Power System Technology

Integration of COBIT 2019 and BYOD:

An Empirical Analysis of Performance Measurement in the Context of the Balanced Scorecard
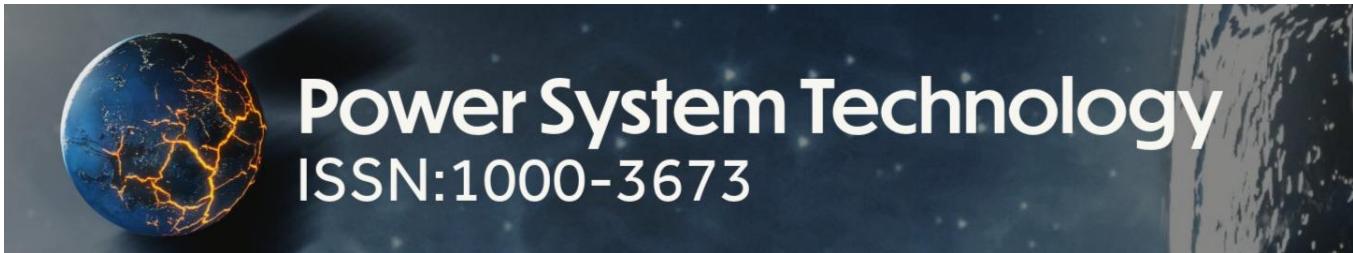
Integration of COBIT 2019 and BYOD: An Empirical Analysis of Performance Measurement in the Context of the Balanced Scorecard

Markus Groß[1]

1. University of Library Studies and Information Technologies, "Tsarigradsko shoes" Blvd. No 119, Sofia, 1784, Sofia Province, Bulgaria

Abstract

The Information Technology (IT) department must align with corporate goals and adapt to evolving data processing methodologies. This study investigates the integration of Bring Your Own Device (BYOD) strategies into IT-Balanced Scorecard (IT-BSC) systems to optimize IT structures and enhance strategic alignment, aligning IT-BSC with general COBIT processes and Key Performance Indicators (KPI) based on the outcomes of the empirical study. The research reveals that BYOD significantly impacts IT strategy and efficiency, enhancing operational processes and increasing alignment with business objectives. BYOD also boosts end-user satisfaction by improving internal processes and service delivery. However, initial challenges of BYOD, such as increased costs from security investments and training, might be balanced by long-term efficiency gains. Additionally, BYOD supports stronger strategic alignment, improving communication between IT and business teams, which contributes to higher customer satisfaction. The adoption of COBIT strengthens governance and compliance, ensuring robust oversight and adherence to regulatory standards. The study discusses the rising adoption of BYOD in Europe and underscores the necessity of managing BYOD initiatives effectively. It concludes with a recommendation for an implementation model that integrates BYOD into IT-BSC systems, focusing on continuous monitoring and validation to ensure successful strategy execution and alignment. This approach promotes agility, adaptability, and effective business-IT alignment, thereby enhancing organizational performance in a dynamic environment.

Keywords: COBIT2019, IT-GOVERNACE, REGULATION, BYOD, BSC

1. INTRODUCTION

The Information Technology (IT) department faces continual pressure from evolving requirements and data processing methodologies. Despite its crucial role, it is often undervalued within companies, regarded as an internal service provider [1]. While stable performance may go unnoticed, isolated disruptions linger in the minds of business units. Beyond system availability, the ability of IT to support core business operations is paramount. The department
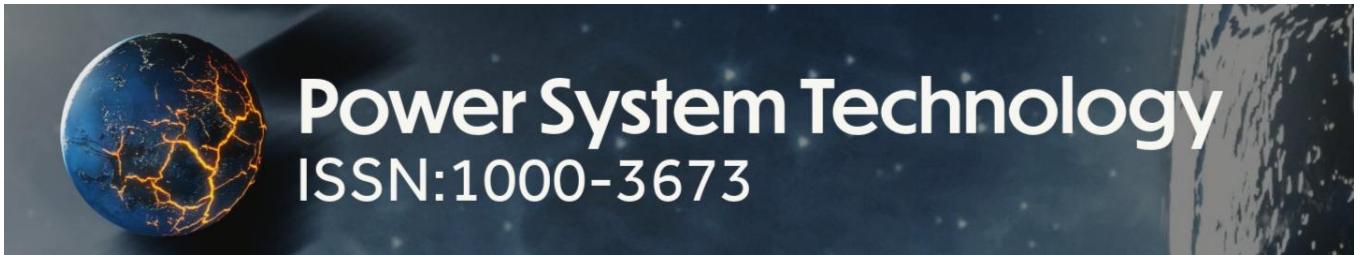
must aid in achieving company goals and adapt to changing circumstances [2]. This demands an IT strategy aligned with corporate objectives [3].

"The degree to which you can express something in numbers is the degree to which you really understand it," proclaimed William Thomson, emphasizing the necessity for continuous performance measurement. Optimization and adaptation are imperative for companies to compete globally. However, the utility and value contribution of IT remain a topic of debate between management and IT leadership [4]. The increasing complexity and rapid innovation within the IT landscape contribute to substantial budgets. Nonetheless, a narrow focus on financial metrics is insufficient; such metrics reflect past performance and fail to predict strategic success or necessary actions to achieve goals [5]. Thus, IT controlling must be approached holistically. The Balanced Scorecard framework, introduced by Kaplan and Norton (1992) , provides comprehensive guidance [6]. This integrative management concept reveals the inadequacy of financial metrics alone and emphasizes the need for investments in personnel development, new products, internal process optimization, and customer relations [5].

