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Integrated Business Performance Monitoring Models Using Excel-Based Dashboards and Manual Controls

Benjamin Monday Ojonugwa [1*], Onyeka Kelvin Chima [2], Onyinye Jacqueline Ezeilo [3], Sandra Orobosa Ikponmwoba [4], Akoche Ochefu [6], Michael Olumuyiwa Adesuyi [6]

[1] Independent researcher, Lagos, Nigeria
[2] Africa Capital Alliance, Ikoyi, Lagos. Nigeria
[3] Independent Researcher, Abuja, Nigeria
[4] Independent researcher, Abuja, Nigeria
[6] Benue State Civil Service Commission, Benue Nigeria
[6] First Bank of Nigeria Ltd Kano, Nigeria

Corresponding Author: **Benjamin Monday Ojonugwa**

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Abstract
The integration of business performance monitoring models through Excel-based dashboards and manual controls offers an effective, cost-efficient solution for businesses seeking to track and improve operational performance. This approach combines the strengths of dynamic data visualization with the reliability of manual oversight, providing a comprehensive system for real-time decision-making and long-term strategic planning. Excel-based dashboards facilitate the aggregation and analysis of diverse business data, such as sales, finance, inventory, and HR metrics, through customizable templates and interactive features. These dashboards enable businesses to visualize key performance indicators (KPIs), track trends, and gain insights into critical areas of operations. In addition to automation, manual controls are implemented to validate data accuracy and ensure compliance with established standards. These controls include manual data checks, review cycles, and exception reporting systems that help prevent errors, ensure consistency, and address discrepancies in the data. The combination of automated dashboards and manual review processes ensures both efficiency and precision, enabling businesses to maintain data integrity while improving decision-making agility. The model's benefits include cost-effectiveness, ease of customization, real-time reporting, and enhanced data transparency, which collectively contribute to improved operational efficiency and strategic alignment. However, challenges such as scalability, dependency on manual processes, and data integration complexities need to be carefully managed. By adhering to best practices, such as regular data updates, user training, and version control, businesses can optimize the effectiveness of this monitoring model. Overall, integrated business performance monitoring models using Excel-based dashboards and manual controls provide businesses with a practical tool for performance analysis and resource management, supporting informed decision-making and organizational growth. This explores the design, implementation, benefits, and challenges of such a model, offering insights into its practical application for organizations of varying sizes and sectors.

Keywords: Integrated business, Performance, Monitoring, Models, Excel-based, Dashboards, Manual controls

1. Introduction
In today's fast-paced business environment, organizations face increasing pressure to optimize their operations and make informed decisions based on accurate, real-time data (Iyabode, 2015; Faith, 2018). To achieve this, an integrated system for monitoring business performance is essential. The development of such a system, which combines Excel-based dashboards with manual controls, serves as a powerful tool for tracking, evaluating, and enhancing business performance (Abimbade *et al*., 2017; Edwards *et al*., 2018). By leveraging these tools, businesses can generate actionable insights, streamline reporting processes, and ensure consistent oversight over various operational facets (Akinyemi, 2013; Imran *et al*., 2019). This explores the purpose, importance, and scope of an integrated business performance monitoring model using Excel-based dashboards and manual controls. The primary objective of this integrated business performance monitoring model is to develop a cohesive system that enables organizations to monitor their performance effectively and make informed decisions.

The combination of Excel-based dashboards and manual controls allows businesses to simultaneously track both real-time and historical data, offering a comprehensive view of their operations. Excel-based dashboards serve as dynamic, visual representations of business metrics, providing stakeholders with an intuitive and user-friendly interface for data analysis (Adedoja *et al*., 2017; Famaye *et al*., 2020). These dashboards can track a wide range of key performance indicators (KPIs), such as sales, revenue, inventory levels, and employee productivity (Adeniran *et al*., 2016; Akinyemi and Ebimomi, 2020). Interactive digital tools and progress tracking frameworks can enhance business performance monitoring by improving engagement and providing real-time feedback, which is critical for effective dashboard-based management systems (Tasleem *et al*., 2020).

On the other hand, manual controls are incorporated into the system to ensure that data integrity is maintained (Aremu and Laolu, 2014; Akinyemi and Ojetunde, 2019). While dashboards can automatically aggregate and present data, manual checks are essential to verify the accuracy of information, correct discrepancies, and maintain compliance with internal standards and external regulations (James *et al*., 2019; Akinyemi and Ojetunde, 2020). The integration of these two components—automated data visualization and manual review processes—creates a robust monitoring system that supports both operational efficiency and data transparency. This dual approach ensures that businesses can quickly identify trends, diagnose issues, and take corrective actions as needed.

