment - eg kitchens and bathrooms, windows*
- Information regarding your rent account*
- Other information*

please write what other housing information here

9. How old are you?

- | | | |
|---------------------------------------|---------------------------------------|---|
| <input type="checkbox"/> <i>18-24</i> | <input type="checkbox"/> <i>40-59</i> | <input type="checkbox"/> <i>75 or older</i> |
| <input type="checkbox"/> <i>25-39</i> | <input type="checkbox"/> <i>60-74</i> | |

- 10. What suggestions do you have for improving communication with the housing service?**

Thank you for taking the time to complete this survey. Please return it no later than 30 March 2012 in the prepaid envelope provided. If you have any questions about this survey please contact DASHH Stock Investment team, Croydon Council, Taberner House floor 13, Park Lane, Croydon CR9 3JS.

Appendix J: Results of Questionnaire to Tenants

Table 11. Questionnaire question 1: How many times on average do you contact housing services each month?

Option	Number of Responses	Response Percent
Daily	0	0%
Two or three times a week	2	3%
Weekly	2	3%
Two or three times a month	10	15%
Once a month	4	6%
Less often than once a month	46	69%
No response	3	4%

Table 12. Questionnaire question 2: Why do you usually contact housing services? (Multiple responses possible)

Option	Number of Responses	Response Percent
Repairs requests	59	88%
Planned maintenance	8	12%
Rent account	17	25%
Other	12	18%

Table 13. Questionnaire question 3: How do you currently contact housing services? (Multiple responses possible)

Option	Number of Responses	Response Percent
Phone call	63	94%
Text message	1	1%
Council visit	15	12%
Internet	17	25%
Post	7	10%
Other	1	1%

Table 14. Questionnaire question 4: How satisfied are you with the ways you are currently able to contact us regarding housing services?

Option	Number of Responses	Response Percent
Very satisfied	22	33%
Fairly satisfied	34	51%
Neither satisfied nor dissatisfied	8	12%
Fairly dissatisfied	2	3%
Very dissatisfied	0	0%
No response	1	1%

Table 15. Questionnaire question 5: Where do you have access to the Internet? (Multiple responses possible)

Option	Number of Responses	Response Percent
No Internet access	18	27%
Home	39	58%
Mobile phone	10	15%
Public location	8	12%
Other	7	10%

Table 16. Questionnaire question 6: If you have access to the Internet, how often do you use it?

Option	Number of Responses	Response Percent
Daily	32	48%
Weekly	8	12%
Two or three times a month	3	4%
Once a month	2	3%
Less often than once a month	4	6%

Table 17. Questionnaire question 7: If you were able to directly access information about your home on a secure site online would you use it? (e.g. your rent account, planned maintenance)

Option	Number of Responses	Response Percent
Yes	40	60%
No	20	30%
No response	7	10%

Table 18. Questionnaire question 8: If you said “yes” to question 7, what information would you be interested in seeing? (Multiple responses possible)

Option	Number of Responses	Response Percent
Repairs requests	36	54%
Planned maintenance	27	40%
Rent account	30	45%
Other	6	9%

Table 19. Questionnaire question 9: How old are you?