The "Bring Your Own Device" (BYOD) trend has diversified internal processes, employee development, and external customer perspectives. However, it also introduces complex legal and technical issues. Notably, data privacy concerns, such as separating personal and professional matters while ensuring corporate information security, present challenges [7], [8]. The COVID-19 pandemic has revolutionized the working world overnight, forcing companies to transition to telework [9]. This shift has bolstered the BYOD concept, allowing employees to use personal devices for work, facilitating continuity and satisfaction [10]. BYOD was an emerging trend even before COVID19, offering flexibility for employees and cost savings for companies [4]. The pandemic has underscored its relevance, ensuring business continuity amid lockdowns [11]. Home office adoption has proven effective, encouraging a permanent shift toward telework [4]. BYOD supports this transition, promoting flexible, efficient work environments [10]. The trend is expected to continue post-pandemic, aiding companies in maintaining competitive, adaptable operations [12].

2. BACKGROUND

In the United States, the use of personal devices such as smartphones or tablets in professional settings has become widespread. A 2012 study by IBSG-Horizon found that 95% of US companies allow employees to use their own hardware, with 84% of those companies providing IT support for these devices [13]. Although these figures indicate a high market penetration of the BYOD trend, its origins lie primarily in the Asia-Pacific region. According to Deloitte, this trend is driven by robust network infrastructures, the importance of mobile communication, and a strong job commitment in countries like South Korea, Singapore, and Taiwan [14].

Europe, on the other hand, is only beginning to adopt this trend. In Germany, BYOD initiatives are gaining traction, but private devices are still less commonly used for professional purposes compared to the United States. A survey by A.T. Kearny in 2011 revealed a prevalence
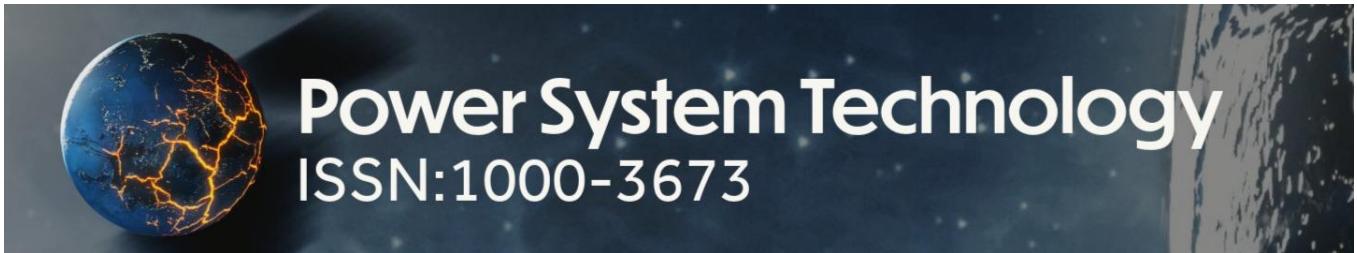
of only about 40% in German companies [15]. Morgan Stanley's 2013 study showed that over half of delivered network devices operate wirelessly, with most being used in workplaces [16]. An IDC study in September 2012 found that 58% of companies allow access to business applications via company-owned mobile devices, but only 33% permit mobile access through private tablets or smartphones [17]. Avanade's study in the same period reported that 61 % of surveyed companies allow most of their employees to use private devices at work [18].

The latest studies by BITKOM and Gartner confirm the upward trend, with BITKOM reporting that nearly three-quarters of all employees use private devices for work [19]. Gartner found that 38% of respondents expected not to need to procure mobile devices for their employees by 2016, and 86 % said they use their private devices for work both day and night [20]. These studies, despite showing varied implementation and prevalence of BYOD initiatives in Europe, reveal a clear upward trend [21].

The Balanced Scorecard (BSC) concept's fundamental idea is that an organization's success depends largely on factors behind financial targets. For businesses reliant on IT and intangible assets, BSC is crucial. Silk notes that 60% of Fortune 1000 companies in the US have experience with BSC, and Marr finds that over 50% of the largest US firms use BSC or a similar performance measurement system [22], [23]. Williams found that over 60% of Fortune 500 companies actively use BSC, and Risby reported a global usage rate of 44% [24], [25]. Numerous studies and scientific publications attest to BSC's importance and popularity as a strategic controlling tool. However, the BSC isn't the only management concept driving changes in IT management. The focus on IT controlling has led to comprehensive monographs and articles on IT metrics [26]. Yet, literature on applying BSC to support IT controlling is limited [27]. The IT-Balanced Scorecard (IT-BSC) is a goaloriented planning, communication, and controlling tool that aims to link IT strategy to operational actions by breaking down goals to the employee level. It balances various elements, including strategic and operational measures, short- and long-term goals, financial and non-financial metrics, qualitative and quantitative measures, internal and external factors, as well as performance drivers and results [28].

The COBIT framework, particularly in its latest 2019 edition, provides a potential interface for integrating BSC principles into IT governance and management processes, promoting a harmonious alignment of business and IT goals [29]. Future research should explore specific paths and mechanisms to integrate BSC into COBIT, enhancing both IT organizations' efficiency and strategic alignment, and assess the impact of BYOD integration into management systems within the COBIT context [30]. The IT Governance Institute's regular studies show COBIT's global adoption nearing 75% in 2023, without specifying implementation maturity [31].

