Research Article

Traversing the Adoption of Instigating Business Intelligence and Analytics in Coping Organization Performance: A Mixed Method Approach from Taiwan Perspective

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Abstract

The field of business analytics and intelligence (BIA) is becoming more and more critical for improving organizational performance. These days, data is not only valuable and crucial to the organization, but it is also acknowledged as being essential to boosting success and performance. Consequently, a great deal of money is invested by many firms in order to acquire more rapid, precise information in real-time. Even if a lot of firms employ business intelligence technology to get information, the previous study found that analytics implementation is still lacking in these organizations. Consequently, the goal of this research is to identify the integrated implementation elements of analytics and business intelligence in controlling organizational performance, especially for private sector firms. To do this, a thorough literature analysis was conducted to determine the key elements influencing the use of performance management, business analytics, and intelligence. This empirical study was carried out in Taiwan, and participation was restricted to subject matter experts in the fields of business intelligence (BI), business analytics (BA), and organizational performance management (OPM). In order to determine the critical elements for business intelligence and data analytics implementation, the study involved conducting expert interviews. To build the integrated elements in BIA and OPM implementation, twenty-six key variables and sixty-five supporting factors were found and examined. Four integrated components of the BIA and OPM implementation were identified by the study's findings: documentation, policy, involvement and training, and adequate training. The study's findings identified four integrated components of the BI and BA implementation: managing Data, strategic planning, decision making, and system, respectively. Overall, this study emphasizes how critical it is to recognize and address the critical elements that affect the success of BIA implementations, providing actionable advice to businesses looking to harness the potential of BIA in today's cutthroat business world.

Keywords: Business intelligence (BI), Business analytics (BA), Organizational performance management (OPM), Private sector, Taiwan.

Introduction

The organization's performance management approach has evolved due to the data explosion, moving away from intuition and toward a data-driven approach focused on knowledge, wisdom, and intelligence [1]. These happen as a result of unstable economic conditions, which force the company to manage resources carefully to stay competitive [2]. Private sector organizations are likewise impacted by these changes, in addition to private sector businesses and industries [3]. To evaluate the interdepartmental, global, and

worldwide environments and to manage and strategize performance in the private sector, extensive research is also required [4]. Making better decisions throughout the development and execution of an organizational performance strategy is made feasible by the analysis of this data.

Nevertheless, prior studies have revealed that the majority of organizations did not employ data analytics in a mature manner [3]. Although they have just used descriptive analysis, their goal is to apply predictive and prescriptive analysis to understand the data in order to make accurate and exact decisions [5]. It appears that business intelligence (BI) is a helpful tool that helps many firms succeed. The reason is that technology can facilitate efficient decision-making by collecting, integrating, accessing, and analyzing data more quickly and easily. Advanced data management technologies that can handle problems with data integration and management while also systematically manipulating data are in great demand right now [6]. Nevertheless, analytics practice is still weak in modern BI implementation [7]. This is due to the fact that the majority of businesses employ analytics and business intelligence (BI) on a per-user basis to manage their performance [7], which lowers the overall efficacy of BI deployment [4], particularly with regard to strategy development and performance improvement.

As per the last survey, the focus has been on leveraging BI as a data management tool and monitoring the company's progress. However, it can also be utilized as a business analytics tool to deliver quick, accurate, and dependable data so that decisions can be taken immediately [5,8]. In order to facilitate the conversion of data into actionable insight, analytic components must be included in BI implementations. The purpose of the article is to explore a detailed theoretical and empirical analysis of the elements that affect the application of analytics and business intelligence in organizational performance management [9]. Thus, the following goals were created for the current study in order to close these research gaps:

(i) Conceptualize the implementation challenges in the BI and analytics integration;

(ii) Pinpoint the crucial elements required for the implementation of BI, analytics, and organizational performance management; and

(iii) To incorporate organizational performance management, analytics, and BI implementation considerations.

To achieve the first goal, a critical literature review on the implementation model of performance management, business analytics, and BI was carried out. Secondly, experts in performance management, analytics, and business intelligence from a select group of Taiwanese companies were questioned for an empirical study. Finally, the empirical and inductive methods are used to assimilate the essentials harmonically. The components and factors discovered in the empirical study were recognized and contrasted with the analysis performed in the earlier literature review.

The results of this study, in our opinion, help to construct a thorough theoretical framework that management consultants and the government can utilize to enhance the application of business analytics and intelligence (BIA) within their institutions.

2. Literature Review

The execution procedure, execution prototypical, maturity model, and decisive success factor are the four primary elements of BI, analytics, and organizational performance management that are the subject of this research's theoretical analysis.

2.1.   *Business Intelligence (BI)*

Business intelligence (BI) refers to the processes, technologies, and tools that are generally used to support business decision-making [10]. Managers can alter and transform data into insightful knowledge by using business intelligence [11]. Chen and Lin [12] coined the term "BI", but its definition was ambiguous. According to Nithya and Kiruthika [13], BI has several distinct components in an effort to make it stronger. Five fundamental elements need to be considered while implementing business intelligence: (i) source of data; (ii) extricate; (iv) investigation method and front-end application; (v) transfer & load engine (ETL); and (iv) data warehouse [14].

