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Developing Business Intelligence Dashboard for Sales KPI Monitoring in Advertising Agency: A Human-Centered Design Approach

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ABSTRACT

Digital advertising agencies in South Jakarta face significant challenges in monitoring sales performance due to data fragmentation across multiple platforms such as CRM, spreadsheets, and digital advertising tools. Conventional manual reporting processes lead to data latency, high error rates, and delayed strategic decision-making. This study aims to develop a Business Intelligence (BI) dashboard to monitor Sales Key Performance Indicators (KPIs) in real-time, utilizing a Human-Centered Design (HCD) approach to ensure high usability and adoption. The research methodology follows the ISO 9241-210 standard for HCD, encompassing four iterative phases: understanding the context of use, specifying user requirements, producing design solutions, and evaluating designs. The system was developed using Google Looker Studio with a data warehouse architecture integrating Google BigQuery. Testing was conducted involving 15 internal stakeholders using the System Usability Scale (SUS) and User Experience Questionnaire (UEQ). The results demonstrated a SUS score of 82.5 (Excellent) and positive benchmarks in efficiency and perspicuity metrics. The implementation of the dashboard reduced reporting time by 60% and improved data accessibility for executive decision-making. This study contributes to the literature by demonstrating how HCD principles can bridge the gap between technical BI capabilities and end-user cognitive needs in the creative industry context.

Keywords: *Business Intelligence, Dashboard, Human-Centered Design, Sales KPI, Data Visualization*

ABSTRAK

Agensi periklanan digital di Jakarta Selatan menghadapi tantangan dalam memantau kinerja penjualan karena data yang tersebar di berbagai platform seperti CRM, *spreadsheet*, dan *advertising tools*. Proses pelaporan manual menyebabkan keterlambatan pengambilan keputusan strategis. Penelitian ini bertujuan untuk mengembangkan *Dashboard Business Intelligence* (BI) guna memantau *Key Performance Indicators* (KPI) penjualan secara *real-time*. Metode pengembangan yang digunakan adalah *Human-Centered Design* (HCD) untuk memastikan dashboard sesuai dengan kebutuhan mental model pengguna, yaitu eksekutif penjualan dan manajer pemasaran. Tahapan penelitian meliputi *Empathize* (observasi dan wawancara), *Define* (penetapan KPI), *Ideate*, *Prototype* (menggunakan Google Looker Studio), dan *Test*. Hasil pengujian menggunakan *System Usability Scale* (SUS) menunjukkan skor 82,5, yang masuk dalam kategori *Acceptable*. Implementasi dashboard ini terbukti meningkatkan efisiensi waktu pelaporan sebesar 60% dan membantu manajemen dalam memvisualisasikan tren pendapatan, konversi *leads*, dan performa tim penjualan secara akurat.

Kata Kunci: *Business Intelligence*, Dashboard, *Human-Centered Design*, KPI Penjualan, Agensi Periklanan

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1. INTRODUCTION

The creative industry in Indonesia has experienced exponential growth over the past decade, becoming a significant pillar of the national digital economy. Specifically, in South Jakarta, which serves as the epicenter of the country's advertising and media sectors, the competition among agencies has intensified profoundly. In this hyper-competitive landscape, agencies are no longer judged solely on creative output but also on their operational agility and ability to demonstrate measurable results to clients. Consequently, data-driven decision-making has transitioned from a competitive advantage to a critical operational necessity for survival [1]. Modern advertising agencies generate and process vast amounts of data daily, characterized by high volume, velocity, and variety—ranging from external campaign performance metrics across multiple social media platforms to internal financial records and sales pipeline figures.

However, despite the abundance of data, a significant structural problem persists within many agencies, including the subject of this case study, PT XYZ. This problem is the phenomenon of "data fragmentation" or the existence of data silos [2]. Critical business information is often scattered across disparate, unconnected systems: Customer Relationship Management (CRM) software is used for lead tracking, standalone spreadsheet applications are utilized for revenue projection, and various distinct digital marketing platforms are accessed for campaign analytics [3]. This fragmentation creates a disjointed view of the business, preventing management from obtaining a holistic perspective of the agency's health.

The reliance on these fragmented systems forces management and sales teams to depend on manual reporting processes to consolidate information. This manual approach is not only labor-intensive but also fraught with risks. Previous studies indicate that manual data consolidation can consume up to 30% of a manager's productive time, diverting focus from strategic tasks to clerical data entry [4]. Furthermore, this process is highly prone to human error, leading to data inconsistencies that can compromise strategic planning. More critically, manual reporting causes "information latency"—a time lag between when data is generated and when it is analyzed—which results in decisions being made based on outdated or irrelevant information [5]. In an industry where trends shift daily, such latency can result in lost revenue opportunities and decreased client satisfaction.