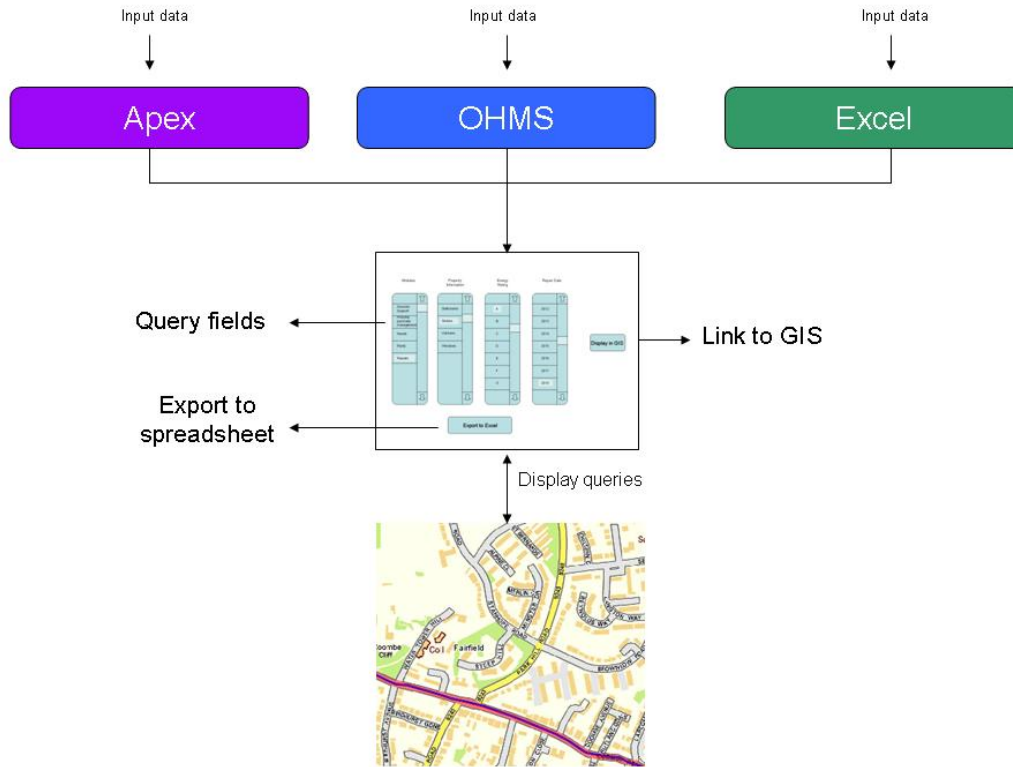
Option	Number of Responses	Response Percent
18-24	0	0%
25-39	9	14%
40-59	28	44%
60-74	20	31%
75 or older	7	11%
No response	3	4%

Appendix K: Preamble and Questionnaire to Officers

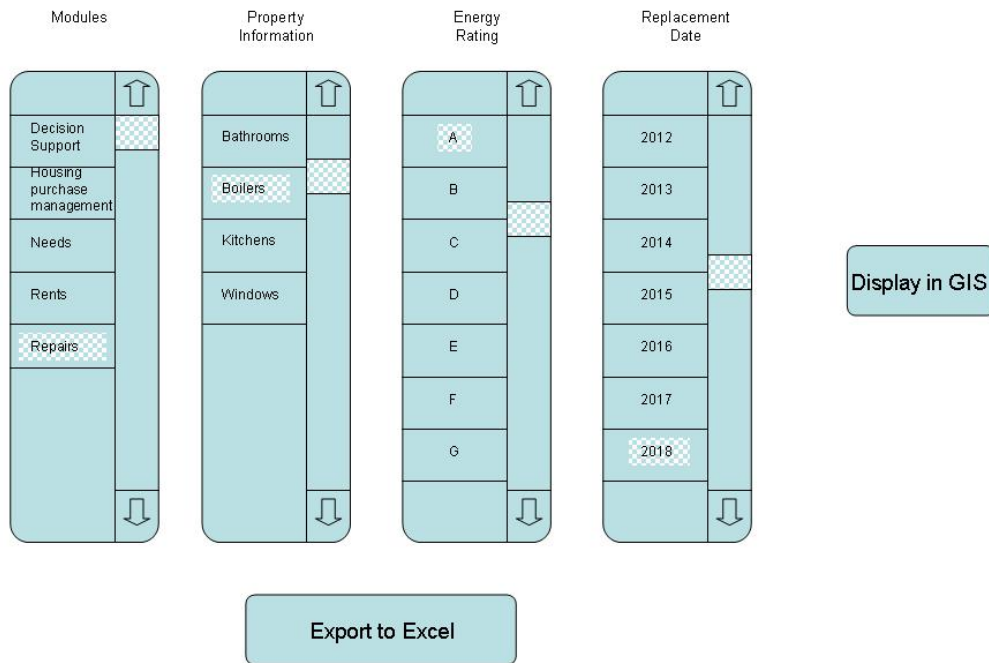
We are a group of students from Massachusetts, United States who are working with Judy Pevan and Carl Taylor from the stock investment team to develop a business case for a system that can better access and share information about Council's homes, tenant demographics and energy efficiency of homes and buildings.

