

EchoCare Evolution Complaint Management System

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2 Executive Summary:

The EchoCare Complaint Management System project, undertaken in collaboration between PBL Care Limited and Birmingham City University, seeks to revolutionise the complaint process within the home care sector. Driven to enhance operational efficiency and service quality, this initiative focuses on developing an automated system utilising Natural Language Processing (NLP) and machine learning technologies. The project methodology included comprehensive market research, the design and development of a proof-of-concept system, and an extensive performance evaluation. The anticipated impact includes a substantial reduction in complaint int handling times, improved compliance with Care Quality Commission (CQC) standards, and heightened customer satisfaction. This initiative is poised to set a new benchmark in complaint management, offering a scalable solution adaptable across the healthcare industry.



3 Introduction

3.1 Motivation

The current complaint operational workflow at PBL Care presented several issues including the need for automation in handling operational complaint systems that served as the foundation for this feasibility study. One of the key issues identified was the manual processing of complaints, feedback, and operational requests from service users, which

adversely affected customer satisfaction and service quality due to delayed responses. In particular, the manual handling of complaints significantly increased the workload for staff, making it difficult to efficiently gather and analyse complaint data. In this context, the existing complaint system relies on hardcopy versions of complaints (paper-based) which makes analysing them even harder, hindering effective management and analysis. These operational limitations restrict the automation of the complaint system, leading to limitations in enhancing the processing time and service quality. PBL Care's goal is to continuously enhance its existing complaint system in compliance with the Care Quality Commission (CQC). However, PBL Care has a significant reputation with CQC, there is a chance to have an automated system for further improvement of the quality and responsiveness.

Hence, this project investigates automating the existing complaint management system by making it a digital system that classifies distinct types of complaints and provides data analysis and virtualisation of them on the dashboard. Moreover, natural language programming (NLP) technology is used to digitalise those paper-form complaints into the system as historical data for training the machine learning model. A proof-of-concept of the system will be implemented to validate the proposed system.

The outcomes of this shall include: (1) enhancing the company image in front of the CQC and being an exemplary model to other home care companies. (2) dissemination of a feasibility study that includes market research, evaluation of the proposed system, and associated risks. (3) exploration of the feasibility of proposing an off-the-shelf software solution that can be sold to other care providers, depending on the gaps in the market.

3.2 Objectives

The objectives of this work can be summarised as follows:

- **Familiarise with the company complaints process:** This includes understanding the company's system and its complaint data sources as well as identifying issues associated with the existing complaint system.
- **Review the Regulatory Compliance and Privacy Protection:** This explores the regulation and privacy requirements for elder home companies in compliance with CQC standards.
- **Assess the Market Opportunity and Value Realization:** This includes conducting a comprehensive market analysis that identifies the existing gaps and the unique selling points.

- **Design and develop a proof-of-concept automated complaint management system:** This includes designing and developing a proof-of-concept automated complaint management system for classifying diverse types of complaints and presenting them in a dashboard in insightful form. This insightful form includes data analyses and visualisation.
- **Develop a Scanning Application for Historical Records:** This entails developing a system that uses NLP to scan hard copy complaints and classify them into various directories in the database depending on the nature of the complaint (i.e., scheduling, staffing, etc.). This digital form of these complaints is utilised as historical data for training the machine learning model.
- **System Evaluation:** This includes evaluation of the performance of the proof-of-concept system among the Company and CQC requirements. Moreover, evaluation of the proposed system among those research gaps in the market. This evaluation includes an investigation of the operational efficiency, robustness of the data analysis, database responsiveness, and dashboard interactivity.
- **Feasibility Study Writing:** This includes summarising the proposed system, its advantages, and limitations. Highlighting the cost-benefit analysis that considers the deposit and running costs as well as the technology investment. Hence, an off-the-shelf solution (i.e., Software as a Service (SaaS) can be conceptualised to fulfil these unique selling points (tackling those gaps). Moreover, a comprehensive utilised methodology, the pros, and cons of each solution for care providers will be investigated.

3.3 CQC Requirements

The CQC standards requirements are summarised as follows [1]:

- **Service User Engagement:** This entails treating people with dignity, allowing them to express their thoughts, and involving them in the choices that have an impact on their care.
- **Responsiveness:** There is a set procedure in place for receiving and managing complaints and feedback to improve the quality of care. This includes the time taken to get back to the complainant.
- **Safety and Safeguarding:** Systems and processes protect people from abuse, and appropriate action is taken in response to complaints indicating danger to others.