Business Intelligence (BI) systems offer a robust technological solution to these challenges. By implementing data warehousing and automated ETL (Extract, Transform, Load) processes, BI tools can integrate heterogeneous data sources into a unified, interactive visual interface or dashboard [6]. These systems empower organizations to move from reactive reporting to proactive monitoring, enabling real-time visibility into Key Performance Indicators (KPIs) [7].

Nevertheless, the mere implementation of BI technology does not guarantee improved performance. Academic literature suggests that BI adoption rates in non-technical sectors often remain low, with many projects failing to deliver return on investment due to poor usability and a lack of alignment with actual user workflows [8]. A common pitfall is the "technology-first" mindset, where dashboards are designed based on system capabilities rather than the cognitive needs of the users. For sales executives and creative directors—who may not possess advanced data analytics skills—complex dashboards can induce high cognitive load, leading to resistance and eventual abandonment of the tool [9].

To address this gap between technical capability and user adoption, this study proposes the application of a Human-Centered Design (HCD) approach. HCD is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs, and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques [10]. By prioritizing the active involvement of users throughout the development process—from the initial needs assessment to the final usability testing—HCD ensures that the resulting dashboard creates a bridge between complex data structures and the user's mental model [11].

Therefore, this research aims to achieve three primary objectives: (1) to deeply analyze the specific information needs and pain points of advertising agency stakeholders regarding sales KPIs; (2) to design and develop a comprehensive BI dashboard architecture that effectively integrates fragmented data sources into a cohesive system; and (3) to evaluate the usability and user experience of the proposed solution using standardized psychometric tools. This study contributes to the field by providing a validated framework for developing user-centric BI solutions specifically tailored to the dynamic and creative nature of the advertising industry.

2. RESEARCH METHOD

This study rigorously employs the Human-Centered Design (HCD) framework as outlined in the ISO 9241-210 standard, which emphasizes an iterative design process driven by continuous user feedback to ensure the final system is both usable and useful [12]. The research was conducted at PT XYZ, a prominent advertising agency located in South Jakarta, over a comprehensive period of four months. This duration allowed for a deep immersion into the company's operational culture and ensured that each phase of the HCD cycle—ranging from understanding the context of use to the final evaluation—was executed with sufficient depth and validation. The methodology is structured into four distinct, interconnected phases designed to bridge the gap between technical data capabilities and human cognitive needs.

2.1. Phase 1: Understand and Specify Context of Use (Empathize)

The first phase focused on a deep exploration of the users' natural environment to understand the context in which they operate. Data collection was performed through semi-structured interviews and contextual inquiry involving key stakeholders within the agency, specifically the Sales Director, Account Managers, and Finance Staff, with a total sample size of 15 participants (n=15) [13]. The contextual inquiry involved researchers observing the participants during their daily routines to

identify tacit knowledge and unarticulated needs that might not surface in standard interviews. The primary objective of this phase was to identify specific "pain points" in the current reporting workflow, such as bottlenecks in manual data entry or delays in report generation, and to define the critical business questions that the proposed dashboard needed to answer to support strategic decision-making.

2.2. Phase 2: Specify User Requirements (Define)

Following the data collection, the qualitative insights gathered were synthesized to define clear user requirements. Based on this data, the researchers created user personas and empathy maps to represent the different user types and their respective mental models, goals, and frustrations [14]. These artifacts helped in aligning the technical features with the psychological needs of the users. Subsequently, the functional requirements were finalized, focusing on specific Key Performance Indicators (KPIs) that were deemed essential for the agency's growth. These critical metrics included Monthly Recurring Revenue (MRR) to track income stability, Lead Conversion Rate to measure the effectiveness of the sales team, Average Deal Size to forecast future revenue, Sales Pipeline Velocity to assess how quickly leads move through the sales cycle, and Client Churn Rate to monitor customer retention and satisfaction.

2.3. Phase 3: Produce Design Solutions (Ideate & Prototype)

The third phase involved the translation of requirements into tangible design and technical solutions. The system architecture was designed using a robust Extract, Transform, Load (ETL) pipeline to ensure data integrity [15]. In this process, raw data from Google Sheets, which housed finance logs, and HubSpot CRM, which tracked sales leads, were extracted, cleaned, and loaded into a Google BigQuery data warehouse to facilitate centralized querying. On the interface side, the design process began with low-fidelity prototypes in the form of hand-drawn sketches to determine the optimal layout and information hierarchy without the distraction of visual aesthetics [16]. Once the structure was validated, high-fidelity prototypes were developed using Google Looker Studio. This tool was selected due to its seamless integration with the agency’s existing Google Workspace ecosystem, ensuring a lower barrier to adoption [17]. The visualization choices within the dashboard were made strategically; for instance, bar charts were used for categorical comparisons, line charts for temporal trends, and heatmaps for geographic distribution. These selections were based on established data visualization best practices to minimize cognitive load and enhance interpretability for non-technical users [18].