An integrated business performance monitoring model provides numerous benefits, the most important of which is its ability to generate actionable insights for decision-making (Olanipekun, 2020). With the continuous flow of real-time data, businesses can respond quickly to emerging challenges, adapt strategies, and optimize resources. These insights are crucial in today's competitive landscape, where agility and data-driven decision-making are key to maintaining a competitive advantage (Olayinka, 2019; Wamba *et al*., 2020). Moreover, an integrated system streamlines reporting processes across departments, enhancing collaboration and efficiency. By centralizing data in a dashboard format, departments such as finance, sales, operations, and HR can easily access and interpret key metrics (Dahlbom *et al*., 2020; Chen and Metawa, 2020). This fosters a culture of transparency, where all teams are aligned on organizational goals and performance metrics. Additionally, the system reduces the time and effort spent on manual data compilation, allowing employees to focus on analysis and strategic initiatives rather than administrative tasks. Furthermore, the visual nature of Excel dashboards ensures that data is presented in an easily digestible format, making it simpler for stakeholders to understand and act upon, regardless of their technical expertise.

The scope of the integrated monitoring model primarily focuses on combining three critical components: data aggregation, visualization, and manual review processes. The model consolidates data from various internal sources—such as sales data, inventory, and employee performance records—into a centralized system. By automating this aggregation through Excel, businesses can efficiently monitor and track multiple variables, making it easier to identify correlations and areas of improvement.

The model also prioritizes data visualization by utilizing Excel dashboards to represent business performance metrics in graphical forms such as charts, graphs, and heat maps. This visual representation helps decision-makers quickly spot trends and understand complex data sets, thereby enhancing decision-making efficiency. The flexibility of Excel allows businesses to customize dashboards according to their specific KPIs, ensuring that the system is adaptable to the unique needs of the organization (Stormi *et al*., 2019; Pinna and Castelnovo, 2019).

In addition to automation, manual review processes are a vital part of this model. These processes ensure that the data presented by the dashboards is verified and accurate. Manual controls, such as cross-checks and exception reporting, serve as an additional layer of oversight, preventing errors that may arise from automated data aggregation. By incorporating manual controls into the model, businesses can ensure that the insights provided by the system are both reliable and actionable.

This integrated business performance monitoring model is highly adaptable, making it suitable for businesses of various sizes, particularly in resource-constrained environments. Smaller organizations with limited budgets may not have access to expensive enterprise-level systems; however, Excel-based dashboards combined with manual controls provide a cost-effective solution for performance tracking. Even large organizations with complex operations can benefit from this approach by using it to supplement existing systems or streamline reporting processes. The model's flexibility, low cost, and scalability make it an ideal solution for businesses aiming to enhance their performance monitoring without substantial financial investment (Chen *et al*., 2019; Attaran and Woods, 2019).

The integrated business performance monitoring model using Excel-based dashboards and manual controls serves as a comprehensive and cost-effective tool for tracking, evaluating, and enhancing business performance (Saidani *et al*., 2019; Dutta *et al*., 2020). By combining automated data aggregation with manual oversight, organizations can ensure accurate and reliable insights for decision-making, while streamlining reporting processes and fostering collaboration across departments. This model is versatile and scalable, making it applicable to businesses of various sizes and operational complexities, particularly those in resource-constrained environments. Through its implementation, businesses can gain valuable insights into their operations, drive continuous improvement, and ultimately achieve their strategic objectives.

2. Methodology

The PRISMA methodology was utilized to systematically review the literature on integrated business performance monitoring models, focusing specifically on the use of Excel-based dashboards and manual controls. The primary objective of this review was to evaluate existing studies and identify best practices, challenges, and advancements in utilizing Excel as a tool for performance monitoring within business environments. The methodology involved a rigorous search for relevant peer-reviewed articles, books, conference proceedings, and reports published between 2010 and 2024. Several academic databases, including Scopus, Web of Science, Google Scholar, and JSTOR, were searched using specific keywords and Boolean operators. Keywords such as "business performance monitoring", "Excel-based dashboards", "manual controls", "data visualization", and "business performance metrics" were employed to capture a

broad range of relevant articles.

An initial search yielded 1,320 records, which were then filtered to eliminate duplicates. This left 1,105 records that were subsequently screened based on their titles and abstracts. The screening was conducted by two independent reviewers who assessed the relevance of each record to the study's focus on integrated business performance monitoring using Excel dashboards and manual controls. Studies were included if they explored the design, implementation, or evaluation of Excel-based dashboards in monitoring business performance, or if they addressed the role of manual controls in ensuring data accuracy and system integrity. Records that were deemed unrelated to the context of business performance monitoring, or those focusing on systems outside of Excel-based solutions, were excluded. Following the initial screening process, 294 studies were selected for full-text review.