This system would support a visual representation of homes and tenants using the Geographic Information System (GIS) software. GIS is an interactive map that allows users to view information about particular locations or regions across the borough, such as locations of homes and demographic data of residents in Croydon.

This system would allow you to continue using Apex and OHMS as you do at the moment to enter information about the housing stock whilst accessing this and other data from both systems, and potential other sources, in a centralised location that allows graphical representation using GIS. A diagram depicting a hypothetical, possible structure for the new system appears below:



An enlarged version of a possible set of interface capabilities for the new system appears below. This diagram represents an example of the query fields that might appear when accessing information about repairs, which would include property information, energy rating, and replacement date.



When accessing information about rents, you might see query fields like owner name, wheelchair access and most recent payment instead. Any information in OHMS, Apex or other systems could be combined whereas it is presently difficult to obtain and view this information in a single location.

***1. What division of DASHH do you currently work for?**

- Adult care commissioning
- Personal support
- Housing needs and strategy
- Croydon landlord services

***2. Please fill in the table below to indicate how often you interact with each of the following databases for managing the Council's housing stock:**

	Daily	Two or three times a week	Weekly	Two or three times a month	Monthly	Less often/Never
OHMS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apex	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GIS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Google Maps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please identify below)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please identify the database you have used if you answered "other" above.

***3. What key priorities do you envision the new system having that the systems you currently use lack? (Tick all that apply)**

- Consistent data
- Central place to access information
- Fewer queries
- Faster response time for queries
- User-friendly interface
- Graphical representation of information
- Ability to view data from a variety of sources in one place
- Other(s), please specify below:

***4. How would you like to learn to use the new system? (Tick all that apply)**

- Training/workshops
- Tutorials (e.g. manuals, online videos)
- Mentors/super users
- Other(s), please specify below:

Next

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5. Give a real-life example of how you imagine the new system could benefit your day-to-day work.

6. Please provide any additional comments below.

Prev

Done

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Appendix L: Results of Questionnaire to Officers

Table 20. Questionnaire question 1: What division of DASHH do you currently work for?

Option	Number of Responses	Response Percent
Adult care commissioning	0	0%
Personal support	0	0%
Housing needs and strategy	10	56%
Croydon landlord services	8	44%

Table 21. Questionnaire question 2: Please fill in the table below to indicate how often you interact with each of the following databases for managing the Council's housing stock:

	Daily	Two or three times a week	Weekly	Two or three times a month	Monthly	Less often/ Never	Response Count
OHMS	5	3	2	2	1	5	18
Apex	0	0	0	0	0	17	17
GIS	0	0	0	4	2	12	18
Google Maps	1	0	3	5	2	7	18
Other	0	0	0	0	0	5	5

Table 22. Questionnaire question 3: What key priorities do you envision the new system having that the systems you currently use lack? (Multiple responses possible)

Option	Number of Responses	Response Percent
Consistent data	13	72%
Central place to access information	15	83%
Fewer queries	5	28%
Faster response time for queries	6	33%
User-friendly interface	12	67%
Graphical representation of information	9	50%
Ability to view data from a variety of sources in one place	14	78%
Other(s)	2	11%

Table 23. Questionnaire question 4: How would you like to learn to use the new system? (Multiple responses possible)

Option	Number of Responses	Response Percent
Training/workshops	14	78%
Tutorials	6	33%
Mentors/super users	10	56%
Other(s)	1	6%

Appendix M: Business Case Submitted to Croydon Council

Executive Summary

Currently, officers access housing management information from a variety of locations either within OHMS (rents; repairs; needs etc) or via APEX (stock information). Because officers access each database separately, there are only indirect opportunities to 'combine' data sets from the different modules. There is therefore a missed opportunity gap in knowledge and information that if resolved could help deliver a more effective and efficient service. An internal survey has confirmed that there is interest in a system that could be used to view housing information drawn from both databases and in addition, overlaid on GIS to give a further geographical perspective. This has the potential to address other needs such as being able to view council properties in super low output areas to match to environmental funding. The project we have been involved in was to identify possible solutions the Council can develop and implement to solve this problem.