The field of decision support is beginning to move toward data-driven models with the use of data warehouses in business intelligence [12]. The idea of information in real-time replaces the use of previous data as the main focus of data analysis [10]. Furthermore, BI offers improved visualization tools that are aesthetically pleasing, intuitive to use, and simple to understand, including scorecards and dashboards, to facilitate strategic decision-making and improve an organization's performance and operations [14]. However, how well BI is implemented depends on how well it can be executed. The phases of BI implementation were specified by the Kimball Lifecycle methodology [15]. Kimball states that project planning was the first step in the BI implementation process, which then included determining the business requirements, design, development, installation, and upgrade. Numerous other BI implementation research projects have drawn inspiration from this Lifecycle [10,16]. The Kimball Lifecycle is applied as a holistic BI deployment guide in this study [15]. Implementing BI is a complicated process that needs in-depth knowledge.

Consequently, success factors are crucial in guaranteeing the successful application of business intelligence. These are the elements that show how the organization can execute and benefit from its deployment. Five categories, decision maker, process, policy-making, technology, and environment, have been created from a critical literature study of the factors influencing BI deployment. The variables that affect the success of BI deployment are presented in Table 1.

Table 1. Crucial Success Factor for BI.

Category	Antecedents	Citation
Decision maker	Engagement of Management	[12,14,15,16,17]
	Team structure	[10,12,16,17,18]
	Sufficient resource	[10,14,15,16,19]
	Budget	[10,12,15,18,19]
	Culture	[12,16,14,18]
Process	Involvement and training	[10,15,17,18]
	Managing of Data	[12,14,16,17,19]
	Data stewardship	[10,14,17,18]
	Flexible enterprise model	[10,14,15,17,18]
	Process dimension	[10,14,16,17,19]

Governance	Policy	[14,15,18,19]
	Infrastructure	[10,14,15,19]
Technology	Integration with other system	[15,16,17]
	Reliability, flexibility, and scalability	[10,12,14,17]
Environment	Vendor selection	[10,15,18,19]
	Competitive pressure	[10,14,15,16,17]

Several fields, such as private sector management, education, medicine, manufacturing, retail, and banking, have started to implement BI [10,14,18]. This is due to its capacity to enhance operational planning, enhance the efficacy of strategy formation, and fortify customer relationships. Additionally, it can enhance departmental cooperation and business processes, which would boost organizational performance [19]. Because its customers are so insistent on getting information about future forecasts, BI technology is still expanding too quickly [17]. Therefore, in order to be employed in a critical business environment that is becoming more and more demanding, BI employment must be coupled with advanced analytics.

2.1. *Business Analytics (BA)*

Business analytics (BA) is the application of analytics to support operational and strategic business processes. According to Storm et al. [20], BA is considered to provide the exact assessment, which can help make a critical decision at the appropriate moment. Szukits and Móricz [21] conferred that BA includes the procedures for gathering, analyzing, and transforming data in order to facilitate decision-making that both people and technology assist. A few categories of analytical movements can be used to group the definition of business analytics (BA), including the conversion of data into information, the application of BA in decision-making, the ability to compete, and the paradigm in particular business processes that use BA in their activities and decisions [22]. The application of BA combines several data analysis techniques to obtain implicit information with the goal of gaining actionable insight. Whereby every process will integrate different analytical approaches and strategies for a successful BA implementation plan [8]. The correct analytical technique to apply will depend on the problem that has to be solved. As a result, the precision with which issues are identified determines how effective BA is [5].

Reviewing a number of business analytics standards has helped to clarify the steps necessary in putting business analytics into practice. The CRISP-DM is the most well-known standard that enterprises use [23]. There are six stages to the process, starting with identifying the organizational need for analytics and ending with a business analyst defining the appropriate data to be used and where it comes from. Data mining procedures were utilized to assess the establishing data in order to offer a resolution for the identified problem [24]. Three layers, data preparation, data quality, and format transformation, are involved in the identification process. The next step is to create a model, which requires organizing several data analysis techniques. Prescriptive or analytical methods, as well as descriptive and predictive, may be included. Subsequently, the constructed model must be assessed using the chosen testing methodology. Additionally, using the information gathered to make decisions is the last step in the process.

In order to understand the deployment of business analytics, a number of relevant prior research have been examined. In conclusion, Table 2 lists the 10 activities that have been determined. The majority of earlier studies began the process of implementing business analytics by identifying opportunities or

problems. After that, it moves on to data management, including data gathering and transformation. Data analysis is typically performed to extract useful information from data. Subsequently, the analysis model should be developed, assessed, and implemented in the decision-making process. Several investigations explored that collected data can offer precise insight or recommendations in order to create a better decision [25]. On the other hand, a few researchers have pointed out that the translation of data analysis results in decision-making [26].