- **Equity in Experiences and Outcomes:** The goal of the complaint procedure is to ensure fairness in the processing and settlement of complaints by being unbiased and non-discriminatory.

Service user engagement, responsiveness, safety safeguarding, and equity are the key requirements for the CQC standards to be followed in elder homes.

3.4 Identified Limitations

This subsection highlights the limitations of the current PBL Care existing compliant system.

1. **Manual Processing:** There is a greater likelihood of human mistakes and slower response times when there is a heavy dependence on manual input and processing.
2. **Inadequate Digital Tools:** The digital technologies currently in use are either too old or inadequately robust to effectively handle the volume and complexity of complaints.
3. **Lengthy Response Time:** The allocated period of up to 28 working days for resolving complaints is out of proportion and may cause service consumers to become dissatisfied.
4. **Complexity for Service-Users:** It is difficult for people with impairments or inadequate technical capabilities to successfully file complaints under the current system since it is not user-friendly.

3.5 Analysis of Potential Gaps

This section describes the further needs to consider in the proposed system to stand out against other solutions in the market.

1. **Sustainability of Digital Solutions:** Long-term sustainable digital solutions that can change with the demands of users and keep up with technological advancements are lacking.
2. **Data Management:** Ineffective data management procedures obstruct fast access to and analysis of complaint data.
3. **Accessibility and Inclusivity:** All user demographics are not sufficiently served by the system, particularly when it comes to features that make it accessible to people with impairments.

3.6 Scope

This feasibility study focuses on developing a proof-of-concept of an automated complaint management system, a system that records historical data and adds to the system for training and market research analysis.

- **Automated Complaint Management:** Our focus is to develop a prototype automated complaint management system that can effectively combine complaints from several sources and categorize them into distinct types based on the issues reported. This system will ensure that CQC criteria are met and will make it easier to track and handle complaints efficiently. An enhanced complaint-handling process is expected to result in more productive interactions with residents and their families as well as higher productivity.
- **Historical records and Intelligent Data Analysis:** The aim is to develop an integrated scanning setup that uses data analysis and NLP to digitize past complaints for database sustainability. Through the identification of trends and notable incidents from historical data, this strategy seeks to extract actionable insights that improve patient safety and yield substantial societal benefits.
- **Value Realization and Market Opportunity:** To carry out in-depth market research to evaluate the competitive environment for comparable automation solutions, identify any gaps that our integrated system could fill, and pursue technology licensing or managed services Software as a service, (SaaS). It is expected that this strategic approach will give PBL Care and other businesses a competitive edge and a new source of revenue, allowing them to take advantage of special market opportunities.

4 EchoCare Complaint system

4.1 System Framework

As illustrated in Figure 1, this section presents the five primary functions of the proposed EchoCare Complaint System.

- **Digital Forms:** With the ability to file complaints online, this feature will serve as the first point of contact for service users. This contains readily accessible and user-friendly web forms that make it simple to submit complaints.
- **NLP Process:** This function indicates how the system automatically analyses and classifies the complaints according to their content using Natural

Language Processing. This facilitates the swift evaluation of the complaint's nature and its routing to the appropriate department or staff member.

- **Database:** This indicates the primary database containing all the complaint data. The structure of this database makes it simple to access and retrieve information, guaranteeing that complaints are handled effectively, and that all information is protected.
- **Machine Learning Model:** This feature reveals how machine learning algorithms are used to analyse complaint data from historical events to analyse trends, forecast foreseeable problems in the future, and provide solutions. This proactive strategy aids in improving the delivery of high-quality services.
- **Dashboard:** To support decision-making and operational oversight, this framework component will serve as the visual interface via which management and staff may access real-time analytics and status updates on complaints, their status, and data trends.