3. Methods

This research endeavors to develop a sophisticated methodology for designing and implementing an IT-BSC tailored specifically for BYOD initiatives within the framework of COBIT. The objective is to offer high-quality, rational solutions adaptable to organizations of
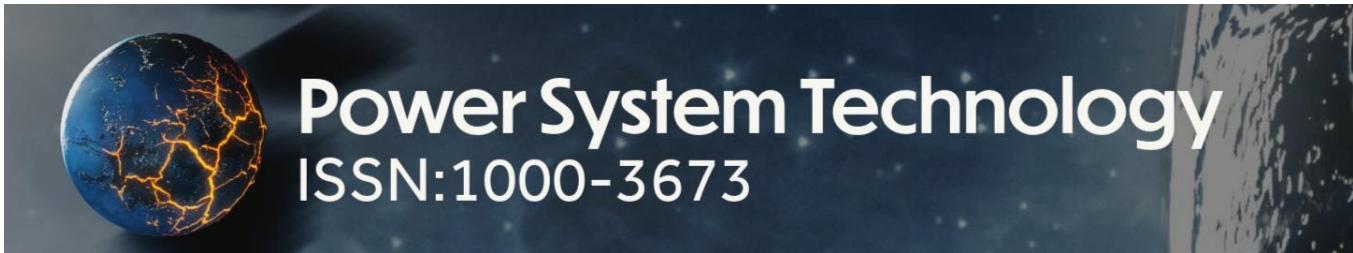
varying sizes, grounding the approach in a combination of empirical research and current scholarly discourse on BYOD, IT governance, and balanced scorecard methodologies.

The study unfolds in three distinct phases: a theoretical examination, an empirical investigation, and an analytical synthesis, each designed to progressively build upon the previous to formulate a robust model for integrating BYOD with IT-BSC using COBIT KPIs.

3.1. Theoretical Examination

This phase involves a comprehensive review of existing literature and methodologies concerning IT consumerization, with a specific focus on BYOD. It evaluates current trends, challenges, and methodologies, establishing a theoretical foundation that addresses both broad and specific concerns related to BYOD implementations. This foundation supports the subsequent empirical and analytical phases by providing a solid scholarly context.

3.2. Empirical Investigation

Central to the study, this phase involves collecting and analyzing new data on BYOD usage within corporate environments. The design of this section is rigorously structured to ensure methodological robustness and includes detailed criteria for sample selection, data collection methods, and statistical analysis techniques. The aim is to gain a nuanced understanding of how BYOD is currently being implemented across different industries and how these practices align with COBIT's governance framework. Insights from this investigation help in identifying practical challenges and opportunities, which are crucial for developing the conceptual model for BYOD integration with IT-BSC.

3.3. Analytical Synthesis

Drawing on insights gained from the empirical research, this phase synthesizes the findings to construct a comprehensive IT-BSC that incorporates COBIT KPIs tailored for BYOD strategies. This synthesis not only integrates the theoretical and empirical insights but also includes practical methodologies for the effective implementation of the IT-BSC. The outcome is a detailed guide that provides actionable strategies and tools for organizations to implement and manage their IT governance in alignment with strategic business objectives via BYOD.

3.4. Conclusion

The culmination of this research presents a deep, structured conceptual model that aligns IT-BSC with COBIT, specifically addressing BYOD initiatives. This model emphasizes the importance of compliance and governance, reflecting the latest developments in IT management and COBIT standards. It also proposes a differentiated approach to understanding and managing BYOD implementations across various organizational contexts, highlighting specific compliance guidelines, usage patterns, and integration strategies within the COBIT framework. This comprehensive model serves as a strategic tool for organizations aiming to enhance their IT efficiency and effectiveness through tailored BYOD strategies, ensuring alignment with broader business objectives and enhancing overall corporate governance and compliance.
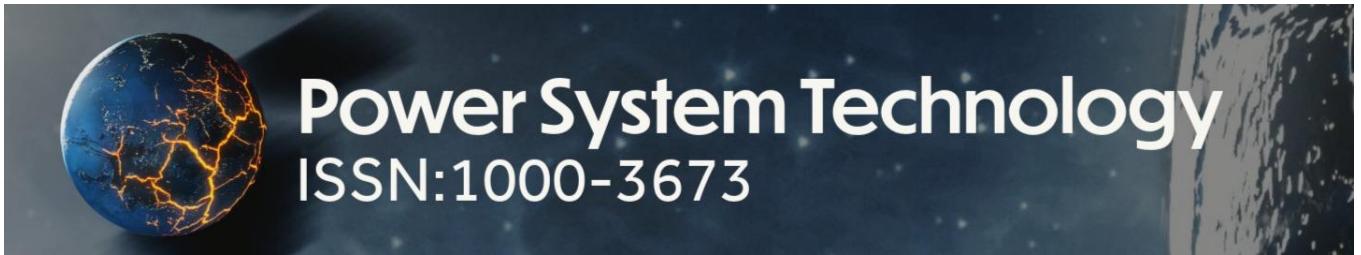
4. ANALISYS OF THE EMPIRICAL SURVEY

A statistical analysis of the survey data was conducted, starting with coding the responses according to a predefined schema. This coding was automated through the web-based survey tool. Descriptive statistical methods such as means and medians were calculated to gain insights into the average responses.

Pearson's correlation coefficient was used to identify dependencies between variables, ranging from ± 1. A value of ± 1 indicates a complete linear relationship, while a value near zero indicates no correlation. This allows for a quantitative evaluation of hypotheses. The correlation between compliance implementation and other variables was examined to provide insights into the necessity of COBIT structures for managing BYOD measures within an IT-BSC system. To rule out differences arising from random sampling, a p-value significance test was conducted with a level of $\alpha = 5\% (p<0.05)$, following Fischer [32]. Several analytical levels were carried out to evaluate the empirical study on the efficiency, effectiveness and strategic orientation of IT organisations in the context of COBIT.

This investigated significant relationships between company characteristics and responses, including company size, industry, and respondent positions, aiming to understand the context of IT strategies and their generalizability. Statistical analyses examined correlations between IT maturity and various aspects of strategy, including BYOD implementation, home office use, and COBIT application, to see if mature organizations pursued more complex or effective strategies. This assessed if companies with higher IT maturity grades had specific IT-BSC structures, indicating a mature approach to performance measurement and management. This contextualized the statistical results, exploring cause-effect relationships and interpretative aspects to validate and understand the research topic comprehensively.