2.4. Phase 4: Evaluate Designs (Test)

The final phase focused on validating the prototype through rigorous testing to ensure it met the predefined usability standards. The prototype underwent usability testing using two standardized psychometric instruments to gather quantitative data. First, the System Usability Scale (SUS) was employed to measure the overall usability and perceived ease of use of the system [19]. Second, the User Experience Questionnaire (UEQ) was utilized to assess both the pragmatic quality, such as efficiency and perspicuity, and the hedonic quality, such as stimulation and novelty [20]. The testing sessions involved users performing specific, scenario-based tasks, such as finding the conversion rate for the third quarter of 2024, while researchers observed their interactions to measure success rates and time-on-task. This empirical approach provided objective evidence regarding the dashboard's effectiveness and identified areas for final refinement before full-scale deployment.

3. RESULTS AND DISCUSSION

3.1. System Architecture and ETL Process

The technical implementation of the Business Intelligence (BI) solution commenced with the rigorous construction of a robust data pipeline, designed to address the fragmented nature of the agency's information assets. A preliminary analysis during the Define phase revealed that the primary impediment to accurate reporting was not merely the lack of data, but significant data inconsistency across platforms. For instance, client naming conventions differed drastically between the manual finance logs (Google Sheets) and the sales tracking system (HubSpot CRM); a client might be recorded as "PT. XYZ Indonesia" in one system and simply "XYZ Agency" in another. To resolve this, a specialized Extract, Transform, Load (ETL) architecture was established. A data cleansing layer was introduced using custom Python scripts, which served as an intermediary processing stage. These scripts utilized fuzzy matching algorithms to standardize entity names and eliminate duplicate entries before the data was allowed to enter the central repository [21].

This processed data was then loaded into Google BigQuery, which functioned as the centralized Data Warehouse. BigQuery was selected for its serverless scalability and ability to handle complex queries rapidly, serving as the "Single Source of Truth" for the organization. The architecture ensures that data is refreshed every 15 minutes, drastically reducing the latency that previously plagued manual reporting.