This is due to the fact that not everyone is able to appropriately interpret the findings of data analysis and turn them into a wise business decision. Most researchers paid less attention to other business analytics deployment processes, such as assessing the impact of model usage and model maintenance [27]. On the other hand, it is thought that business analytics implementation can guarantee sustainability. The proficiency of data analysts and the effectiveness of the tools they use are also essential factors in the success of business analytics deployment [25,27].

Table 2. Putting business analytics into practice

Activities	Citations
Recognize difficulty/scope.	[5,15,19,24,25,26,27]
Data quality	[5,14,25,26,27]
Collect data	[5,10,18,19,24]
Transmute data	[18,23,24,25,26]
Evaluate data	[5,15,10,18,25]
Develop a model	[23,25,26,27]
Effective technology fit	[25,26,27]
Interpret result	[18,19,27]
Evaluate the influence	[25,26,27]
Preservation	[15,19,27]

2.2.   Management of Organizational Performance

In order to guarantee that all sources are coordinated to enhance an organization's total performance, managing performance is a crucial responsibility. An essential component of performance management is the analysis of business processes and the metrics that go along with them. This is to guarantee the attainment of general organization optimization [28]. Organizational performance management (OPM), employee performance management, executive manager performance management, and performance consistency are some of the categories of performance management [29]. The purpose of this study was to investigate how BI might be used for organizational performance management (OPM). Its main objective is to strategize organizational goals by considering the metrics and procedures that affect the performance of the organization.

The goal of OPM is to translate the goals of the company into actions. This entails choosing the strategy plan, keeping an eye on how it's being carried out, and distributing performance results [30]. Simultaneously, OPM adoption will maximize performance through ongoing assessment and enhancement

of operational procedures [31]. In order to create a plan that is in line with corporate goals, a firm can foster a proactive climate by implementing OPM [32]. Prior studies have indicated that the private sector's OPM adoption presents more significant challenges than the public sector [30,32]. This is due to the fact that the primary aims of the private sector are typically centered on the profit of the corporation. Still, the public sector has more elusive goals that are challenging to categorize [32]. As a result, business intelligence and analytics technologies are essential to managing the performance of the private sector since they support decision-making and guarantee that strategic planning is in line with organizational goals, which in turn brings revenue.

2.3.   *Analytics and Business Intelligence Models*

The deployment of BI, BA, and OPM had been the subject of numerous previous inquiries. The Gartner Business Analytics Framework (GBAF) is an integrated framework that includes all three categories [33]. Nevertheless, there is still a lack of complete integration and private-sector performance management deployment of this framework.

Further investigation into the definition of BI, BA, and OPM components led to the proposal of frameworks for the implementation of BI [26,32]. These frameworks addressed the use of business intelligence and enterprise resource planning systems for organizational performance. Other research that concentrated on the use of data mining techniques suggested the BI implementation framework [23,28]. Nevertheless, Huang et al. [10] examined how BI and business analytics could be combined. In conclusion, the existing frameworks are insufficient from the perspective of BIA implementation that links to controlling organizational performance.

Previous studies have shown that the framework highlights several areas where an organization-wide adoption of BI, BA, and OPM should be comprehensive and integrated [11], with a particular focus on the finance, management, and IT departments [12]. For optimal performance, the organization needs a whole life cycle process that is effective and efficient [11,13]. This will assist the company in reaching a conclusion that is pertinent and consistent with its strategy and objectives [12,14]. The necessary management data analysis must accompany any decision or modification to the plans and IT actions from other parties. As a result, it used inference and intelligence to create a new, inventive environment [15].

An enterprise implementing mature business intelligence (BI) should be prepared with an integrated technological architecture comprising hardware and software to facilitate BI activity and analytics [11]. Apart from guaranteeing the caliber and reliability of the data collected to facilitate analytical application and decision-making [11,12], a robust and adaptable architecture is essential for effortless adjustment to the ever-changing demands of the business nowadays [16]. Real-time data is necessary for the application of prescriptive analysis in mature analytical implementation [10].

3. Material and Methodology

3.1.   *The Investigational Study*

Using a phenomenological method, this study developed an in-depth analysis of the overall application of business intelligence and analytics. Through the researcher's observation and interpretation, the inductive and deductive approach was also used to explore and develop a thorough grasp of this topic [34]. It was determined that the interview method would be employed for this study in order to collect data, as it is one of the main techniques in the phenomenological approach [35]. In order to ensure the validity of the results, numerous interviews were conducted throughout the fieldwork with seasoned specialists who

were known to be able to provide accurate and dependable data [34]. The methodology and tasks carried out during the empirical investigation are described in the ensuing subsections.

3.1.1.   *Interview Protocol*

The design and formulation of the interview questions were based on the theoretical phase inquiry. Suitable and competent volunteers were selected based on their experience and area of specialization to guarantee the accuracy of the data collected. As mentioned before, the study's participants are subject matter experts in three different fields. The initial group of participants or responders comprises seasoned business intelligence practitioners and managers. Experts with a comprehensive history in business analytics practice make up the second category, and experts involved in overall organizational performance make up the third. A total of forty-eight were asked to take part in the study. However, thirty-four individuals finally agreed and finished their interviews.