5000 companies were approached, resulting in 1091 completed questionnaires, making this study the most extensive in this field. The response rate of 22% reflects significant interest in the topic. After accounting for incomplete responses, 1023 participants remained, with a dropout rate of 30% on survey page 6, suggesting complexity or ambiguity in hypothesis evaluation.

4.1. Participant Classification:

Participants in the survey were classified by industry, company size, functional profile, decision-making authority, and their general experience with COBIT and the relevance of Home Office/BYOD. This provided a comprehensive view of the companies and respondents involved. 22% (225 participants) belonged to the "Information and Communication" sector, forming the largest group. Contrary to some expectations, the "Manufacturing" sector ranked second, representing 7.6% (78 participants), followed by "Professional, Scientific, and Technical Activities" at 6.5% (66 participants). "Wholesale and Retail Trade" and "Financial and Insurance Activities" each comprised 5.9% (60 participants). The remaining 15 ISIC-classified sectors ranged from 5% (51 participants) to 1.8% (18 participants) of respondents.
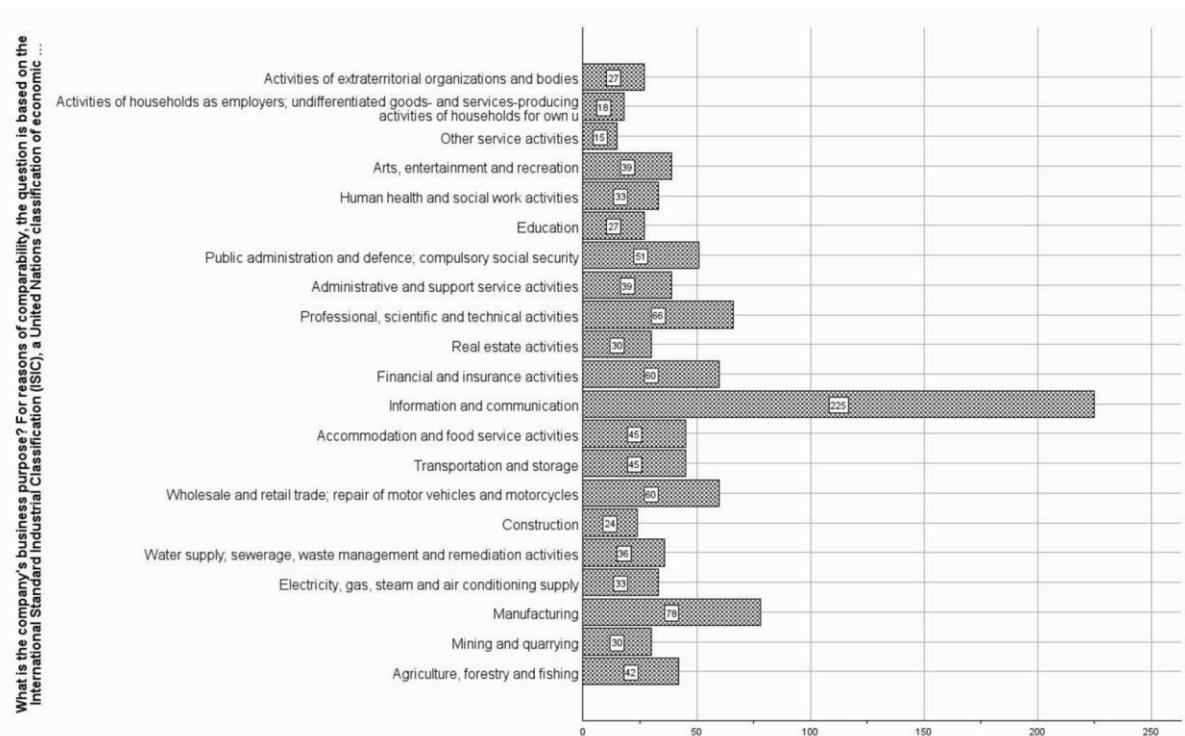
This diversity shows the study's high quality, as responses came from various sectors beyond IT 1(see Figure 1).

Regarding the legal form and size of the companies, 42.2% (432 participants) worked in sole proprietorships, 35.5% (363 participants) in corporations (Ltd or PLC), and 18.5% (189 participants) in partnerships (LIMITED PARTNERSHIP or open trading companies). In terms of size, 44.9% (459 participants) worked in companies with 51-200 employees, while 20.8% (213 participants) were in companies with 11-50 employees. Companies with 2501000 employees made up 17.3% (177 participants), and companies with over 1000 employees accounted for 15.5% (159 participants). This variation indicates that COBIT guidelines must be flexibly applied to accommodate various company sizes and forms, particularly smaller businesses.

The participants' positions and decision-making competence were evaluated, revealing that 30.5% (312 participants) were department heads, 23.8 %

Figure 1: Distribution by sector

(243 participants) were CEOs or managing directors, and 22.8% (231 participants) were CTOs or CIOs. This indicates a high quality of responses in terms of strategic decisions. Additionally, 37.8% (387 participants) had been in their roles for 7-10 years, 29.6% (303 participants) for 4-6 years, and 26.4 % (270 participants) for over 10 years. The remaining 7.7% had been in their positions for 1-3 years or less than a year. 43.4% (444 participants) had primary decision-making authority over IT projects, 41.3% (423 participants) had an advisory role, and 12.5%
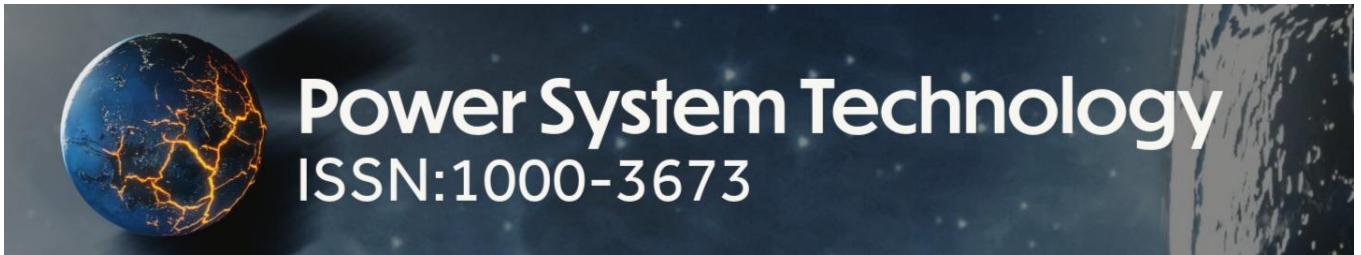
(129 participants) were partially involved. Only 2.6% (27 participants) had no IT decision-making authority.