In the full-text review phase, the selected studies were evaluated for their methodological rigor, relevance to the research questions, and the quality of the insights provided. Articles were excluded if they lacked empirical data, presented theoretical concepts without practical application, or focused solely on automated performance monitoring systems unrelated to manual controls or Excel-based solutions. After a detailed review, 78 studies were deemed to meet the inclusion criteria and were included in the final analysis. These studies provided a comprehensive understanding of how Excel dashboards are used in performance monitoring, the role of manual controls in data accuracy, and the integration of these models in business performance management.

Data extraction was carried out systematically, focusing on key aspects such as the design and functionality of Excel-based dashboards, the types of performance metrics monitored, the challenges associated with manual controls, and the effectiveness of these models in improving business performance. The data was synthesized to highlight common themes, successful strategies, and gaps in the current literature. Key findings indicated that Excel-based dashboards are widely used for visualizing business performance metrics such as sales, expenses, and operational efficiency. The integration of manual controls was found to be crucial for ensuring data quality, particularly when businesses rely on manual data entry or complex calculations within Excel spreadsheets.

Moreover, the review revealed several challenges, including the risk of human error in data entry, the difficulty in scaling Excel-based solutions as business needs grow, and the limitations of manual controls in large, dynamic organizations. Despite these challenges, the studies highlighted several benefits of using Excel-based dashboards, including ease of customization, cost-effectiveness, and familiarity among business users. The review also emphasized the importance of user training in maintaining the effectiveness of manual controls and ensuring that dashboards provide accurate and actionable insights.

The findings from this systematic review provide a solid foundation for the development of an integrated business performance monitoring model using Excel-based dashboards and manual controls. The review suggests that while these models are effective for small and medium-sized enterprises, businesses seeking to scale operations may require more advanced systems that combine automated data processing with manual oversight. Future research could explore the integration of Excel dashboards with more advanced technologies, such as business intelligence platforms or automated reporting tools, to enhance the scalability and efficiency of performance monitoring systems.

2.1 Key Components of the Integrated Model

The integrated business performance monitoring model, utilizing Excel-based dashboards and manual controls, relies on several key components that work together to provide an effective, flexible, and reliable system for tracking and analyzing business performance. These components include data aggregation and collection, Excel-based dashboards, and manual controls and checks. Each element plays a crucial role in ensuring that businesses can monitor key performance indicators (KPIs), make data-driven decisions, and maintain data integrity (Zhang *et al*., 2019; Hristov and Chirico, 2019).

The foundation of any business performance monitoring system is the ability to aggregate and collect relevant data from multiple sources. In this integrated model, data is sourced from both internal and external environments, and it is often supplemented by manual data entry to ensure comprehensive coverage.

Internal data sources; Sales data provides insights into revenue streams, product performance, and customer buying behaviors. This data can include transactional details, sales trends, and customer profiles. Finance data includes financial statements, budgets, forecasts, and expense tracking. This data is crucial for assessing financial health and profitability. Inventory data helps businesses manage stock levels, track turnover rates, and ensure that inventory is aligned with demand. Human Resources (HR) data offers insights into employee performance, productivity, turnover rates, and labor costs (Addo, 2020; Orobia *et al*., 2020).

By aggregating internal data from various departments into a centralized system, organizations can gain a holistic view of their operations. This data is essential for measuring performance and identifying areas for improvement.

External data sources; Market trends are vital for businesses to stay competitive and anticipate shifts in demand. By tracking changes in consumer behavior, industry developments, and market forecasts, businesses can adjust their strategies accordingly. Competitor data offers insights into how competitors are performing, their pricing strategies, and product offerings. This information helps businesses identify gaps in their own operations or market opportunities. Economic factors such as interest rates, inflation, or exchange rates can impact business operations, especially for companies that rely on international trade or investment.

Aggregating external data along with internal data allows organizations to gain a comprehensive understanding of their position within the market and adjust their strategies accordingly. While many data sources can be automated, some elements may require manual data entry. This is particularly true for non-automated sources, such as physical documents, external reports, or third-party information that is not directly integrated into existing systems. By incorporating manual entry processes, businesses can ensure that all relevant data is captured and analyzed, even if it's not available through automated channels (Ismail *et al*., 2019; Mandolla *et al*., 2019).

Once data is collected, it must be organized and presented in a way that is actionable and easily interpretable. This is where

Excel-based dashboards come into play. These dashboards serve as powerful tools for visualizing complex data sets, enabling decision-makers to monitor performance at a glance.