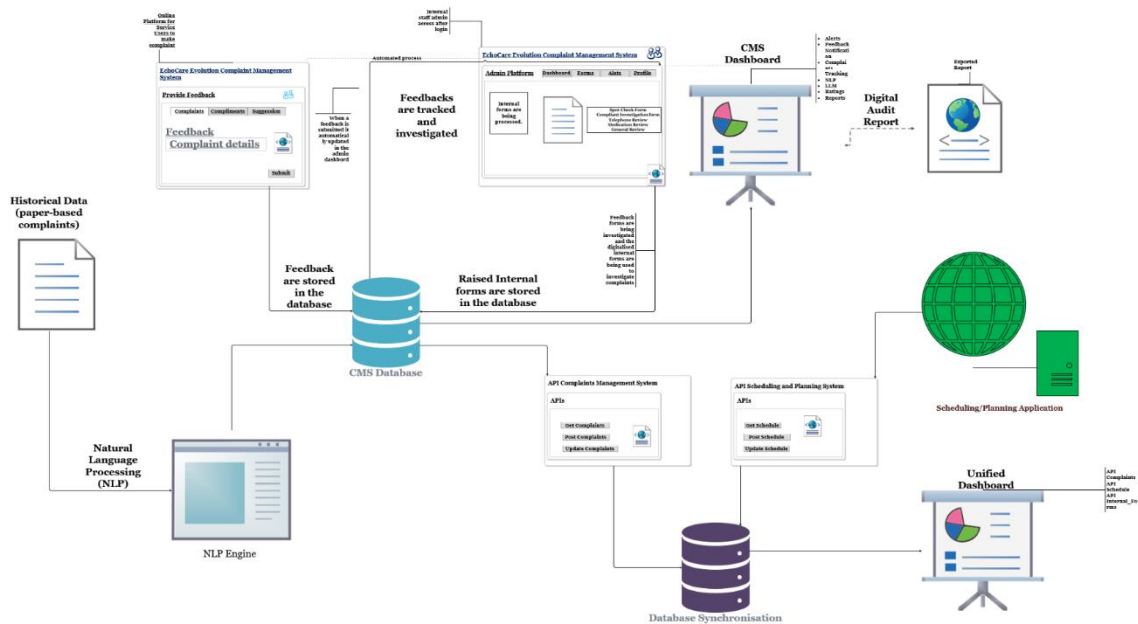


Figure 1 System Framework

5 Data Sources

There are various sources of the complaints data which are: phone, in-person, letters, and emails.

This can be revolutionised to receive complaints via a web form, as previously mentioned. A QR Code will also be generated to facilitate easy access to those who need to fill in a complaint from social media interaction. Additionally, family members of service users can fill out the form on behalf of a service user who is unable to do so. This denotes a strategic step toward digital transformation in which the digital format of the complaints enables the utilisation of intelligent systems. This will make the process more efficient and accessible, as well as less difficult for service customers who might find it easier or preferable to connect online.

5.1 Complaint Life-Cycle

PBL Care's complaint handling process consists of six stages from the receipt of the complaint to the investigation and record keeping. These stages are detailed in Figure 2 and described as follows:

- 1. Receiving the Complaint:** The company accepts various forms of complaints; in person, over the phone, in writing, via a staff member, or through an advocate or representative. Also, the company accepts anonymous complaints.
- 2. Acknowledgment:** Within three working days of receipt, complaints are formally acknowledged, and the complainant is given the name and contact information of the investigating officer.
- 3. Investigation:** A staff member with adequate seniority and experience investigates the complaint. The investigation follows standard procedure for analysing the complaint, identifying the problem, and suggesting a solution.
- 4. Resolution and Response:** After receiving the complaint, the investigating officer has 28 working days to investigate it and provide the complainant with a thorough response. This covers any steps taken or suggested to address the issues brought up, as well as the investigation's findings.
- 5. Escalation:** The complaint is advised of their options if they are not happy with the resolution, which includes taking the matter further and reporting it to the Local Authority Complaints Team, the Registered Manager, or outside organizations like the CQC or the Local Government and Social Care Ombudsman.

- 6. Record Keeping:** Every received complaint is stored in a Complaints and Compliments Register, which also contains information about the complainant, a summary of the complaint, the status, and the investigation summary (including the complaint's nature and the decision).

