SECP1513

TECHNOLOGY AND INFORMATION SYSTEM

SECTION 06

DESIGN THINKING REPORT

TECHNO GANG – GROUP MEMBER:

	Name	Matric Number
1	NAM SOOK JING	A23CS5016
2	TAN MIN XUAN	A23CS5030
3	RAGHAD ZAINALABDIN TAHA OSMAN	A22EC9002
4	HANAN OSAMA HUSSEIN SALAH	A22EC4042
5	JULKER NAYEEN	A21EC9117

Table of Contents

Detailed Report on Addressing Data Inconsistency in Databases

Introduction

This report, informed by Chapter 5 of our reference material, addresses the significant challenge of data inconsistency in databases within the context of data management and analytics. Data inconsistency, as identified in various studies and industry insights, undermines the reliability of data analytics and impairs decision-making processes in organizations. To counter this issue, we propose a solution involving the implementation of data validation rules and the establishment of a Master Data Management (MDM) system. This approach is substantiated by insights from various industry sources, emphasizing its criticality in ensuring data integrity.

Detail Steps and Description

The design thinking process, as applied to addressing the challenge of data inconsistency in databases, can be detailed in the following steps, each supported by various forms of evidence:

Empathy Phase:

Description: This phase involved understanding the user's perspective through interviews and surveys with database users and administrators.

Evidence: Interviews and Surveys - Conducted with users like John, Maria, Alex, and Emily to gather firsthand accounts of how data inconsistency impacts their work. Redis's 2022 Report: Used as a reference to highlight the broader industry perspective on the issue.

Figure 1 - Empathy Phase

Define Phase:

Description: The problem was clearly articulated, and the team scrutinized database structures, data entry methodologies, and inter-system data flows.

Evidence: Problem Statement Documentation - Articulated as "Data inconsistency across databases results in unreliable analytics and decision-making processes." Atlan's 2024 Report: Provided insights into the root causes of data inconsistencies.

Figure 2 - Define Phase

Ideate Phase:

Description: Brainstorming sessions were held to generate potential solutions, focusing on data validation rules and an MDM system.

Evidence: Brainstorming Session Logs - Documenting the ideas generated during the phase. Decube's 2024 Report: Influenced the direction of the brainstorming towards industry best practices.

Figure 3 - Ideate Phase

Prototype Phase:

Description: Creation of a prototype for the MDM system, alongside designing a set of data validation rules.

Evidence: Prototype Designs - Outlining the architecture, features, and integration capabilities of the MDM system. Validation Rules Documentation: Detailing the data validation rules based on identified inconsistencies

Test Phase:

Description: Testing the prototype in a simulated environment to assess improvements in data accuracy and user satisfaction.

Evidence: Testing Logs - Documenting the testing process and outcomes.

End of Project Demonstration:

Description: Evaluation of the effectiveness of the implemented solutions.

Evidence: Performance Metrics - Reductions in data errors, improvements in data quality, and user feedback. Demonstration Videos/Images: Showcasing the functioning of the MDM system and data validation rules.

Transition Between Phases:

Description: Regular evaluations to ensure alignment with objectives and effective progress.

Evidence: Progress Reports - Documenting the transition and achievements at the end of each phase. Team Meeting Minutes and Logs: Detailing decisions and discussions during phase transitions.

Throughout these phases, additional evidence such as log journals, team progress updates, and visual documentation (e.g., images and videos of prototypes and brainstorming sessions) were utilized to provide a comprehensive overview and support the effectiveness of the design thinking approach in solving the challenge of data inconsistency in databases.

Detailed Descriptions

Problem Overview:

The inconsistency in databases arises from various factors such as disparate data entry standards, manual entry errors, and lack of synchronization across systems, leading to challenges like duplicate records, outdated information, and conflicting data. These issues significantly affect data analytics' reliability, as Decube and Atlan reported in their respective 2024 studies.

Solution Proposal:

Our solution includes implementing comprehensive data validation rules to prevent the entry of incorrect or inconsistent data. Furthermore, the establishment of an MDM system ensures centralized and standardized data management, thus maintaining consistency across all databases. This approach aligns with industry best practices and recommendations for ensuring data consistency and integrity, as emphasised in reports by Redis and Tapdata.

Team Dynamics:

The project leveraged a cross-functional team, including experts in database management, software development, and project management. Effective collaboration, communication, and decision-making were pivotal in executing the project, reflecting the best practices in team dynamics and project management.