Excel dashboards use a variety of visualization tools, such as charts, graphs, and tables, to present data in a clear and accessible format. By transforming raw data into visual representations, businesses can quickly identify trends, outliers, and areas of concern. Excel offers a broad selection of chart types, from bar and line graphs to pie charts and heat maps, which can be tailored to suit the specific needs of the business.

One of the key advantages of Excel-based dashboards is their flexibility. Organizations can customize dashboards to track specific KPIs, financial metrics, and operational metrics that are most relevant to their business objectives (Reinking *et al*., 2020; Zingde and Shroff, 2020). This customization allows businesses to align their dashboards with their strategic goals and make more informed decisions.

Excel dashboards can also incorporate interactive features that enhance the user experience. Filtering capabilities allow users to view data by specific time periods, geographic regions, or product categories. Drill-down functionality enables users to access detailed data behind high-level metrics, providing a deeper understanding of the factors driving performance. These interactive features make it easier for users to analyze the data from different angles and gain a more nuanced understanding of the business's performance.

While Excel dashboards and automated data aggregation provide efficiency, the human element remains crucial to ensure data accuracy and integrity. Manual controls and checks are incorporated into the system to verify that the data being used for analysis is correct, complete, and consistent.

Regular manual review processes are implemented to validate automated data. This may involve cross-checking data for discrepancies or inconsistencies, ensuring that all information aligns with other business records or previous reports. By conducting these manual checks, businesses can catch errors that may have been overlooked in automated processes, such as data entry mistakes, missing data, or incorrect calculations (Tuma *et al*., 2020; Faruqui *et al*., 2020).

To ensure consistency in the manual review process, businesses implement standard operating procedures (SOPs). These SOPs outline the specific steps that need to be followed when reviewing data, the individuals responsible for the checks, and the tools or methodologies to be used. SOPs provide clear guidelines for manual oversight, ensuring that review processes are systematic and repeatable.

One of the most important functions of manual controls is to address outliers or exceptions in the data. For example, if sales data shows an unusually high or low number for a particular period, manual review processes can flag these anomalies for further investigation. Additionally, manual checks can be used to resolve data discrepancies that may arise from conflicting reports or errors in data entry.

The integrated business performance monitoring model, built on data aggregation, Excel-based dashboards, and manual controls, provides a comprehensive, cost-effective, and flexible approach to performance tracking. By combining automated data analysis with manual oversight, businesses can maintain data accuracy, identify trends, and make informed decisions that drive operational efficiency. This hybrid model offers organizations the agility to adjust their strategies while ensuring the integrity and reliability of their performance data. The flexibility of this system makes it suitable for businesses of various sizes and industries, enabling them to optimize their performance monitoring processes and achieve their strategic goals (Mohamed *et al*., 2019; Kamble and Gunasekaran, 2020).

2.2 Implementation Strategy

In today's data-driven business landscape, companies require effective systems to monitor performance across various departments, from finance to operations to human resources. Implementing integrated business performance monitoring models that combine Excel-based dashboards with manual controls offers a flexible, cost-effective, and customizable approach to achieve this goal as shown in figure 1(Irwin and Walters, 2019; Huang *et al*., 2019). Such models can be designed to centralize and visualize key business metrics, enabling decision-makers to make informed choices in real time. However, to maximize the effectiveness of these models, a comprehensive implementation strategy is needed. This strategy should address data integration and automation, dashboard customization and design, and manual review and control mechanisms. By aligning these elements, businesses can create a robust framework for monitoring performance while ensuring data accuracy and operational efficiency.

A critical first step in implementing an integrated performance monitoring system is ensuring seamless data integration across various business systems. Excel provides a powerful platform for connecting and linking data from multiple sources, allowing businesses to consolidate information into a centralized dashboard for analysis. The use of Excel functions such as VLOOKUP, INDEX-MATCH, and PivotTables can be highly effective in linking datasets from disparate sources. VLOOKUP, for example, is particularly useful for looking up and retrieving data from large tables, while INDEX-MATCH allows for more flexibility in searching for data across columns. PivotTables, on the other hand, enable users to summarize and analyze data dynamically, which is invaluable when businesses need to quickly assess performance metrics such as sales volume, revenue, or employee performance (Iyengar *et al*., 2019; Golfarelli and Rizzi, 2020).

Moreover, for businesses with more complex needs or larger data sets, integrating Excel with other business systems like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) tools can significantly enhance the automation of data flows. This integration can be achieved via manual import/export processes, or for more efficiency, semi-automated scripting tools such as Power Query. Power Query allows users to pull data from external sources into Excel and automate the data transformation process, reducing the risk of manual errors while saving time. By leveraging these integrations, businesses can maintain real-time access to up-to-date data and avoid discrepancies between systems, making performance monitoring more accurate and efficient.