The individuals were selected based on their expertise, which is similar to the theme of the current study, their job function, and the nature of their job function. Afterward, they were divided into five groups according to the function of their job profile. The participant's history and demographic are displayed in Tables 3 and 4.

Table 3. Demographic background of participants.

Position	Business intelligence	Data Analytics	Enterprise resource planning	Performance management	Teamwork and ethical judgment
Director	5	-	-	2	-
Deputy director	4	-	-	1	-
Consultant		1		1	-
Data scientist	3	4	-	-	-
Database administrator	2	2	2	-	-
Technical manager	2		2	1	2
Total	**16**	**7**	**4**	**5**	**2**

Table 4. Profile of participants.

	Experience	Type of company	Tools used (currently)	Tools used (before)
Business intelligence	> 10 years	IT	Oracle BI	Tableau
Data Analytics	> 8 years	CRM (Customer Relationship Management)	SAP Business Objects	Microsoft Power BI
Enterprise resource planning	> 10 years	Higher education	Oracle BI	Amazon SageMaker

| Performance management | > 10 years | IT | SAP Business Objects | SAS Visual Analytics |
| Teamwork and ethical judgment | > 15 years | IT | Amazon QuickSight | IBM Cognos Analytics |

Three different techniques were employed to choose the interviewees. Initially, purposive sampling, which was carried out in the preparatory phase, was used in this investigation. In this study, a sampling strategy was employed in order to focus on particular groups [34]. In order to accomplish this, participants in the BI and BA fields were identified during a restricted professional forum. Subsequently, throughout the interview process, the participants were asked to recommend other professionals in their respective industries who might make good study subjects. Another name for this technique is the snowball sampling technique. Following the completion of all interview sessions and data analysis, conformity sampling was the last technique employed during this stage of participant selection. A small number of participants were chosen to confirm the data gathered during the interview.

The sample size for this study was determined by taking into consideration a number of factors. The amount of time required for analysis, the resources at hand, and the saturation point are a few examples [35]. When the phenomenon investigation provides no fresh or additional information, the saturation level is reached. If this is accomplished, it becomes unnecessary to carry out the following repetitive acts of research [34]. However, according to earlier research, a phenomenology investigation needs at least five informants in order to construct the word and provide a relevant interpretation [35].