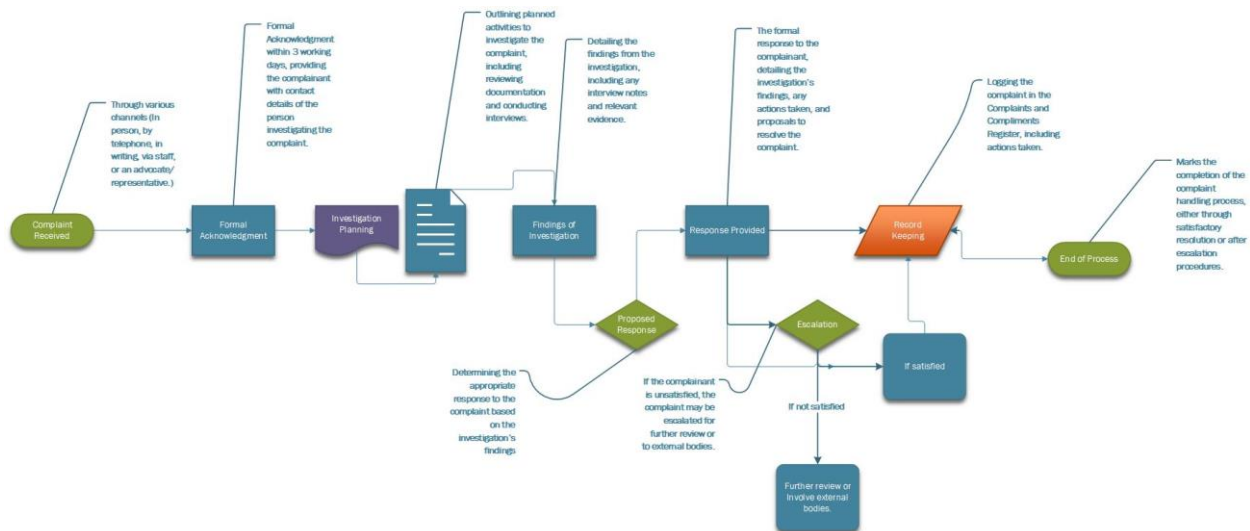


Figure 2: PBL Care's Current Complaint Process Workflow.

5.2 Digital Interface (Online Forms)

This section describes the potential requirements for the digital interface. There are two digital interfaces will be considered: one for the users and one for the staff members. There are several types of complaints which are classified depending on the internal/external form as shown in Table 1.

Table 1: Operational Forms Overview

Internally /Externally	Data Source (Form)	Complaint type(s)	Data Class	Frequency	Purpose
Service Users/Customers	Written (General Review)	Staff Attitude, Inadequate Care, Missed Appointments	Service Quality Evaluation	Every 3 Months	To assess the overall service quality and user satisfaction periodically.
Service Users/Customers	Telephone (Review Form)	Scheduling Problems, Billing Issues, Paperwork Errors	Immediate Feedback	Monthly	To capture quick, ongoing feedback on services provided over the phone.
Service Users/Customers	Written (Annual)	Cleanliness and Maintenance, Accessibility,	Comprehensive Feedback	Annually	To conduct an in-depth evaluation of services and

	Questionnaire Form)	Dignity and Respect, Cultural Sensitivity			user experience over the year.
Service Users/Customers	Written (Medication Review Form)	Medication Errors, Safety Hazards, Infection Control	Health and Safety	Monthly	To review and manage the medication protocols for service users, ensuring safety and efficacy.
Staff Evaluating	Written (Spot Check Form)	Non-compliance with Regulations, Privacy Concerns	Operational Compliance	Every 45 Days	To ensure staff compliance with operational standards protocols through unannounced checks.
Staff Evaluating	Written (Supervision Meeting)	Staff Shortages, Staff Competency	Performance and Development	Every 3 Months	To provide staff with feedback on their performance and development opportunities.
Staff Evaluating	Written (Appraiser Meeting)	Staff Attitude, Missed Appointments, Privacy Issue	Annual Performance Review	Annually	To assess the staff's annual performance, set goals, and discuss career progression.
Staff Evaluation (New Staff)	Written (New Carer Review Form)	Staff Competency	Initial Competency	Once after 1 Month	To evaluate the new carer integration and competency within their first month.
Staff Evaluation (New Staff)	Written (Probation Review Form)	Staff Attitude, Inadequate Care, Missed Appointments, Lack of Communication	Performance Assessment	At 6 Months	To assess the performance of staff nearing the end of their potential confirmation.