A significant element of the project is also focussed on being able to provide direct access to the information available as a result of the middleware solution to tenants via the web. This could be for information regarding their specific property e.g. when improvements are planned to take place or to access their individual rent account. This element strongly supports the challenge of 'demand management'. The project also aligns with the Council's Community Strategic priority of delivering high quality public services and improving value for money.

Following an options appraisal (see below) the preferred recommended solution is that of '**middleware**' i.e. a sophisticated user friendly system that can access information from all modules in OHMS, the APEX database and local data and spreadsheets using a single, central access point and view this data using GIS. The system can also identify any inconsistencies between pieces of information within both databases so that administrators can resolve these differences. Administrators will have the most access to the system and will use permission groups to control other officers' access to data. The system will also link information from these databases to a separate interface that tenants will use to access information related to their dwellings. OHMS and APEX will continue to be used as presently to input information and run standard reports, the middleware solution offers a further platform/tool to deliver additional benefits.

Background and Purpose

Under the comprehensive spending review carried out in 2010 funding for local governments has been significantly reduced. Croydon is using a number of tools to support more efficient working and reduce costs including 'LEAN' and 'Demand Management'. This project supports these initiatives. Even though Croydon Council itself has received less funding compared to previous years, because of changes to the HRA under the Localism Bill, self-financing has meant that an increase in its budget repairs and improvements. This increase in funding comes with a responsibility to ensure that funds are targeted where they can be most effective. We think that the middleware solution supports this objective.

Present Situation

Currently DASHH uses two independent databases – Apex and OHMS – and supports a data visualisation tool called the Geographic Information System (GIS). Apex contains information about the housing properties themselves, such as number of bedrooms and number of windows, while the OHMS database contains tenants' information, such as contact information and repairs history of their dwellings. GIS has the potential to display some of the information from Apex and OHMS on a map of the Croydon borough. GIS can show the Council's properties, and officers can perform different analyses, such as viewing the economic distribution of the borough population.

OHMS is used on a daily basis to manage tenants' information, repairs history, rent accounts and lettings. APEX is used on a daily basis to access property information, plan maintenance projects – such as new windows and new kitchens – and examine energy ratings. Whilst APEX and OHMS are refreshed, i.e. data from APEX goes in to OHMS, there are still instances where data is inconsistent i.e. number of bedrooms. During interviews, officers who do not interact with the databases identified that they need to request other officers to send them the necessary information in the form of spreadsheets. Also, officers explained that the lack of a dynamic connection between the two housing databases – Apex and OHMS – and GIS prevents them from seeing live updates from APEX and OHMS in GIS.

The Council regularly receives queries regarding planned improvements and whilst they have access to spreadsheets on certain programmes, they do not have access to all of the information requested. Contact Centre staff currently contacts the stock investment section to retrieve information regarding planned maintenance. There are no self-access routes for tenants. During an interview, a member of the Responsive repairs team explained that Contact Centre staff, who receive calls from tenants, access information regarding repair schedules by communicating with the responsive repairs team. To avoid conflicts, the responsive repairs team then needs to contact the planned maintenance team in order to ensure that no maintenance projects are already

scheduled for the tenant's dwelling. The Contact Centre could work more efficiently if they had access to repairs and planned maintenance information.

The purposes of this business case are:

1. To deliver the problem and discuss the need for change;
2. To illustrate possible options that Council officers can take to improve their access to housing information;
3. To analyse what will happen if the various system options are implemented or not;
4. To identify the costs and benefits associated with the implementation process;
5. To offer a recommendation of our preferred option, based on the research we have conducted.