Once the data is integrated and automated, the next critical component is dashboard customization and design. Dashboards serve as the interface through which users interact with business performance data, and their design plays a crucial role in ensuring that the information is accessible, understandable, and actionable. One of the first steps in this process is tailoring the dashboard to track

business-specific Key Performance Indicators (KPIs). Identifying and focusing on the right KPIs ensures that the dashboard provides meaningful insights that align with the business's goals and objectives (Abduldaem and Gravell, 2019; Cokins, 2020).

In addition to KPI customization, it is essential to design the dashboard in a way that enhances user experience. A user-friendly dashboard features simple navigation and clear visualization of data, allowing users to quickly interpret the information. Using charts, graphs, and color-coded indicators, such as traffic light systems or bar graphs, can make data more intuitive and actionable. Providing drill-down capabilities, where users can click on a metric for more detailed insights, also improves usability. Additionally, businesses should ensure that the dashboard design remains flexible enough to adapt to future needs as performance metrics evolve. By creating a dashboard that balances customization with ease of use, businesses can foster greater engagement with the system, ensuring that decision-makers can access the information they need without being overwhelmed.

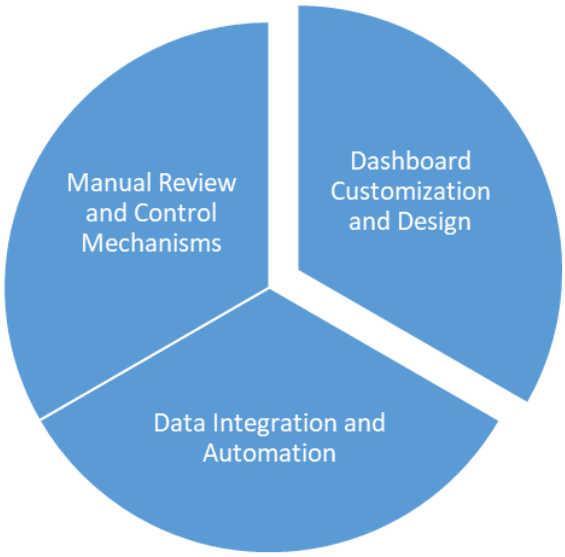

Fig 1: Implementation Strategy

While Excel-based dashboards and automated data integration are powerful tools, they must be complemented with manual review and control mechanisms to ensure data quality and accuracy. One of the most effective ways to maintain control over data integrity is by designing manual checklists that validate both data inputs and outputs (Hock *et al*., 2020; Khin *et al*., 2020). These checklists serve as a reference for users to verify that the data entered into the system is accurate, consistent, and complete. They also help ensure that data is updated regularly, reducing the likelihood of errors and outdated information affecting the performance monitoring process.

Furthermore, businesses should establish regular review cycles for key financial, operational, and performance metrics. These review cycles allow for periodic checks on the performance indicators tracked by the dashboard. By conducting routine reviews, businesses can identify trends, spot anomalies, and ensure that the metrics being tracked remain relevant to the company's current objectives. For example, a monthly review of financial performance can help businesses detect cash flow issues early on, while regular operational reviews can highlight bottlenecks or inefficiencies in production processes.

In addition to regular review cycles, exception reporting is a key component of manual control mechanisms. Exception reporting helps identify areas of concern by highlighting data points that fall outside of predefined thresholds or expected ranges. This allows business leaders to investigate and address potential issues before they escalate. Exception reporting ensures that the system remains responsive to unexpected changes and keeps the focus on areas requiring immediate attention (Pettit *et al*., 2019; Hollnagel and Braithwaite, 2019).

The implementation of integrated business performance monitoring models using Excel-based dashboards and manual controls can provide businesses with a powerful tool for tracking and managing their key performance metrics. By focusing on effective data integration and automation, businesses can streamline data collection and ensure real-time access to critical information. Customizing dashboards to align with business-specific KPIs and ensuring that they are user-friendly enhances the decision-making process and enables quick responses to changing conditions. Lastly, manual review and control mechanisms, including checklists, review cycles, and exception reporting, provide an additional layer of oversight, ensuring data accuracy and operational integrity. This multifaceted implementation strategy supports the development of a performance monitoring system that is not only efficient and scalable but also robust enough to adapt to future challenges and changes in business operations. By combining automation with manual controls, businesses can achieve long-term success in managing and improving their performance metrics.

2.3 Benefits and Challenges

An integrated business performance monitoring model using Excel-based dashboards and manual controls offers numerous benefits, making it an attractive option for many businesses as shown in figure 2 (Sunder *et al*., 2019; Schönfeldt and Birt, 2020). However, like any system, it also presents several challenges that must be addressed to ensure its effectiveness. Understanding both the benefits and challenges is essential for organizations looking to implement this model for performance tracking.