6 Preliminary Market Research

As preliminary market research, we have followed several criteria for evaluation of the existing solutions to analyse the market research as follows:

Table 2: Criteria for selecting the researched tool

Criteria	Description
Type	Determines the system's open-source or proprietary status, which determines control, cost, and flexibility.
Cost	The focus is on cost-effectiveness, considering both setup and ongoing operating costs, ensuring solutions provide substantial financial value.
Core Functionalities	The system requires automated logging and complaint classification based on initial inputs from staff assessments and service user feedback.
Scalability/Flexibility	As PBL Care's operational requirements grow, the system must expand to accommodate more customers and complaints without compromising efficiency.
Use Case	Systems are designed for specific situations, such as managing confidential information, managing multiple departments, or providing multi-channel support.
Limitation	The system's long-term suitability is ensured by assessing its operational or technical limitations.
Utilisation of AI/ML	The tool utilizes artificial intelligence (AI) techniques like natural language processing (NLP) to enhance complaint registration, classification, and analysis, thereby enhancing accuracy and efficiency.
Analysis	This application can analyse data, spot trends, assess the effectiveness of services, and direct decision-making procedures.

Compliance	The tool is regulated by healthcare and data protection regulations like GDPR and CQC requirements.
User Adoption and Support	It guarantees that the system is easy to use for employees and service consumers as well, reducing the need for training and promoting ease of use. Evaluate the quality and accessibility of new user support and training materials. More seamless transitions and improved adoption can be facilitated by thorough training and easily available support resources.
Ongoing Support and System Maintenance	Crucial to long-term sustainability, with an emphasis on dependable service and simple system changes. Consider the provider's history of adding new features and security precautions to the system. Regular upgrades can guarantee that the system remains secure and up to date.
Security	Robust data security protocols to prevent unwanted access to confidential information.
Data Portability	Data exporting and transferring across systems must be simple, especially when using data analytics tools or for backup and recovery.
Customisation Flexibility	Although various customization options have been considered, it is important to specifically assess how much the system can be modified to fit the unique processes and evolving requirements of PBL Care.
Integration with other systems	Ensure the system can seamlessly integrate with existing healthcare management systems. HR systems, and other software tools used by PBL Care. This could include electronic health records (EHR), customer relationship management (CRM) systems, or enterprise resource planned (ERP) systems.

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Regulatory Futureproofing	Beyond current compliance, consider how well the system can adapt to potential future changes in healthcare regulations and standards.
Environmental Impact	If sustainability is a concern for PBL Care, evaluating the environmental impact of deploying and maintaining the system could be considered. This includes server energy consumption if hosted on-premises or the environmental policies of the cloud provider if hosted.
Feedback Mechanisms	Ensure there are effective mechanisms for collecting feedback from users about the system's functionality and usability, which can inform continuous improvement.
Vendor Stability and Reputation	Research the stability and market reputation of the software provider. A stable vendor with a solid reputation is more likely to provide reliable long-term service and support.
Disaster Recovery and Business Continuity	Evaluate the system's capabilities in terms of data backup, recovery solutions, and its role in the business continuity plans of PBL Care.

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Table 3: Tools Analysis

Tool	Type	Approx Cost (USD)	Criteria Matched	Usefulness in Healthcare	Link	Compliance	User Adoption and Support	Feedback Mechanisms	Vendor Stability and Reputation	Environmental Impact	Key Analysis Points
osTicket	Open Source	Free, Varies	Customization, Scalability, Integration	Efficient patient inquiry management, adaptable to healthcare systems.	osTicket	GDPR, HIPAA (with customization)	Moderate; requires technical expertise	Community forums	Stable, widely used	Low; cloud-based reduces footprint	Highly Customizable, requires technical setup
OTRS Community Edition	Open Source	Free, varies	Customization, Scalability, Compliance	Ideal for multi-department healthcare workflow	OTRS	GDPR, HIPAA (customisable)	High, extensive training required.	Community feedback, direct support options	Stable, reputable in IT	Low, cloud-based	Strong process management, complex setup
MantisBT	Open Source	Free, Varies	Customization, Security, Tracking	Tracks and manages clinical issues and complaints	MantisBT	Can be configured for GDPR, HIPAA	Moderate, user-driven	Issue tracking system	Stable, less known outside IT	Low, server-based	Effective for detailed tracking, not healthcare-specific
Redmine	Open Source	Free, Varies	Scalability, Customisation, Integration	Manages healthcare projects and complaints	Redmine	GDPR, HIPAA (with plugins)	Moderate, developer-focused	Community forums, Issue tracking	Stable, open-source community	Low, server or cloud-based	Requires customization for healthcare use
Zammad	Open Source	Free, Varies	Multi-channel Support, Customisation, AI/ML	Manages multi-channel patient communications	Zammad	GDPR, potential for HIPAA	High, user-friendly interface	Direct user feedback, analytics	Emerging, growth	Moderate, cloud-hosted	Modern interface, growing community support