Assessment of Need

To assess the need for improvements of the current housing management system, we distributed a survey to 25 officers within DASHH. We learnt that 83% of respondents would like a system that allows them to access the two databases simultaneously and view the data using GIS from one secure location. From the survey responses we received, the most common request for functionality within the new system was the ability to have consistent data. The middleware solution will not be able to remove any inconsistencies but will allow Council officers to identify pieces of conflicting information so that the relevant parties can correct the information. Also, officers can retrieve various combinations of data from multiple sources of information and display this data within GIS. These additional functions allow officers to analyse the data from different perspectives so that they can work more efficiently and make more informed decisions. This system will benefit tenants as well. A web interface linked to the middleware solution will allow tenants to access information related to housing services from the two databases without needing to call the Contact Centre, provided that this information is consistent. We distributed a questionnaire to 297 tenants to determine the need for a web interface and found that 60% of the 67 respondents would like to access housing information online. They did, however, insist that the web interface should be user-friendly, secure and simple to navigate so that tenants who are not as technically proficient can still interact with the system. If implemented, the current project will align with the following Council strategy:

Delivering high quality public services and improving value for money

The Council will be able to provide high quality services by giving tenants secure access to information related to housing services online. By allowing tenants to access information themselves, the Council will be able to reduce the number of avoidable contacts, such as “customer requests for a service or information, reports of failure to deliver a service, progress chasing and responses to council correspondence”.¹ Therefore, tenant self-access can help the Council further advance its demand management initiative. Avoidable contacts include The central access point will allow officers to work more efficiently and reduce the time they spend in retrieving data.

¹ Communities and Local Government (CLG), *Reducing avoidable contact: a guide to NI 14*, accessed 20 April 2012, <http://www.idea.gov.uk/idk/aio/8621612>.

Options Analysis

Ref #	Short Description	Main Advantages	Main Weaknesses	Conclusion/Impact if Chosen
1	Do nothing – Continue to update and view housing management information from Apex and OHMS, exporting summaries to Excel as necessary.	<ul style="list-style-type: none"> • Officers know how to use the current housing management system • No immediate cost • No short-term disruption or change 	<ul style="list-style-type: none"> • Housing data remains inconsistent • Time delays in reporting information • Officers cannot access information from both databases at the same time • No continuous communication between current databases and GIS, leading to discontinuous updating of GIS 	<ul style="list-style-type: none"> • Still cannot view information using GIS • Difficulty in using combinations of data to conduct analyses
2	Middleware system (preferred) – Implement a middleware that serves as a central access point for querying information from Apex and OHMS. Also offers links for displaying this information using Excel or GIS.	<ul style="list-style-type: none"> • User-friendly interface • Offers temporary views of GIS without overloading system storage space • Reduction in report delays • Central access to all databases; allow viewing of data from any module in OHMS • Can identify inconsistencies • Can pick up data from local spreadsheets and databases 	<ul style="list-style-type: none"> • Data inconsistencies still possible • Data security concerns • Costly • New system will require training 	<ul style="list-style-type: none"> • Improved data quality • Improved data management • Improved employee efficiency

3	Integrated system – Migrate the information and functionality of Apex and OHMS into a centralized system, with the ability to view data using GIS	<ul style="list-style-type: none"> • One single, coherent database with functionalities of Apex and OHMS • No inconsistencies in data • No time delays in file conversion and data updating • Continuous updates to GIS 	<ul style="list-style-type: none"> • Very costly (commission, design and procurement) • Extensively long implementation process • Data security concerns • New system might require training 	<ul style="list-style-type: none"> • Improved data quality • Improved data management • Improved employee efficiency
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Interdependencies

Name of interdependency	Explain dependency relationship	Action to manage
Development of the web interface for tenants	The web interface connects to the new system. Tenants can access the consistent data within this system and have confidence in the accuracy of this data.	Council needs to make data within system consistent before making this data available within the web interface

Risk Analysis of Option 2

Ref #	Risk description	Impact
1	Implementation issues (power failure, delayed schedule, changing opinions among stakeholders)	Prolonged project time, which leads to more cost
2	Disclosure of secure information by external vendor	Data compromised
3	Differences in opinions between contractors and officers	Delay or discontinuity of project
4	Decreased funding or increased costs	Incomplete implementation
5	System is too difficult to use	Middleware is underused
6	Maintenance takes a long time to complete	Problems cannot be fixed immediately
7	Excessive work to produce consistent data	Increased costs, delay of project
8	Council inexperienced with type of middleware that this project introduces	Mistakes caused by lack of experience working with this middleware
9	Require disproportionate support from ICT/vendors relative to gains system is providing	Viability of system
10	Data inconsistency appears in web interface	Less satisfying experience for tenants
11	Tenant rent accounts exposed	Identity theft

Costs and Future Possibilities

The Council not only considers costs associated with implementation but also takes into account the costs associated with supporting and maintaining software for the five years following implementation – the Total Cost of Ownership (TCO).