One of the most significant advantages of using Excel-based dashboards is their cost-effectiveness. Unlike enterprise-level software solutions, which can require hefty investments in licensing, training, and maintenance, Excel is widely available and requires minimal upfront costs. Businesses can leverage their existing Excel infrastructure to build comprehensive performance monitoring systems without needing to invest in expensive tools. For small to medium-sized organizations, or those with limited budgets, this feature makes Excel-based dashboards an attractive alternative to more costly, specialized business intelligence (BI) platforms.

Another key benefit of this model is its customizability. Excel is a highly versatile tool that allows businesses to tailor dashboards according to their specific needs. Organizations can adjust the data fields, visualizations, and layout to reflect the KPIs and metrics that are most relevant to their operations. This flexibility makes it easy for businesses to create dashboards that align with their strategic goals, offering a personalized solution for performance monitoring (Pugna *et al*., 2019; Bugwandeen and Ungerer, 2019).

With the integration of automated data aggregation and Excel's interactive features, businesses can achieve real-time monitoring of performance metrics. Dashboards can be set to refresh regularly, ensuring that decision-makers always have access to the latest data. This feature is particularly valuable in dynamic industries where conditions can change rapidly, as it allows businesses to react quickly to emerging trends or issues. By receiving up-to-date reports and insights, leaders can make informed decisions, adjust strategies, and allocate resources efficiently without delays caused by outdated information.

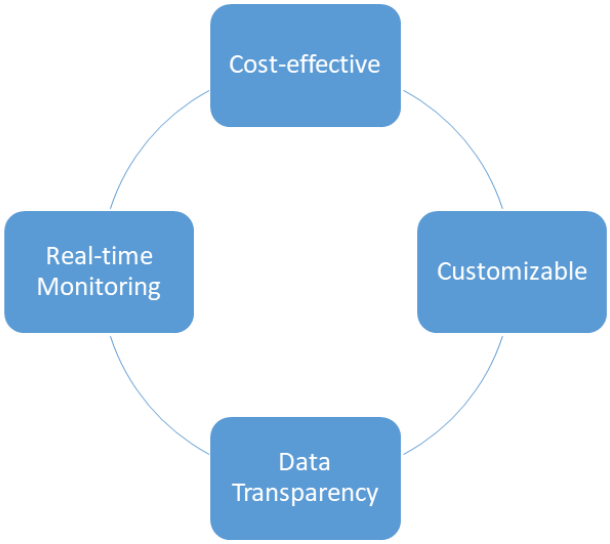

Fig 2: Excel-based dashboards and manual controls numerous benefits

Excel-based dashboards, coupled with manual controls, promote data transparency within an organization. The manual review processes ensure that automated data is validated and accurate, reducing the risk of errors or discrepancies. This transparency also supports accountability, as it provides a clear audit trail of how data is aggregated, analyzed, and reviewed. Moreover, having manual oversight ensures that any anomalies or outliers in the data are flagged and investigated, maintaining the integrity of performance metrics (Joshua *et al*., 2019; Narsina *et al*., 2019). This fosters trust among stakeholders, as they can rely on the accuracy and consistency of the data presented in the dashboards.

Despite the numerous benefits, there are several challenges associated with using Excel-based dashboards and manual controls for business performance monitoring as shown in figure 3.

As businesses grow, they accumulate large volumes of data from diverse sources. The scalability of the Excel-based system becomes a significant concern. While Excel is a highly flexible tool, managing large datasets can become cumbersome over time. As the amount of data increases, Excel workbooks can become slow to update, prone to errors, and difficult to navigate. Furthermore, Excel has limitations in terms of data processing capacity, which can hinder its ability to handle complex calculations or large-scale data analysis. As businesses expand, they may find that the manual nature of the system becomes a bottleneck, requiring more resources to maintain and update the data effectively.

The reliance on manual data entry and review processes presents an inherent risk of human error. Even with the best procedures in place, mistakes such as data entry errors, oversight during manual checks, or failure to update data on time can lead to inaccurate insights. If these errors are not detected and corrected promptly, they can undermine the effectiveness of the entire monitoring system. While manual controls are meant to catch these discrepancies, their effectiveness depends on regular oversight and thorough review processes, which require significant time and effort (Roy *et al*., 2019; Sundaram *et al*., 2019).