Design Thinking Assessment Points

End of Project Demonstration:

Evaluation at this stage focused on the effectiveness of the MDM system and data validation rules in addressing data inconsistencies. Metrics included reductions in data errors, improvements in data quality, and user feedback.

Transition Between Phases: Evaluations at the end of each design thinking phase ensured that the project remained aligned with our objectives and was making effective progress.

Design Thinking Evidence

Empathy Phase:

Interviews and surveys with database users and administrators revealed the profound impact of data inconsistency on their operations. This phase highlighted the real-world challenges and frustrations stemming from inaccurate or inconsistent data, as emphasised in Redis's 2022 report on database consistency.

Question (User - John, Database Administrator - Age 35, IT Background): John, as an experienced database administrator with an IT background, how has data inconsistency specifically impacted your work?

Answer: Well, data inconsistency has been a major headache for me, especially considering my IT background. It often leads to confusion among the team and forces me to spend a significant amount of time resolving these issues manually.

Question (User - Maria, Sales Manager - Age 40, Sales Background): Maria, with your background in sales, can you share a recent instance where data inconsistencies in the database system caused problems for your sales team?

Answer: Absolutely. Just a few weeks ago, our sales figures didn't match up with what the database was showing. This led to confusion among my sales team, and we had to delay important sales forecasts and strategies until we could sort out the discrepancies.

Question (User - Alex, Customer Support Representative - Age 28, Customer Service Background): Alex, as a customer support representative, how has inaccurate data from the database affected your interactions with clients?

Answer: It's been frustrating, to say the least. When the data isn't consistent, I've had instances where I provided incorrect information to our customers, leading to escalations and unhappy clients. It's crucial for our database to be reliable in my line of work.

Question (User - Emily, Marketing Analyst - Age 30, Marketing Background): Emily, with your marketing background, can you explain how data inconsistencies have influenced your ability to analyze campaign performance?

Answer: Sure, it's been a challenge. Inaccurate data has led to skewed campaign performance reports, making it difficult to evaluate the success of our marketing efforts. It's essential to have accurate data for making data-driven marketing decisions.

Define Phase: We articulated the problem statement as "Data inconsistency across databases results in unreliable analytics and decision-making processes." This phase involved scrutinizing database structures, data entry methodologies, and inter-system data flows to understand the root causes of inconsistencies, as outlined by Atlan in 2024.

Ideate Phase: Solutions such as implementing data validation rules and an MDM system were proposed, aiming to enhance data accuracy and ensure system-wide consistency. This stage drew inspiration from industry best practices for achieving data consistency, as discussed in Decube's 2024 report.

Prototype Phase: A prototype for the MDM system was created, outlining its architecture, features, and integration capabilities with existing database systems. Concurrently, a set of data validation rules was designed based on typical data inconsistencies identified in our preliminary research.

Prototype: https://drive.google.com/file/d/1IJ0abDDm3ZBO

Test Phase: The testing of the prototype in a simulated environment demonstrated notable improvements in data accuracy and user satisfaction. This phase was crucial in validating our approach against the real-world scenarios detailed in Tapdata's 2024 report on database integration challenges.

Personal Reflection

My main goal in my Software Engineering program at UTM is to achieve a perfect CGPA of 4.0. Using design thinking, I'm not just focusing on grades; I'm also planning for my future life, understanding different work situations, and figuring out what kind of jobs I want.

Design thinking helps me think broadly about my future, beyond just studying. It encourages me to plan for challenges and opportunities in the software engineering and computer sciences field.

To boost my chances in the industry, I know it's essential to gain hands-on experience. So, I'm committed to doing practical projects, getting real job experiences, and learning as much as I can about software engineering. This way, I'll be well-prepared for whatever comes my way in the tech world.

References:

1."What is Database Consistency?" Redis. 2022. Redis.com.

https://redis.com/

2."Why is Data Consistency Important?" Describe. 2024. Decube.io.

https://atlan.com/

3."Data Consistency 101: Causes, Types and Examples." Atlan. 2024. Atlan.com.
https://www.decube.io/

4."Overcoming Challenges in Database Integration: Ensuring Data Consistency, Security, Compatibility, and Performance." Tapdata. 2024. Tapdata.io.

https://tapdata.io/