The participants' experience with BYOD initiatives varied. 44.3% (453 participants) had implemented such initiatives for 4-6 years, while 21.4% (219 participants) for over 6 years. 20.2% (207 participants) had initiatives for 1-3 years, and 6.2% (63 participants) for less than a year. 7.9% (81 participants) had no BYOD initiatives. 45.7% (468 participants) regularly used an IT-BSC for BYOD control, 43.1% (441 participants) irregularly checked it, and 11.1 % (114 participants) did not use it or were unaware of it. A Pearson correlation coefficient of $r=0.463$ showed a moderate correlation between IT-BSC usage and BYOD control, validating that COBIT-integrated BYOD measures can optimize IT structures.

4.2. COBIT Experience:

The study analyzed survey responses to evaluate participants' knowledge and experience with COBIT 2019, aiming to assess its impact on the integration of BYOD strategies into IT-BSC systems. The findings revealed that 42.8% (438 participants) were well-informed about COBIT, while 41.1 % (420 participants) were very well-informed. 10% (102 participants) had basic knowledge, and 6.1% (63 participants) were barely or not at all informed.

In 43.7% of cases (447 participants), COBIT was used alongside other frameworks. In 35.2% of cases (360 participants), it was the primary framework for IT governance, indicating its central role in many organizations' IT strategies. 12.9% (132 participants) used COBIT in individual projects or departments. Only 5.6% (57 participants) did not use COBIT at all, and 2.6% (27 participants) knew of it but didn't use it. 52.5% (437 participants) had attended multiple COBIT training sessions, while 36.7% (375 participants) had undergone one training session. 7.9% (81 participants) planned to take a training session, and 2.9% (30 participants) had not attended any sessions nor planned to.

48.1% (492 participants) reported that COBIT 2019 had a very high influence on IT decisions, and 40.8% (417 participants) noted a high influence. 6.2% (63 participants) saw no influence on IT, and 5% (51 participants) reported a minor or partial influence. Additionally, 51.3% (525 participants) viewed COBIT 2019 as more relevant than previous versions, with 34.5 % (354 participants) finding it more relevant than COBIT 5 or COBIT 4.1. Only 7% (72 participants) saw the relevance as unchanged, and 6.2% (63 participants) considered it less relevant.

40.8% (417 participants) faced minor challenges when implementing COBIT 2019, while 37% (378 participants) encountered and overcame several challenges. 11.4% (117 participants) faced significant hurdles that impacted implementation, 1.8% (18 participants) delayed implementation due to concerns, and 9.1% (93 participants) couldn't comment on it.

4.3. BYOD efficiency:

The COVID-19 pandemic led to a significant increase in the use of BYOD and remote work. Data from the survey indicate that prior to the pandemic, 56.3% of participants (576 participants) utilized BYOD in their home office once a week, while 33.7% (345 participants)

did so several times per week. 6.2% (63 participants) used BYOD once a month, 2.6% (27 participants) used their own devices daily, and 1.2% (12 participants) reported no private use. The pandemic accelerated BYOD adoption, with 69.2% (708 participants) reporting increased usage, and 27% (276 participants) noting a strong increase. 3.5% (36 participants) saw no change, and 0.3% (3 participants) noted a decrease. This growth highlights the flexibility and adaptability of businesses in response to changing work conditions, reflecting a strategic alignment of IT structures.

75.7% of respondents (774 participants) noted an increase in productivity due to BYOD and home office use, while 13.2% (135 participants) saw a significant increase. 10.3% (105 participants) saw no change, and 0.9 % (9 participants) reported a slight to significant decrease. Collaboration improved slightly for 60.4% (618 participants) and significantly for 27.3% (279 participants), while 6.2% (63 participants) saw no change. Challenges such as technical hindrances, blending work and personal life, and communication barriers were reported by 15.8%, 40.8%, and 42.5% of participants respectively.

The majority of businesses (49.6% or 507 participants) intend to adopt a hybrid model combining office and remote work. 22.3% (228 participants) plan for primary office work with occasional remote options, while 15.8 % (162 participants) opt for fully remote work. 11.7% (120 participants) plan to return to the office, with 0.6% undecided. Future plans include investments in technology and software (25.5%), training (44.9%), employee equipment (32.6%), and IT security (25.8%). It can be seen here in Figure 2 that companies that already regularly offered remote working (at least once a week) want to offer significantly more flexible models in the future.