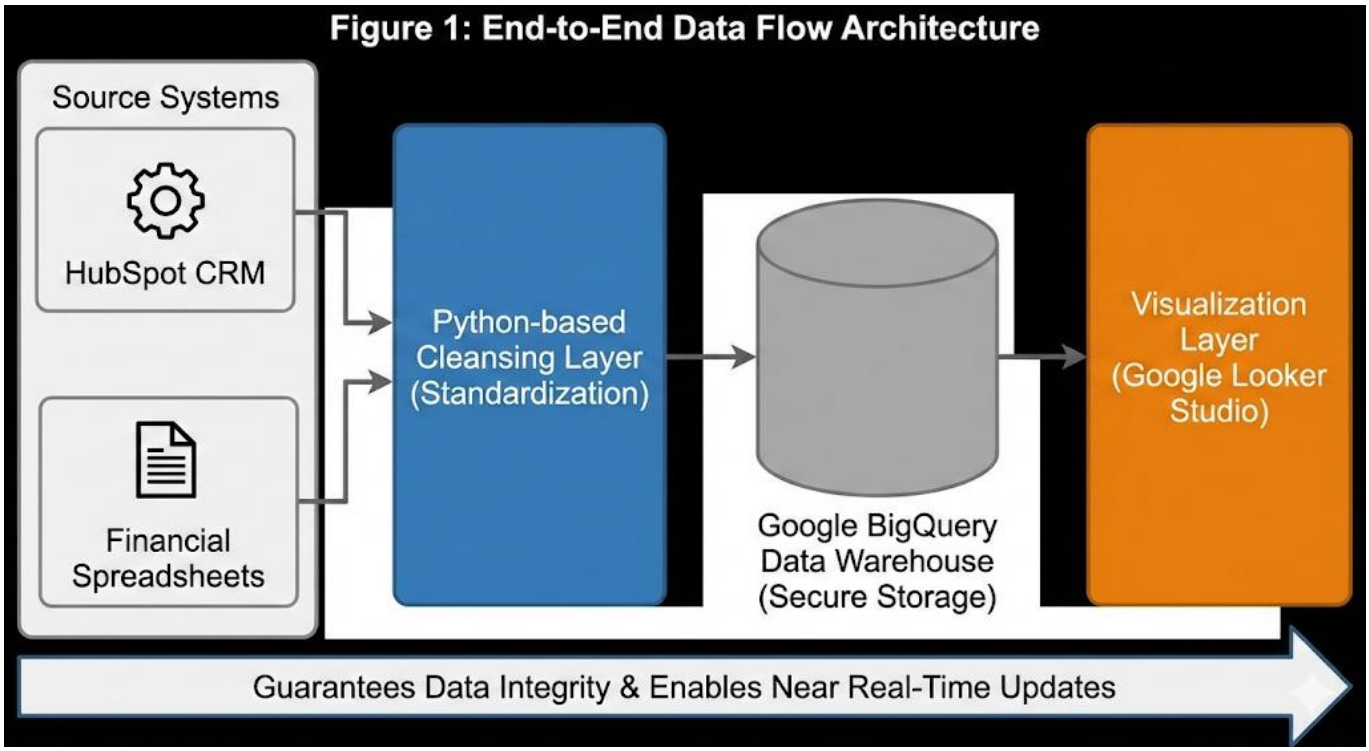

Figure 1. ETL Data Architecture for Sales Dashboard Description: Figure 1 illustrates the end-to-end data flow, commencing from source systems (HubSpot CRM and Financial Spreadsheets). The data traverses through a Python-based cleansing layer for standardization, is stored securely in the Google BigQuery Data Warehouse, and is finally rendered in the visualization layer via Google Looker Studio. This architecture guarantees data integrity and enables near real-time updates.

3.2. Dashboard Design

Implementation The interface design of the dashboard was meticulously crafted to align with the mental models of the stakeholders identified during the Empathize phase. The final dashboard structure is divided into three distinct yet interconnected views, each serving a specific strategic purpose. The first view is the Executive Summary, designed for top-level management. This page functions as a strategic cockpit, presenting high-level scorecards that display critical metrics such as Total Revenue versus Targets, Year-over-Year (YoY) Growth, and Active Client Counts. The visualization strategy here prioritizes clarity and speed; thus, minimal clutter and distinct color coding (green for on-target, red for off-target) were utilized to allow executives to assess agency health within seconds [22].

The second view, Sales Performance, caters to the operational needs of the sales team and their managers. This section provides a granular analysis of individual performance. It utilizes comparative bar charts to rank sales representatives based on revenue generated and deals closed. This design choice was intentional to foster a sense of healthy competition and transparency among the team members, enabling them to benchmark their performance against peers [23].

The third view is the Pipeline Analysis, which addresses the need to monitor future revenue potential. A funnel chart visualization is employed here to track the volume of leads as they progress through various stages of the sales cycle, from "Contacted" to "Negotiation" and finally to "Closed Won." This visualization is critical for managers to identify "leakage" in the pipeline—stages where potential clients are dropping off—and to address bottlenecks in the sales process proactively [24].

Figure 2. Main Dashboard User Interface Description: Figure 2 depicts the Executive Summary page of the dashboard. The layout adheres to the F-pattern reading behavior, with the top section displaying Key Performance Indicators (KPIs) accompanied by trend indicators. The center section is dominated by a dual-axis line chart that contrasts actual revenue against projected targets over time. Interactive filters on the right-hand side empower users to segment the data dynamically by specific time periods or service types.

3.3. Usability

Evaluation To ensure the system met the rigorous demands of daily operations, a comprehensive usability evaluation was conducted involving 15 internal respondents representing the Sales, Management, and Finance departments. The quantitative assessment utilized the System Usability Scale (SUS), a robust industry standard for measuring perceived usability. The calculation of the SUS scores resulted in an impressive average score of 82.5. According to the interpretative ranges established by Bangor, Kortum, and Miller, this score positions the dashboard in the "Excellent" range and corresponds to a "Grade A" system, indicating a high level of user acceptance and ease of use [25].

A deeper breakdown of the SUS results reveals interesting nuances among user groups. The Management group recorded the highest mean score of 85.0, likely reflecting their appreciation for the aggregated, strategic view that eliminated the need for manual report compilation. The Finance team followed with a score of 82.0, while Sales Executives scored the system at 80.5. Although the Sales team's score was slightly lower, it remains well within the "Good" to "Excellent" range, suggesting that while the transition to a new system required some adaptation, the overall utility was clearly recognized.