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Zendesk	Private	Starts at \$19/agent/month	AI/ML, Multi-channel Support, Scalability	Advanced patient interaction management across channels	Zendesk	GDPR, HIPPA	Very High, extensive resources	Surveys, automated feedback	Vary stable, industry leader	Moderate, extensive cloud usage	Comprehensive AI features, extensive for large scale
Salesforce Health Cloud	Private	\$25 to \$300+/user/month	Customisation, Compliance, Integration	Comprehensive patient data Integration and management	Salesforce	GDPR, HIPPA, others	Very High, complex features require training	Integrated within platform	Very stable, industry-leading	Moderate, significant infrastructure	Excessive cost, effective features, best for large organisations
Freshdesk	Private	Free to \$15/agent/month	Scalability, User Support Customisation	Centralized management of patient queries and complaints	freshdesk	GDPR, potentially HIPPA	High, Intuitive platform	Ticket-based feedback, surveys	Stable, reputable	Low, cloud-based	Flexible, cost-effective, suitable for various healthcare sizes
Medallia	Private	Custom pricing	AI/ML, Real-time Analytics, Multi-channel support	Enhances patient care through real-time feedback analysis	Medallia	GDPR, HIPPA	High, specialised for client experience	Real-time feedback, in-depth analytics	Stable, well-regarded in CX	Moderate, data-intensive operations	Specializes in patient experience, requires significant data handling
Healthgrades	Private	Custom pricing	Feedback Mechanisms, User Adoption, Multi-department Support	Specialises in managing patient satisfaction and healthcare provider ratings	Healthgrades	GDPR, potential for HIPPA	Moderate, healthcare provider-focused	Patient reviews and feedback	Stable, well-known in healthcare	Low, primarily an online platform	Focused on patient satisfaction, limited in direct complaint management

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Tool	Use Case				Cost		Features				Compliance			Implementation			Technical Requirements			User Adoption			Vendor Stability		
✓ X	Availability	Healthcare	Retail	Hospitality	Free Version	Premium Version (USD) / Varies	Customisable	Scalable	Add-ons acceptance <small>asked</small>	Secure	CQC	HIPPA	GDPR	Setup Complexity	User Interactivity	Integration Capabilities	OS Compatibility	AI Adaptability	Computational Requirements	Feedback Mechanism	Training Requirements	Ease of Use	Market Presence	Growth Stability	Reputation
osTicket	Open - Source	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	H	✓	✓	✓	M	✓	H	H	✓
OTRS Community Edition	Open - Source	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	H	✓	✓	H	✓	H	M	H	M	H	H	✓
MantisBT	Open - Source	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	H	✓	✓	L	M	M	H	M	✓
Redmine	Open - Source	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	H	✓	✓	H	✓	M	M	M	M	H	H	✓
Zammed	Open - Source	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	M	✓	M	M	M	✓	M	M	✓
Zendesk	Private	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	L	✓	✓	L	✓	M	H	L	✓	H	H	✓

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Salesforce Health Cloud	Private	✓	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	H	✓	✓	H	✓	H	M	H	M	H	H	✓
Freshdesk	Private	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L	✓	✓	L	✓	L	H	L	✓	H	H	✓
Medallia	Private	✓	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	H	✓	H	M	H	M	H	H	✓
Healthgrades	Private	✓	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	M	✓	M	M	M	✓	H	H	✓

6.1.1 Keynote:

- **Availability:** Open-Source or Private
- **Use Case:** Healthcare, Retail, Hospitality
- **Cost:** Free version available, Premium version varies
- **Features:** Customizable, Scalable, Integrable, Secure
- **Compliance:** CQC, HIPPA, GDPR
- **Implementation:** Setup Complexity (M= Medium, L= Low, H= High), User Interactivity, Integration Capabilities

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- **Technical Requirements:** OS Compatibility, AI Adaptability, Computational Requirements (L= Low, M= Medium, H= High)
- **User Adoption:** Feedback Mechanism, Training Requirements (L=Low, M= Medium, H= High), Ease of Use
- **Vendor Stability:** Market Presence, Growth Stability, Reputation (L=Low, M=Medium, H= High)

6.2 Discussion and Market Gap:

Operational Efficiency: Operational efficiency in complaint management is crucial for reducing resolution times and increasing the overall productivity of PBL Care. Streamlining processes through automation and digital solutions can minimize manual handling, thus reducing human error and the associated workload for staff. This not only enhances service quality but also improves customer satisfaction.