Key lessons from the pandemic include the importance of communication (51% or 522 participants), work-life balance (16.7% or 171 participants), and flexibility (16.4% or 150 participants). 55.1% (564 participants) aim for BYOD and home office to be a regular but not dominant part of work, while

23.2% (237 participants) see it as the new norm.
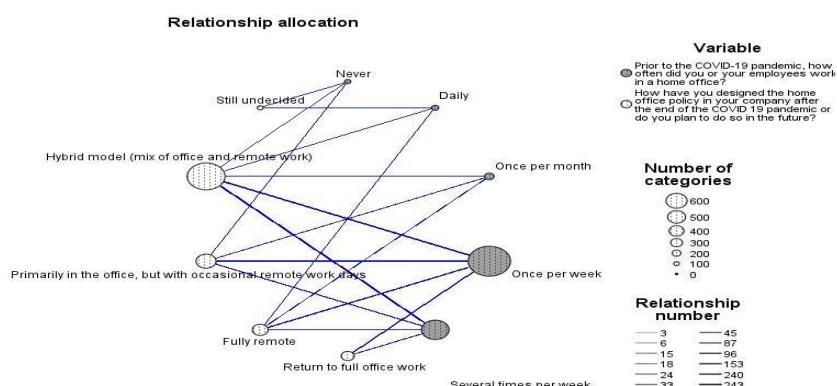
Figure 2: Relationship allocation

4.4. Operational Efficiency:

The adoption of BYOD (as Home Office) has had a varied impact on IT performance. 46.9% of respondents (480 participants) reported a slight increase in IT performance, while 42.8% (438 participants) saw a significant increase. 9.4% (96 participants) saw no benefit, and 0.9% (9 participants) noted a slight decrease. These findings indicate that BYOD contributes to IT performance, though its impact can vary.

The alignment of IT strategy with the COBIT framework improved following the BYOD integration. 37.5% of respondents (384 participants) reported a high degree of alignment, and 27.6% (282 participants) noted complete alignment with COBIT. 26.1% (267 participants) saw partial alignment, while 7.8% (90 participants) reported little to no alignment. A moderate correlation ($r=0.458$) between COBIT alignment and the increase in efficiency and effectiveness due to BYOD indicates that aligning IT strategy with COBIT can enhance BYOD's positive effects. 59.5% (609 participants) felt BYOD integration greatly contributed to IT strategy implementation, and

25.5% (261 participants) saw a very large contribution. 12.3% (126 participants) saw a neutral impact, and 2.7% (27 participants) saw little to no influence. 58.7% (600 participants) saw BYOD's role in their IT-BSC as important but not critical, while 24.6% (252 participants) considered it central. A strong correlation ($r=0.571$) between BYOD's role in IT-BSC and its contribution to strategy implementation highlights its strategic influence. 46.3 % (474 participants) reported a positive impact of BYOD on IT strategy effectiveness, and 36.4% (372 participants) saw a very positive influence. 16.1 % (165 participants) saw a neutral impact, and only 1.2% (12 participants) saw a negative effect. This indicates that BYOD is seen as a significant factor in IT strategy.

51.9% (531 participants) noted a slight increase in IT budget since BYOD integration, and 14.7% (150 participants) saw a significant increase. 12% (123 participants) saw a slight decrease, and 11.7% (120 participants) reported a significant decrease. 10% (99 participants) saw no change. This suggests that initial investments may be needed for BYOD strategies, potentially balanced by long-term gains. 39.3% (402 participants) saw a significant increase in IT staff workload, 27.9% (285 participants) saw a slight increase, 12.3% (126 participants) saw a slight reduction, and 10.3% saw a significant reduction or no change. 63.3% (582 participants) saw a slight improvement in customer satisfaction from BYOD integration, 20.2% (207 participants) saw a significant improvement, and 16.4% (168 participants) saw no change. No respondents saw a decrease, indicating a strong link between BYOD and operational efficiency. 56.9% (582 participants) saw a significant improvement in IT-related business processes, and 28.7% (294 participants) saw a very strong improvement. This underscores BYOD's positive impact on operational efficiency and business processes.

5. DISCUSSION ON THE IMPACT OF BYOD INTEGRATION

The integration of BYOD strategies into companies has profound implications for various aspects of IT strategy and efficiency, as evidenced by the empirical study. BYOD significantly
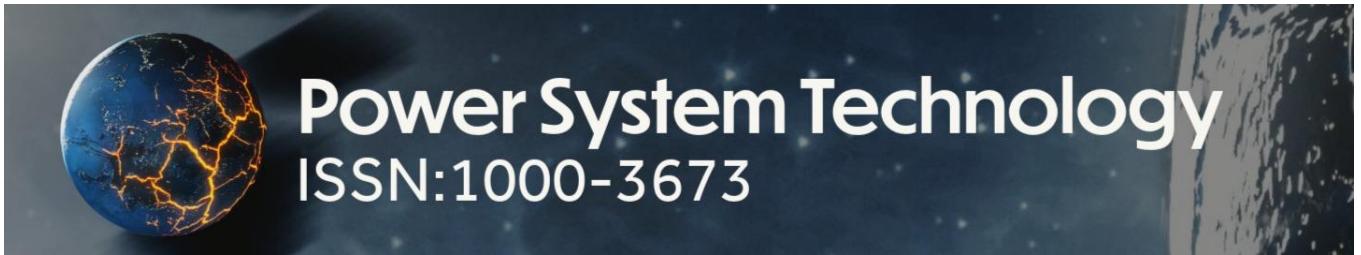
enhances IT performance by integrating processes such as APO01 (Management of IT Management Frameworks) and EDM01 (Monitoring, Evaluating, and Controlling IT), contributing to the overall efficiency and effectiveness of IT systems. This indicates that BYOD is an effective means of boosting IT efficiency and aligning IT strategies with business goals.

Contrary to initial assumptions, BYOD has led to increased costs for many respondents, likely due to initial investments in security solutions and training. This emphasizes the importance of careful planning and resource allocation, particularly in processes like APO04 (Resource Management) and EDM01 (Policies, Plans, and Models of the Organization). Over time, these initial investments may be offset by efficiency gains, positively impacting processes such as MEA03 (Performance Measurement) and APO06 (Budget and Cost Management). The study found significant improvements in end-user satisfaction due to BYOD, indicating effective implementation of processes such as APO01 and MEA03. This highlights BYOD's contribution to the company's success and the importance of COBIT's DSS01 (Service Delivery) process in improving service provision.