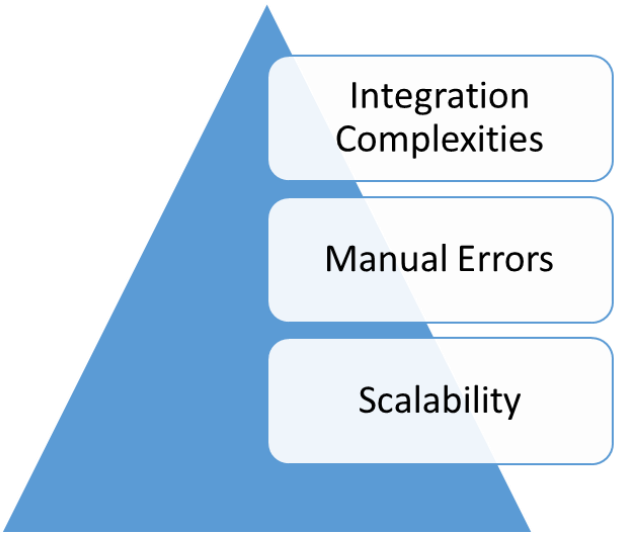

Fig 3: Several challenges associated with using Excel-based dashboards and manual controls

Integration complexities arise when attempting to merge data from various systems into Excel. Many businesses use multiple software tools for managing different aspects of their operations—such as customer relationship management (CRM), enterprise resource planning (ERP), inventory management, and accounting. While Excel provides powerful tools for data aggregation, pulling data from disparate sources can be time-consuming and prone to error without proper automation. For instance, manually importing data from different systems into Excel can lead to inconsistencies in formatting, data duplication, or missing information. Without a robust integration strategy, these complexities can result in inefficiencies and reduce the reliability of the monitoring system. Although automation tools can help streamline this process, businesses may still face challenges in ensuring smooth integration between various data sources.

While an integrated business performance monitoring model using Excel-based dashboards and manual controls offers clear advantages, including cost-effectiveness, customizability, real-time monitoring, and data transparency, it also presents several challenges that need to be addressed. The scalability of the system may become problematic as the business grows, requiring careful planning to ensure that Excel remains effective as data volumes increase (Fritzsch *et al*., 2019; Shekhar, 2020). Additionally, the reliance on manual data entry introduces the risk of manual errors, which can undermine the accuracy of the system. Lastly, integration complexities can arise when merging data from various systems, requiring businesses to implement robust processes for data consolidation. Despite these challenges, the model remains a practical and flexible solution for businesses, especially in resource-constrained environments, and can be

optimized through careful implementation and regular maintenance.

2.4 Best Practices

In today's dynamic business environment, ensuring that performance monitoring systems are accurate, reliable, and adaptable is critical for sustained success. When businesses utilize Excel-based dashboards and manual controls, they must follow best practices to maximize the effectiveness of these tools (Glegg *et al*., 2019; Sharp *et al*., 2020). By establishing sound data management routines, providing robust user training, and implementing version control and backup protocols, businesses can ensure that their performance monitoring models continue to deliver valuable insights while minimizing risks such as data errors, loss, or inefficiencies.

One of the fundamental best practices for maintaining the accuracy and integrity of any Excel-based performance monitoring system is regular data clean-up and updates. As businesses accumulate vast amounts of data over time, it is crucial to ensure that the data used in dashboards and reporting tools is clean, accurate, and up-to-date. Establishing a routine for cleaning and updating data ensures that outdated, incomplete, or erroneous entries do not compromise the insights derived from performance metrics.

The process of data clean-up involves several key steps: removing duplicate entries, correcting inconsistencies, handling missing values, and ensuring data formatting consistency. Such inconsistencies can lead to skewed performance metrics, undermining the credibility of the dashboard. By regularly reviewing the data for these issues, businesses can improve the reliability of their reports (Boiral *et al*., 2019; Olabode *et al*., 2019).

In addition to cleaning, regular updates are essential for maintaining the system's relevance. Business performance data—such as financial figures, sales, or employee performance—changes frequently. Failure to update data in real time or on a set schedule can result in outdated dashboards, providing inaccurate information to decision-makers. Setting up automated reminders or workflows for data updates, such as importing the latest financial data into Excel on a weekly or monthly basis, can ensure that the system always reflects the most current business performance.

Providing proper training for employees who interact with Excel-based dashboards is another key best practice for maximizing the effectiveness of business performance monitoring systems. While Excel is a widely used tool, it offers a wide range of functions, features, and potential complexities that can be challenging for non-expert users (Incerti *et al*., 2019; Lindquist and Sulewski, 2020). Effective training helps employees become proficient in using dashboards, enabling them to navigate the system, interpret the data correctly, and make informed decisions.