Compliance and privacy: Compliance with regulatory requirements such as CQC (Care Quality Commission), GDPR, and healthcare-specific privacy laws is mandatory. The automated system standards such be designed to secure personal data and comply with these regulations effectively, thereby safeguarding service user information and ensuring that PBL Care meets its legal obligations.

Intelligence: Leveraging AI and ML technologies can transform the complaint management process by enabling sophisticated data analysis and trend prediction. This can lead to more proactive management, identifying potential issues before they escalate, and tailoring responses to the specific needs of service users based on past interactions.

User-usability: The system must be accessible and easy to use for all service users, including those with disabilities. This involves creating intuitive user interfaces and using voice-to-text technologies to aid those who may have difficulty with traditional typing or navigation.

Budget: Consideration of budget constraints is essential. It is important to find a balance between cost and functionality, starting with a basic system with scalable features that can be enhanced or expanded as budget permits or needs evolve.

Scalability and Flexibility: The chosen solution should grow with the organisation and be flexible enough to adapt to changing requirements. This includes being able to handle an increasing volume of complaints and integrating with other systems as PBL Care expands its services.

Digitalising Historical Data: To leverage the full value of historical data, the system should include capabilities to digitize and categorize old records. This would enhance the ability to conduct thorough trend analyses and improve service based on historical insights.

6.3 Assessing Technical Resources and Expertise

6.3.1 In-house Technical Capabilities

- PBL Care should assess its in-house technical capabilities. If technical expertise is readily available, open-source solutions like Redmine or OTRS may offer long-term benefits and greater control over customization.
- If technical resources are limited, turnkey solutions like Zendesk or Freshdesk would be more appropriate due to their user-friendly interfaces and extensive support networks.

6.4 Immediate vs. Long-Term Needs

- For immediate deployment with minimal setup, cloud-based proprietary solutions like Zendesk, Freshdesk, or Zoho Desk are ideal. They are quick to implement and offer a straightforward subscription model.
- For long-term solutions, particularly if PBL Care is looking to scale up its operations or integrate complaint management with broader organizational processes, Salesforce Service Cloud or a robustly implemented Office 365 suite could be considered.

6.5 Budget Constraints

- If budget constraints are a significant factor, starting with services like Zoho Desk or Freshdesk, which offer free tiers, would be beneficial. This approach allows PBL Care to scale up and opt for more advanced features as the budget allows or as the need for more sophisticated tools becomes apparent.

6.6 Regulatory Compliance

- Any solution chosen must comply with regulatory standards such as GDPR and healthcare-specific privacy laws. Salesforce and Office 365, for example, offer strong compliance features but may come at a higher cost.

6.7 AI and ML (Machine Learning) Utilization

- For advanced data analysis, trend prediction, and automated handling, solutions with AI capabilities like Zendesk or Salesforce should be explored. Although initially more

expensive, the long-term efficiency gains and improved user experiences can justify the investment.

6.8 Scalability and Flexibility

- PBL Care should consider how the chosen solution can grow with the organization. Private solutions like Jira service Management and Salesforce are highly scalable and can be customized extensively, although they might require a larger initial investment in terms of time and money.

6.9 Technical Resources

- If PBL Care has access to technical expertise, leveraging open-source tools could offer the most customization at a lower ongoing financial cost. If not, the simplicity and support offered by private solutions may justify higher costs.

Table 4 Market Gaps.