3.1.2. Development of questionnaire:

Interviews play a crucial role in obtaining primary data. It also facilitates direct communication between researchers and participants, which helps them get raw primary data. Thus, research interviews are used to gather information for the current study as interviews help researchers to delve deeply into the topic as well as the ideas, experiences, and viewpoints of an expert. Thus, researchers must create a systematic and discerning approach to gathering data on the current subject. The current study considers three essential components of a research interview, which are discussed as follows:
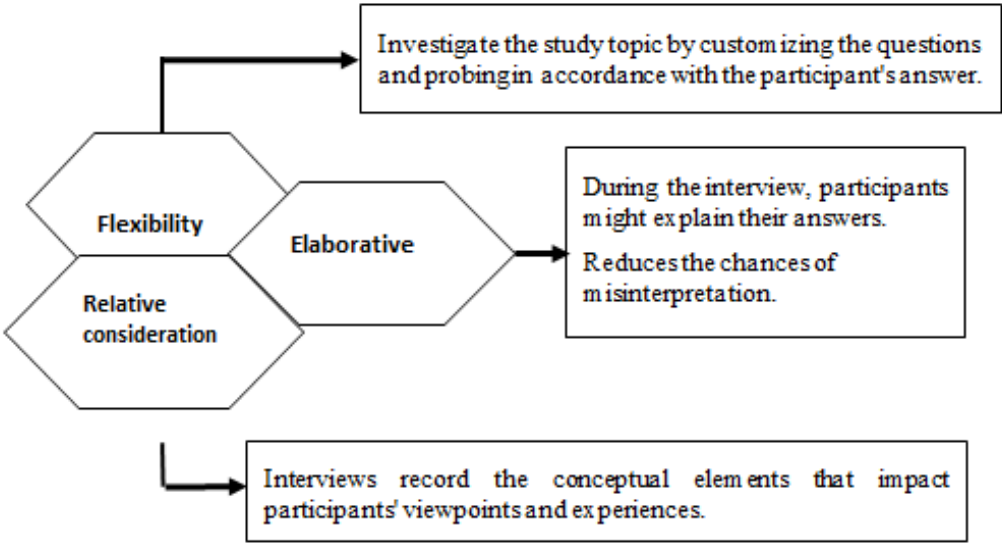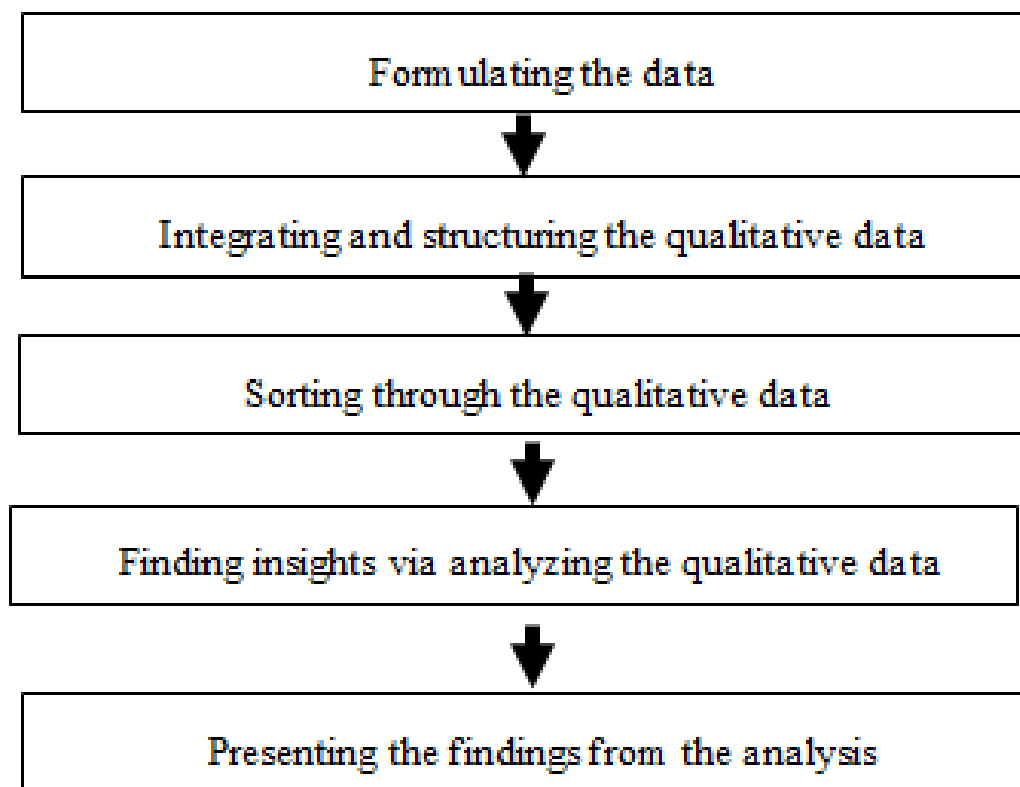

Figure 1. Three critical features of the interview

Interview Question Structure: Several rounds of interview outline questions were used to confirm the validity and reliability of the study findings. First, the primary goals of this study were broken down into a number of smaller goals. The matrices from earlier literature reviews, which included performance management, business and data analytics deployment, and business intelligence, were put into appropriate goals. Subsequently, the relevant interview procedure questions were developed. The design of the interview protocol was based on the conceptual framework, as discussed in the literature [34]. The conceptual framework was derived from the theoretical study phase, which comprised four main components or layers related to analytics, performance management, and business intelligence. The layers consist of governance, human resources, process and application, and tools.

Finally, two field specialists were consulted in order to validate and verify the information. The interview questions are divided into four sections: performance management, business analytics, business intelligence, and participant demographics.

3.1.2. Analysis Method

As suggested by Busetto et al. [35], qualitative data analysis methodology was used to analyze the data from the interviews. The stages involved in analyzing qualitative data are shown in Figure 2. To provide a complete analysis of the data, the audio data was also transcribed into text form. To find the codes that emerged in the text's substance, a thorough reading and discussion of the text was conducted.

Figure 2: Details descriptions of Qualitative Analysis.

After that, content analysis was used to ensure that every important factor had been wholly retrieved from the data. The outcome revealed 86 codes, each of which was divided into groups according to their shared meaning. Once the codes in each group were analyzed, the relevant themes were found. Following that, codes with comparable meanings were merged to shrink the size of the groups. Twenty finalized vital

components, each with 65 subfactors, have been determined. Nevertheless, in order to strengthen the validity of these empirical findings, a number of respondents were selected to corroborate and validate the findings.

3.1.2. Method of interview

An unstructured interview is considered for the current study as it introduces the researcher to unexpected issues and aids in the development of a deeper comprehension of the reality of the interviewees from their points of view. It can also be conducted in the most accessible and flexible manner when it is conducted in an unstructured manner. There was no predetermined list of questions. As a result, the participants' comments and the interviewees' interests drive the conversation's natural flow.

3.1.3. Reliability and Validity

In the current study paradigm, trustworthiness, rigor, and quality are the concepts issued for reliability and validity. That can be accomplished by employing triangulation to reduce bias and increase the researcher's degree of integrity while making claims about phenomena. The following 10 strategies are used by the researchers, as advised by [36].

Table 5. Reliability and Validity.