52.2% of participants reported that BYOD strengthens strategic alignment between business and IT goals. This shows BYOD's role in enhancing processes such as APO04 (Resource Management) and MEA03 (Performance Measurement). Additionally, the improved communication between IT and business teams, facilitated by BYOD, strengthens customer satisfaction, indicating the effectiveness of processes such as DSS01 (Service Delivery) and DSS06 (Incident and Problem Management). BYOD serves as a catalyst for continuous learning and development, impacting processes like APO07 (Human Resource Management) and MEA01 (Performance Measurement). It introduces new technologies and practices, highlighting the need for training and efficient resource allocation, particularly in managing staff competencies. This suggests ongoing education and development can enhance BYOD's integration, further supported by regular risk assessments (APO14 and EDM05).

BYOD plays a crucial role in the process perspective of IT strategy, with a strong correlation between its role in the IT-BSC and its contribution to IT strategy implementation. Processes like BAI01 (Manage Programs) and APO08 (Manage Relationships) benefit from BYOD, making IT departments more agile and responsive (APO02 and APO05). This also improves IT-related business processes (BAI04 and MEA02), essential for efficient IT services. BYOD integration has a significant impact on IT efficiency, effectiveness, and alignment with COBIT processes and the IT-BSC, enhancing overall IT performance and customer satisfaction. Initial challenges in costs and workload may be offset by long-term benefits, emphasizing careful planning and implementation. BYOD strategies can streamline IT services and processes, improve end-user satisfaction, and strengthen the alignment between business and IT goals, demonstrating BYOD's potential in modern IT landscapes.

6. Conclusion

This research sought to develop a sustainable and efficient methodology for integrating BYOD initiatives into the management system of an IT-BSC framework, within the context of the COBIT framework as an international best practice for IT governance. The primary goal of
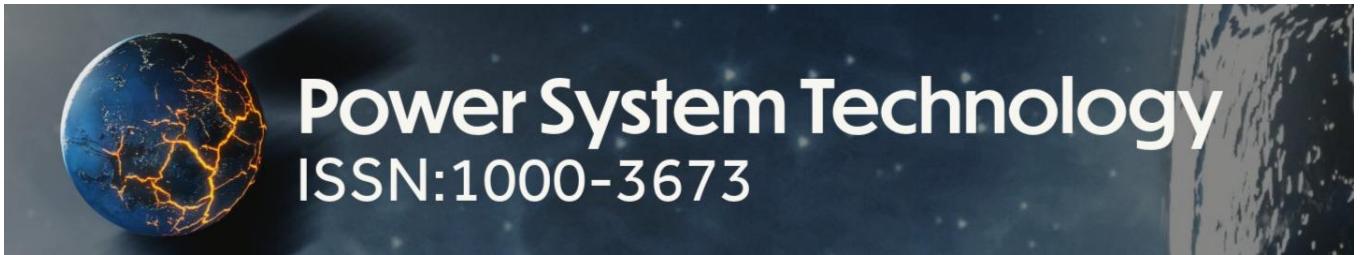
this research was to create a comprehensive methodology designed to support the conception and implementation of an IT-BSC. This methodology aims to provide rational and high-quality solutions for companies of different sizes by leveraging the foundational principles of the COBIT framework and adapting them specifically for BYOD initiatives. This is a crucial step in offering companies a clear and effective path to implementing BYOD, taking into consideration both the specific advantages and challenges of this technology.

The research laid comprehensive foundations for developing an introduction model, considering the complex relationships and dependencies between IT-BSC, COBIT, and BYOD initiatives. This model draws heavily on the empirical study, which provided not only support for the research hypothesis but also a wealth of data and insights, serving as a basis for crafting tailored solutions. Based on the established premises and empirical data, a recommendation for an implementation model is made, incorporating specific KPIs to measure and enable an effective use of BYOD in companies in alignment with the IT-BSC system and COBIT framework. By focusing on specific KPIs, this model offers a clear and precise guideline for rational and informed implementation of BYOD initiatives, emphasizing strategic alignment and optimization of IT process efficiency and effectiveness.

1. **Strategic BYOD Definition:** The first phase focuses on clearly defining the company's vision, mission, and strategy, ensuring the BYOD strategy harmonizes with the organization's primary goals. The COBIT framework acts as a guiding structure to articulate company values and consider best practices throughout the integration phase.

2. **Identification of Performance Goals:** The next step involves identifying essential COBIT processes that provide a foundation for developing performance goals, emphasizing flexibility, transparency, and adaptability to the changing IT landscape. The IT-BSC is then introduced to measure the effectiveness of BYOD integration through representative KPIs.

3. **Creation of IT-BSC with COBIT Process KPIs:** These KPIs are essential for measuring the added value of the BYOD strategy and supporting the strategic direction of the IT organization.

4. **Monitoring and Verification:** The final phase involves continuous monitoring, validation, and verification to ensure the strategy's effectiveness, enabling continuous improvements and securing the long-term success of BYOD integration.