Training should be tailored to the specific needs and roles of employees. For example, financial analysts may need detailed training on advanced Excel functions, such as PivotTables, VLOOKUP, and custom formulas, to analyze financial data and generate meaningful insights. On the other hand, managers using dashboards for high-level performance monitoring might benefit more from a focus on understanding KPI trends and making quick decisions. Regardless of the audience, training sessions should be hands-on, with employees practicing using dashboards and data entry tools in real-world scenarios (Ficco *et al*., 2019; Ošlejšek *et al*., 2020).

In addition to formal training, documenting processes and guidelines for manual control handling is crucial. As manual controls are implemented to ensure the accuracy and integrity of data inputs and outputs, it is essential that there are clear and accessible instructions for how to handle them. Documentation should include standardized procedures for checking data accuracy, performing manual calculations or adjustments, and reviewing performance metrics (Binkhonain and Zhao, 2019; Kokina and Blanchette, 2019). This ensures that all employees follow consistent practices and helps avoid errors that may arise from inconsistent handling of data.

Clear and comprehensive documentation also facilitates the onboarding of new employees and provides a valuable reference for those who need to refresh their knowledge. This minimizes the learning curve and ensures that best practices are maintained across the organization.

Version control and backup protocols are critical best practices for preventing data loss and ensuring data integrity, especially in an environment where multiple users may be interacting with Excel files. Excel spreadsheets are often shared across teams, and multiple versions of a document may exist, leading to confusion or data inconsistencies (Orozco *et al*., 2020; Giesen and Roeser, 2020). Implementing version control practices helps track changes made to files, ensuring that previous versions can be accessed and restored if necessary.

Version control can be managed through various methods. This allows users to review and revert to earlier versions of a spreadsheet, providing a safeguard against unintended errors or unauthorized changes. Alternatively, businesses can implement manual versioning by naming files with version numbers (e.g., "Dashboard_v1," "Dashboard_v2"), though this can be less efficient and prone to human error.

In addition to version control, it is essential to establish backup protocols to prevent data loss due to system failures, corruption, or accidental deletion. Regular backups of Excel files, along with any linked data sources, should be scheduled to ensure that data can be recovered if necessary. Cloud-based storage solutions often provide automated backup options, ensuring that all data is stored in multiple secure locations, reducing the risk of permanent data loss (Ghani *et al*., 2020; Shalima *et al*., 2020).

Backup protocols should also include disaster recovery plans, outlining the steps to take in the event of a data breach or system failure (Chakraborty *et al*., 2020; Mishra *et al*., 2020). This ensures that businesses can quickly recover and minimize disruption to their performance monitoring systems. Furthermore, businesses should test their backup and recovery processes periodically to verify that they work as expected and that critical data can be restored with minimal downtime.

The implementation of best practices is crucial for ensuring that integrated business performance monitoring models using Excel-based dashboards and manual controls remain effective, efficient, and sustainable. Regular data clean-up and updates maintain the accuracy of performance metrics, while user training and documentation ensure that employees can use the system proficiently and consistently (Tripathi *et al*., 2019; Wang *et al*., 2020). Version control and backup protocols protect against data loss and ensure that historical data is accessible for review and recovery when needed. By

following these best practices, businesses can maximize the utility of their performance monitoring systems, enabling better decision-making and continuous improvement over time.

3. Conclusion

The integration of Excel-based dashboards with manual controls has proven to be an effective tool for business performance monitoring, providing a flexible and cost-effective approach for organizations to track, analyze, and optimize their operations. The system enables businesses to gain real-time insights, improve decision-making, and ensure data accuracy through manual validation, making it an invaluable resource, especially for smaller businesses or those with limited budgets. By combining automated data aggregation with manual oversight, this model allows businesses to manage their performance effectively, even in dynamic and resource-constrained environments.

Looking to the future outlook, there is significant potential to scale the model, particularly as organizations grow and their data needs increase. As businesses accumulate larger datasets, the integration of automation tools could further enhance efficiency and reduce the reliance on manual entry and review processes. Automating data integration, reporting, and analysis could improve scalability and reduce the risk of manual errors. Advanced tools, such as data connectors, machine learning algorithms, or more sophisticated business intelligence (BI) platforms, could be incorporated into the system to handle larger volumes of data and provide even deeper insights into business performance. This transition could allow businesses to maintain a high level of efficiency and accuracy without compromising their operational agility.

In final thoughts, the balance between automation and manual oversight is critical to creating a robust performance monitoring system. While automation offers speed and efficiency, manual controls ensure that data integrity is maintained and that the business can respond effectively to discrepancies or anomalies. Achieving this balance allows businesses to harness the best of both worlds: the consistency and speed of automation, along with the flexibility and accuracy of human oversight. Ultimately, the success of an integrated performance monitoring model hinges on thoughtful implementation, regular updates, and continuous refinement to meet the evolving needs of the organization.

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