No.	Strategy	Description
1	Extended and continuous fieldwork	Enables verification and intermediate data analysis to guarantee that the results match the reality of the participants
2	Multiple-method approaches	Permits the use of triangulation in the gathering and analysis of data
3	Participant accounts expressed in verbatim	Acquire participant statements verbatim and document citations.
4	Low-precision characterizations	Keep accurate, nearly literal, and thorough records of the persons and circumstances you encounter.
5	Several investigators	Consensus over the descriptive information that the research team gathered
6	Manually recorded information	Using cameras, videotapes, and tape recorders
7	Engaged investigator	Using participant observations that they wrote down in diaries or anecdotal records as a source of confirmation
8	Participant verification	Informal participant verification is a common practice in participant observation research to ensure accuracy during data collection.
9	Review by participants	Request that participants check the researcher's summary of their interviews to ensure that the portrayal is accurate, as is often the case in interview studies.
10	Unfavorable or inconsistent data	Look for, record, evaluate, and report any adverse or contradictory data that deviates from or modifies established patterns in the data.

3.1.2. Institutional review board

Since the participants were not asked to provide any confidential information about their physical attributes, genetic compositions, or psychiatric disorders, the current study does not require institutional review board (IRB) permission. Furthermore, no laboratory data were utilized. In order to understand the factors influencing the implementation of business intelligence in controlling organizational performance, especially for private sector firms, the participants were asked to respond to questions based on their knowledge and comprehension. The interview was conducted between 10 September 2023 and 25 November 2023.

4. Results

As was said in the previous part, the empirical study, which involved many interview sessions, identified 26 criteria that were thought to be necessary for the integrated application of analytics and business intelligence with performance management in the private sector. Top management support, data stewardship, data quality, data scientist, managing of data, BI practitioner, flexible enterprise model, strategic planning, clear business objectives, performance manager, requirement analysis, analytics, software, hardware, change management, adequate budget, performance monitoring, work culture, effective communications, team building, skills, and BI implementation are the crucial measurements found in the current study, which are presented and described in Table 6.

Table 6. Measurements and their description related.

Measures	Description
Decision making	Information Collection, action setting, and pros-and-cons analysis of the proposal are the steps involved in decision-making.
Top Management	Individuals accountable for the control and management of the entire organization
Data stewardship	The management and supervision of an organization's data assets with the goal of giving business users consistent, high-quality data that is readily accessible
Data quality	Data integrity (if the fields are complete), accuracy, consistency (in all fields across data sources), and usability are some of the metrics used to assess the quality of your data.
Data Scientist	It is the party's responsibility to analyze organizational issues and use data to identify solutions.
Management of data	In order to gather data in a secure and organized manner throughout BIAPM execution, process, store, organize, search, and preserve data
BI Practitioner	Technical personnel in charge of overseeing and developing business intelligence systems
Flexible enterprise model	Model the company with unparalleled adaptability.
Strategic Planning	The procedure for organizing and outlining the organization's course. He/she established a path for the company that will serve as a manual for its

	employees.
Clear business objectives	It has clear, attainable, pertinent, quantifiable, short- and long-term objectives.
Performance Manager	Individuals in charge of overseeing and outlining upper management's needs to guarantee the accomplishment of company goals
Requirement Analysis	The procedure to collect, identify, and assemble information regarding the needs of organizations in employing BIA technologies
Analytics	Obtaining insight into data through data analysis employing descriptive, predictive, and prescriptive techniques
Software	Applications for computers needed to facilitate the use of analytics and business intelligence in overseeing the performance of organizations
Hardware	Equipment needed to implement BIA
Change Management	Methods for handling modifications to BIAPM requirements
Adequate budget	The effective execution of BIAPM depends on the management and control of financial affairs, including the allocation of infrastructure and human resources.
Performance Monitoring	Actions are taken to guarantee that aims and goals are regularly met in a condition that is both efficient and effective.
Work Culture	Think, act, and conduct in order to complete the task.
Effective communications	It entails communicating a message effectively and getting confirmation that the target audience has heard and comprehended it.
Team structure/building.	It is the process of turning data into insights that can assist companies in making better decisions by bringing together people with various responsibilities and skill sets who can collaborate to add value to the company.
Skill	Proficiency or aptitude in carrying out a task
User participation	It is the process of including people in the creation of a process, either individually or as a team.
Documentation	Information related to the BIAPM implementation is continuously stored. It serves as a source of reference, a means of information transfer, and an essential evaluation of the activities completed.
Visualization	The method of displaying numerical data in a user-friendly graphical format
BI Implementation	The process of designing and developing business intelligence (BI) to assist with organizational performance management and analysis

Subsequently, the factors undergo categorization and sub-factorization in order to improve measurement and classification. There are 68 total sub-measures after organizing, analyzing, and coding; these are displayed in Table 7. Based on the informant's comments, three sub-measures related to reward, performance monitoring, and natural calamities are improper and irrelevant in this particular circumstance. As a result, these are not included in the list of sub-measures. Thus, 65 sub-measures are finally selected for the current investigation.

Table 7. Integration of measurements, sub-measurements, and related areas.