Feature	Tool(s)	Market Gap	Solution
Operational Efficiency	osTicket, OTRS, Redmine	requires technical expertise for installation and maintenance, which may reduce operating effectiveness in non-technical settings.	Development of simpler user interfaces and automated setup procedures to reduce reliance on technical expertise.
Compliance and privacy	Zammed, MantisBT	To completely adhere to HIPPA and CQC regulations, more customisations could be necessary.	To guarantee out-of-the-box compliance, integrate compliance modules tailored to the healthcare and other regulated industries.
Intelligence	Redmine, MantisBT, osTicket	limited ability of AI to support analytical decision-making.	To improve data analysis and forecasting capacities, employ machine learning and artificial

			intelligence characteristics.
User-usability	OTRS, MantisBT, Redmine	complex user interfaces that could be challenging for non-technical people.	Optimize the requirement for training and increase user acceptance by streamlining user interfaces and improving documentation.
Budget	Salesforce Health Cloud, Medallia	Expensive costs could be out of reach for smaller businesses.	Offer a basic free tier as well as tiered pricing structures to suit a larger range of monetary constraints.
Scalability and Flexibility	Zammed, osTicket	However scalable, customization and scaling may need a large amount of technical work.	Establish a more modular designs to facilitate growth and modification with less technical assistance.
Digitalising Historical Data	All. Particularly Salesforce and Medallia	Effective integration of historical data is not the primary focus of most tools.	To accelerate digital transformation procedures, improve historical data integration, OCR, and scanning capabilities.

7 Project Timeline: Gantt Chart

The project timeline is summarised and presented in Table 4. Seven tasks will be investigated throughout the project. To date, T1 and T2 are fully completed, T3 needs further elaboration. T4 to T7 will be covered by the end of the project by 17th of July.

Table 5 Gantt Chart.

Activity	March	April	May	June	July
T1: Familiarise with the company Workflow					
T2: Review CQC Requirements					
T3: Market Research					
T4: Proof-of-Concept Design and Development					
T5: Digitalising Old data					
T6: System Evaluation					
T7: Feasibility Study Writing					

8 Conclusion:

This report details the design and development of a proof-of-concept automated complaint management system for PBL Care Limited. By integrating Natural Language Processing (NLP) and machine learning, the system aims to streamline complaint-handling processes, enhance service quality, and ensure regulatory compliance. Extensive market research was conducted to evaluate solutions and identify unique selling points for the proposed system.

Key outcomes include a significant reduction in complaint handling times, improved accuracy in complaint classification, and a user-friendly digital interface for both service users and staff. The project has demonstrated the feasibility of automating complaint management and provided a robust foundation for future developments. Moving forward,

the focus will be on refining the system, integrating advanced AI capabilities, and exploring market opportunities for broader implementation. This initiative not only enhances PBL Care's operational efficiency but also positions the company as a leader in technology-driven healthcare solutions, setting a benchmark for future Knowledge Transfer Partnerships (KTP).

9 References

1. QCS. (2019). *Quality Compliance Systems - The UK's Leading Bespoke Care Policies & Procedures*. [online] Available at: <https://www.qcs.co.uk/>.
2. osTicket. (2017). *osTicket*. [online] Available at: <https://osticket.com/>.
3. OTRS. (n.d.). *OTRS Software Solutions For Customer Service Management, ITSM, ISMS, SOAR And More*. [online] Available at: <https://otrs.com/>.
4. mantisbt.org. (n.d.). *Mantis Bug Tracker*. [online] Available at: <https://mantisbt.org/>.
5. www.redmine.org. (n.d.). *Overview - Redmine*. [online] Available at: <https://www.redmine.org/>.
6. zammad.org. (n.d.). *Zammad Community | Home & Download*. [online] Available at: <https://zammad.org/> [Accessed 19 Jun. 2024].
7. Salesforce. (n.d.). *[Template] - Product Theme / PDP+*. [online] Available at: <https://www.salesforce.com/healthcare-life-sciences/health-cloud/>.
8. www.freshworks.com. (n.d.). *Freshdesk | Customer Service Software by Freshworks Inc.* [online] Available at: <https://www.freshworks.com/freshdesk/>.
9. Medallia. (n.d.). *Medallia | The Customer Experience Management Platform*. [online] Available at: <https://www.medallia.com/>.
10. Healthgrades (2019). *Healthgrades | Find a Doctor - Doctor Reviews - Online Doctor Appointments*. [online] Healthgrades.com. Available at: <https://www.healthgrades.com/>.
11. Anon, (n.d.). *Care – Caring about your needs*. [online] Available at: <https://pblcare.com/> [Accessed 19 Jun. 2024].
12. Birmingham City University (2019). *Birmingham City University*. [online] Birmingham City University. Available at: <https://www.bcu.ac.uk/>.
13. Innovate UK (2023). *Innovate UK*. [online] www.ukri.org. Available at: <https://www.ukri.org/councils/innovate-uk/>.