This structured approach creates a solid foundation for successful BYOD integration, fully utilizing the benefits of this strategy while maintaining alignment with IT-BSC and COBIT. The research highlights the necessity of a thorough approach to implementing BYOD strategies within the IT management system, allowing companies to harness the full potential of BYOD, optimize IT services, and meet end-user needs. BYOD strategies, integrated with the COBIT framework and IT-BSC, contribute to a stronger alignment between IT and business goals, enhancing response to external changes and strengthening IT organizations within the COBIT framework. This study affirms BYOD's potential to promote effective business-IT alignment
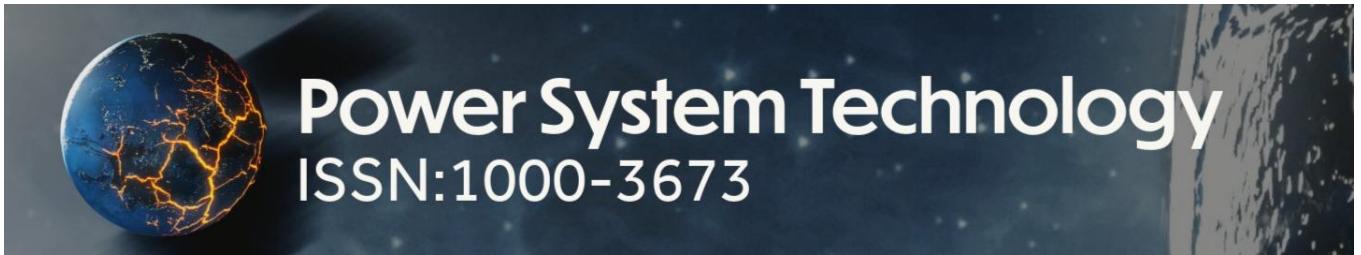
and enhance the agility and adaptability of IT structures in a constantly changing business environment.

References

[1]   Blankenhorn, M., It performance and recognition, IT Journal 1(1) , (2005,) 2.

[2]   V. Bon, J., It's role in core business operations, IT Management Quarterly 1(1), (2005,) 7 – 8.

[3]   Kamleitner, A., Langer, T., Aligning it and business strategy, Business & IT Review 2(1), (2006,) 12.

[4]   Gartner, It's role in business strategy, Gartner Report 15(2), (2020 b,) 25–27.

[5]   Wiedemann, M., It strategy and business goals, Business Strategy Review 1(1), (2012a,) 2 – 3.

[6]   Kaplan, R. S., Norton, E., The balanced scorecard, Harvard Business Review 2(4), (1992,) 24–25.

[7]   Buckley, S., Byod and legal challenges, Tech Law Quarterly 10(1) , (2012,) 10–11.

[8]   Fischer, D., Security in a byod world, InfoSec Review 8(4), (2012,) 60 – 61.

[9]   Kumar, R., Rahman, S., The telework shift, Business Continuity Journal 5(1), (2020) 12.

[10] Cisco, Byod and the future of work, Cisco Insights 4(2), (2021,) 2.

[11] McAfee, Byod in the covid era, Security Today 7(3), (2020,) 10.

[12] Microsoft, Remote work's new norm, Tech Trends 3(2), (2021,) 2.

[13] IBSG, Byod adoption in us companies, IBSG-Horizon Study 2(1) , (2012,) 4 – 6.

[14] Deloitte, Byod's asian roots, Deloitte Insights, 2(4), (2016,) 15.

[15] Kearny, A. T., Byod adoption in germany, Kearny Report 3(1), (2011,) 12.

[16] Stanley, M., Wireless network devices in workplaces, Morgan Stanley Research 2(1), (2013,) 5.

[17] IDC, Mobile access in european companies, IDC Research 3(1), (2012,) 14.

[18] Avande, Byod adoption in european companies, Avanade Report 1(2) , (2012,) 16.

[19] BITKOM, Byod trends in germany, BITKOM Research 3(1), (2013,) 12.

[20] Gartner, T procurement trends, Gartner Report 4(1), (2013,) 1.

[21] Wiedemann, M., Byod in european it strategies, IT Strategy Review 1(1), (2012b,) 18–19.

[22] Silk, S., Bsc and fortune 1000 companies, Harvard Business Review 1(1) , (1998,) 13–22.

[23] Marr, B., Bsc usage in us firms, Performance Management Quarterly 2(2), (2010,) 4.

[24] Williams, J., Bsc in fortune 500 companies, Management Quarterly 2(1) , (2005,) 4–10.

[25] Risby, C., Bsc global usage, Management Tools Report, 1(1), (2004,) 11.

[26] Zumstein, C., It metrics in scientific publications, IT Management Review 1(1), (2005,) 3.

[27] Ku¨tz, M., Bsc and it metrics, IT Controlling Guide 1(1), (2009) 77–78.

[28] Keyes, J., Byod and it management, BYOD Survival Guide 1(1), (2013,)
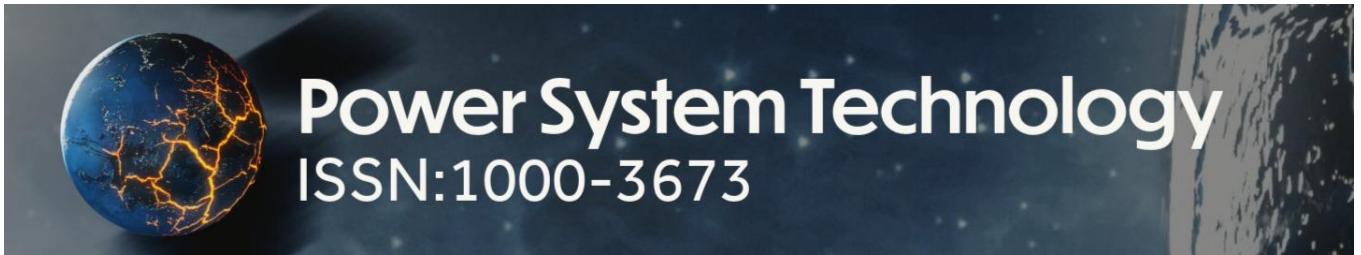
47.

[29] ISACA, Cobit and bsc alignment, ISACA Governance Report 4(2) , (2019d,) 22–23.

[30] ISACA, Cobit integration, ISACA Report 5(3), (2019c,) 25–26.

[31] ILO, The future of work in the digital age, https://www.ilo.org/global/topics/future-work/lang--en/index.htm (2023).

[32] Raab-Steiner, E., Benesch, M., Statistik fu¨r sozialwissenschaftler, Statistical Methods Review (2010,) 64–111.