Measurements	Sub-measurements	Area
Engagement of Management	Time Management Data Scope BI enhancement	BI
Team building	Personality Proficiency Alignment about Processes Accountability Supportive Relationships	OPM
Sufficient resource	Human resources Equipment Management assistance Individual's attainability	BA, BI, OPM
Budget	Financial Source Financial plan Financial Management	BI, OPM
Culture	Inspiration Compliance Collaboration Constructive Defiance	OPM
Involvement and training	Training Knowledge Experience	BA, BI, OPM
Managing of Data	Source of data Criteria of data Standardization of data	BA, BI
Data stewardship	Data adherence Data policy (collection, storing, and using)	BA

	Data processing	
Flexible enterprise model	Responds to unsolicited features Transformation (ability to modify existing products) Deliverability (ability to change delivery schedules)	BA, OPM
Documentation	Definition of process Manual for individuals Metadata Functioning Analysis of data	BA, BI, OPM
Policy	Policy for gathering, storing, and using data Rules pertaining to national and international organizations	BA, BI, OPM
Strategic Planning	Goals and Objectives Analysis of Success Factors Plan of Action for Strategy	BA, BI
Infrastructure	Design of business intelligence Development of business intelligence Transmission of data	BI
Decision Making	Evaluation of analysis Pronouncement Intuition	BA, BI
System	Accessories Database Extract, Load, Transform (ELT) tools Business intelligence methods Investigative tools	BA, BI
System requirements	Functionality Usability Consistency Performance Supportability	BI
Vendor selection	Better products or services Improved suggestion prompt service	OPM

Competitive pressure	Market portion Satisfaction Retaining Trustworthiness Effectiveness	BI, OPM

5. Discussion

5.1. The Combined Factors of OPM, BA, and BI

The empirical study's findings have revealed the crucial components and sub-components for the use of performance management, BI, and BA. This research aims to integrate the different elements into a coherent framework that will facilitate the application of Business intelligence, analytics, and performance management (BIAPM) in private sector settings. The relative relevance of each subfactor determines the classification of the subfactor connections.

The findings explore four measurements incorporated into the three measurements, which are involvement and training, documentation, visualization, and culture. The findings show that all participants in the integration and execution of BIAPM need to be qualified to be leaders in their respective fields. The findings, moreover, indicate that proficient individuals who cultivate a salubrious workplace are indispensable to the triumphant execution of integrated BIAPM. To guarantee that the project is completed successfully, all employees must also be extraordinarily driven and capable of working as a team. Additionally, each team must be capable of producing enough documentation to back up the undertaking. Data visualization is a crucial component of the integrated BIAPM deployment. This is because it's critical to present information in a way that all parties can understand despite their disparate backgrounds.

5.2. The Combined Aspects of BI and BA

Managing Data, data stewardship, and system features are the three main components that integrate BI and BA. These are three crucial components that are closely linked to one another and require an effective, coordinated workflow across the three domains. The ability of the software to integrate workflow between different sectors is crucial for supporting the work processes in both domains. Appropriate software is needed for this purpose. This is to guarantee that the integrated BPM implementation is enhanced. One of the most critical components of implementing BPM is data management. This study finds that data scientists and performance managers are the ones that request data. For the purpose of standardizing data design, the data source and necessary data requirements are determined. The purpose of the data model is to help with the design of static data reporting or to function as an input for data analytics. Both structured and unstructured data should be taken into consideration when managing data. Additionally, it is crucial to manage unstructured data precisely and in detail [34]. As a result, data management is crucial to data analytics and business intelligence.