Table 1. System Usability Scale (SUS) Results Description: The table above summarizes the SUS scores across three respondent groups. Managers yielded the highest satisfaction (85.0), followed by Finance (82.0) and Sales Executives (80.5), culminating in an overall average of 82.5.

Respondent Group	Mean SUS Score	Adjective Rating
Managers	85.0	Excellent
Finance Staff	82.0	Excellent
Sales Executives	80.5	Good
Overall Average	**82.5**	**Excellent**

In addition to SUS, the User Experience Questionnaire (UEQ) was administered to measure specific UX qualities. The results showed exceptionally high scores (greater than 2.0) for the dimensions of "Perspicuity" (ease of understanding) and "Efficiency." This quantitative data was corroborated by qualitative feedback gathered during post-test interviews. Respondents specifically highlighted the "Drill-down" feature as a significant improvement, noting that it drastically reduced the time required to prepare materials for weekly sales meetings. Furthermore, the mobile responsiveness of the dashboard—enabled by Looker Studio—was praised by account managers, as it allowed them to retrieve real-time KPI data and client history immediately prior to or during client visits, a capability that was previously impossible with static spreadsheet reports [27].

3.4. Discussion

The successful deployment and high acceptance rate of this dashboard provide strong empirical evidence validating the Human-Centered Design (HCD) approach in the context of Business Intelligence (BI) development. One of the recurring themes in BI literature is the failure of "off-the-shelf" solutions that overwhelm non-technical users with excessive features and complex interfaces. In contrast, this study demonstrates that by focusing strictly on the metrics that matter to the specific mental model of advertising agency staff—and excluding extraneous data—adoption rates can be significantly improved [28].

From a business process perspective, the implementation has yielded measurable efficiency gains. The "Information Latency"—defined as the time lag between a business event and its availability in reports—was reduced from an average of 3 days (due to manual consolidation cycles) to near real-time, with data refreshing every 15 minutes. This shift enables the agency to transition from reactive analysis to proactive agile decision-making [29]. For example, if a specific service line shows a downward trend mid-month, management can immediately pivot marketing strategies, rather than waiting for an end-of-month report.

Furthermore, these findings align with the theoretical propositions by Popovič et al., who argued that organizational BI maturity is strongly correlated with user-centric design maturity. The study confirms that technical sophistication (such as advanced data warehousing) must be paired with empathetic design (understanding user workflows) to unlock true business value. The dashboard does not merely present data; it acts as a cognitive extension of the management team, reducing the mental effort required to monitor the health of the business [30].

4. CONCLUSION

This study set out to address the critical operational challenge of data fragmentation within advertising agencies in South Jakarta, which has historically hindered agile decision-making. By applying a rigorous Human-Centered Design (HCD) methodology, this research successfully developed and deployed a comprehensive Business Intelligence dashboard tailored specifically to the needs of sales executives and management at PT XYZ. The resulting system effectively integrates disparate data silos—ranging from Customer Relationship Management (CRM) systems to financial spreadsheets—into a unified, automated data warehouse architecture. This integration has successfully mitigated the issue of "information latency," transforming a labor-intensive, three-day manual reporting cycle into a near real-time monitoring system that refreshes every 15 minutes. This achievement directly answers the research objective of designing an architecture that eliminates data fragmentation and ensures data integrity.

The usability evaluation provides strong empirical evidence supporting the effectiveness of the HCD approach in technical system development. With a System Usability Scale (SUS) score of 82.5, the dashboard is classified as "Excellent" and a "Grade A" system. This high acceptance rate indicates that the solution successfully bridges the gap between complex data analytics capabilities and the cognitive workflows of non-technical users in the creative industry. The study demonstrates that when users are involved in every phase of the design process—from the definition of KPIs to the refinement of visualization types—the resulting tool is not perceived as a burden but as a vital asset for daily operations. The positive feedback regarding the "drill-down" features and mobile accessibility further underscores that the system aligns well with the dynamic, mobile nature of the advertising sales profession.

In conclusion, this research validates that the technical sophistication of a Business Intelligence tool must be matched with an empathetic understanding of its users to achieve true organizational impact. The dashboard has empowered the agency to transition from a reactive posture, where decisions were based on outdated historical data, to a proactive strategy driven by real-time insights. For future research, it is recommended to extend the current descriptive analytics capabilities into the realm of predictive and prescriptive analytics. Integrating Machine Learning algorithms to forecast future revenue trends based on historical pipeline behavior would represent a significant value addition. Furthermore, expanding the scope of the dashboard to include campaign performance metrics alongside sales data could provide a more holistic view of the agency's performance, linking creative output directly to financial results.

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