If the Council decides to remain with the current system (Option 1), they will continue to encounter several significant issues associated with the current housing management database systems. The databases will continue to contain information that is not consistent and up-to-date, leading to inaccuracies within officers' reports. Perhaps more importantly, the Council will continue incurring significant time and labour costs as officers manage phone calls from tenants regarding planned investment without having the required information as they answer calls.

With Option 2, the Council will not only need to fund the maintenance of the middleware solution, but it will also need to continue funding for the current Apex and OHMS systems. We realize that to make a better assessment of the costs, we would need to have extensive contact with external vendors, but based on our current research, we expect the implementation process of Option 2 to be less costly than that of Option 3. In particular, Option 3 will incur more extensive commission, design and procurement costs compared to those of Option 2.

Option 3, unlike Option 2, includes functionality from both Apex and OHMS and therefore involves introducing a new system for the entire department to use. Therefore, the Council will incur more overall expenses in training officers to become accustomed to the system described in Option 3 than the one described in Option 2.

The single, integrated database (Option 3) will require extensive data cleansing before data migration can occur. The middleware solution (Option 2) provides a convenient way for officers to cleanse the information in the current databases. Therefore, the purchase of the middleware software would facilitate the Council to move towards a single system if this was to be considered in the future.

Breakdown of Costs

A set of cost estimates from one external vendor to procure a middleware system appears below:

Items	Price
License (engine and CPUs)	£31,000
Connectors to existing systems	£12,000
Non-production environment	£15,500
Support (per year)	£6,200-£9,300
Consultants (1 day, 1 person)	£1,500
Training (1 day, 8 people)	£2,800
Minimum Total Cost during First Year	£69,000
Minimum Total Cost over 3 Years	£81,400

Key Implementation and Use Factors to Consider

A case study from Estonia entitled “X-Road: An Interoperability Framework for eAccess to Registers in Estonia,” identified “administrative barriers, existing work practices, lack of motivation for changes,” and hesitation from the IT department as major organisational barriers to the project. The IT managers expressed hesitation on allowing an external company into their workplace.

Proponents of the X-Road project initiative managed reluctance from the IT department was effectively managed by providing them training so that they could develop the system themselves. Otherwise, the Estonian company would have needed to bring in an external vendor to implement the new system.²

In another study, Suzanne Beaumaster explains that one of the most important aspects of transitioning to a new system effective is training staff members. In particular, Beaumaster mentions that members of an organisation have different levels of technical proficiency, which makes it more difficult for management to plan training sessions. The case study also highlights that IT staff might need to contact external vendors to assist in the training process. This assistance from vendors could cause additional expenses and introduce logistical difficulties, such as scheduling. Ultimately, the organisation should support users through “continuous and ongoing” training.³

During a conversation with Alisdair Maclean from Brent regarding the Council’s implementation of their GIS system [StatMap Earthlight], he explained that the Council encountered several obstacles. These issues included technical obstacles, such as changing data into a GIS-compatible format, as well as social obstacles, such as “changing perceptions of users in seeing the advantage in having their data mapped”.⁴

² Rebecca Eynon and Helen Margetts, “Organisational Solutions for Overcoming Barriers to eGovernment,” *European Journal of ePractice* November 2007: 1, accessed 20 April 2012, <http://www.epractice.eu/files/1.6.pdf>.

³ Beaumaster, Suzanne, “Information Technology Implementation Issues: An Analysis” (PhD diss., Virginia Polytechnic Institute and State University, 1999).

⁴ Alisdair Maclean, e-mail message to authors, 16 April 2012.

Appendix: Data Analysis

(Data analysis same as questionnaire results above.)

(Diagrams of options same as Options Analysis above.)

Implementation Process