5.3. The Combined Aspects of OPM and BI

Furthermore, the study's findings demonstrate that one of the most critical factors in boosting BIAPM implementation success is efficient financial management. Three sub-dimensions, financial source, financial plan, and financial resources, are crucial elements in terms of BIAPM implementation. Assuring the availability of funding sources is crucial for the development and upkeep of BIAPM implementation. The needs for strategic planning operations and software and hardware should be included in financial
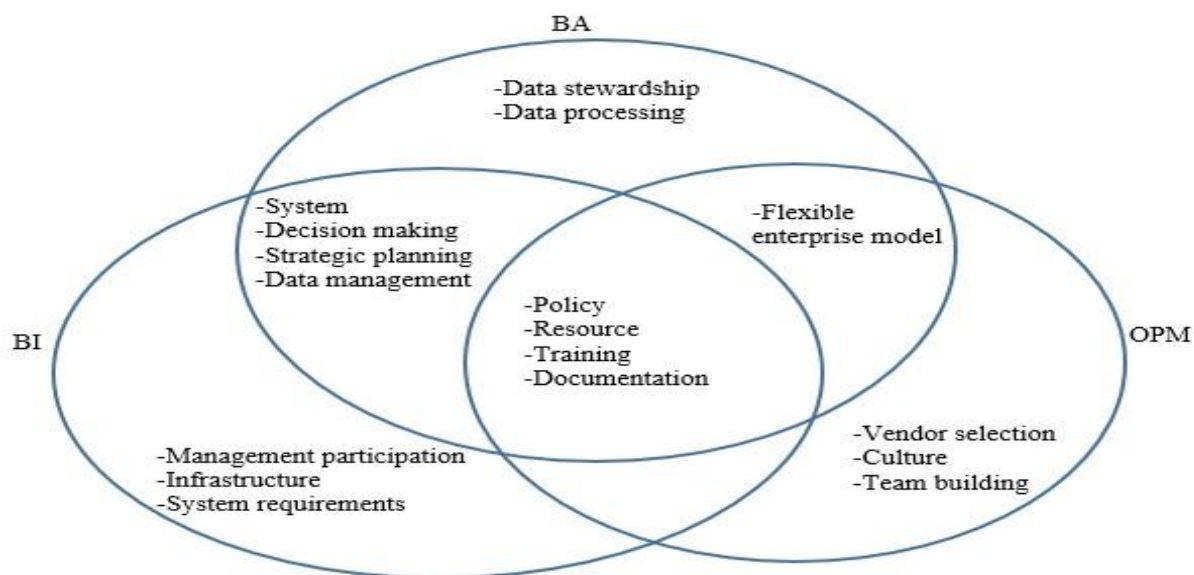
planning. It should also consider certain viewpoints, such as technological ones. Nonetheless, in order to guarantee that the adoption of BIAPM may accomplish its goal, financial management must concentrate on managing budget sources efficiently and effectively.

5.4. The Combined OPM and BA Factors

The integration of BA and OPM is facilitated by three variables that this study has identified: strategic planning, decision-making, and flexible enterprise modeling. An organization can strategize its actions through the process of strategic planning. It establishes the organization's course, assisting its members in reaching their objectives. Strategic planning comprises three sub-dimensions in total. Data analytics and performance management are closely related to the strategic planning process. Because data analytics offers analytical insight to help strategic planning and decision-making, it is significant in all subfactors. However, the flexible model allows enterprises to modify unsolicited features and deadlines to meet the requirements as well as satisfy the customers. The integration of these components with the fields is shown in Figure 3. These findings offer a summary of the essential components that go into combining analytics and business intelligence when using organizational performance management in private sectors. It also demonstrates the connections between the three primary categories this research defines.

6. Implications

These days, trade secrets can be quickly copied, and a secret formula is no longer the basis for a competitive advantage's durability. Managers will see that there is less and less space for intuition as the demand for logical predictability increases. Hence, in order to improve their ability to make decisions in real-time and strategically adapt, it would seem more prudent and advantageous for management to knock down their barriers and participate in double-loop learning with academics.

Figure 3. The incorporation of fields and factors

This study has some implications for practitioners, namely about the role they should play if they want the BI process to produce actionable intelligence. Managerial reluctance to expose their intelligence procedures to thorough scrutiny was evident in all of the studies this research looked at. Managers clearly bear a great deal of responsibility for producing exploratory and descriptive studies, even though their apathy is understandable given their annoyance with the immeasurability of intelligence constructs. Their involvement in defensive management is partly to blame for this. It's interesting to note that management,

fearing negative publicity or competition, would prefer to keep an underperforming BI unit under wraps rather than open it for evaluation. Consequently, this study emphasizes the potential benefits that management's open participation in longitudinal studies could have for BI research and, to some extent, for the development of a new open intelligence culture within their organizations—one in which knowledge is transparent, intelligence is participative rather than selective, and double loop learning with academics is ongoing. Their dedication to longitudinal study and open engagement will stimulate the development of new metrics for intelligence performance and better integrate the BI process within its environment.

7. Conclusions

The primary objective of this research project is to provide an organizational performance management framework for BI and analytical implementation that is specifically designed for the private sector. The current study explored the influences of performance management, business analytics, and business intelligence in private-sector enterprises using a holistic model. In addition, how the latest Business intelligence analytics (BIA) are executed is also explored. The study goes on to examine the empirical information acquired from a number of interview sessions in an effort to identify the crucial components involved in the effective implementation of integrated BIA and Organizational performance management (OPM) in the Taiwanese private sector. The analysis explores 26 determinants and 65 sub-determinants as the vital measurements for the implementation of business intelligence and analytics in handling performance in associated private organizations. Top management support, data stewardship, data quality, data scientist, managing of data, BI practitioner, flexible enterprise model, strategic planning, clear business objectives, performance manager, requirement analysis, analytics, software, hardware, change management, adequate budget, performance monitoring, work culture, effective communications, team building, skills, and BI implementation are the crucial measurements found in the current study are identified as critical factors.

Regarding subfactors, this study indicates three sub-measures, such as reward, performance monitoring, and natural calamities, are improper and irrelevant in this particular circumstance. As a result, these are not included in the current study. Additional research needs to explore how to integrate these elements logically. Future research will examine the relationships between each element in greater detail with the aim of discovering the association and its usage in the proposed model.

Author Contributions

Data collection= MH Peng; *Methodology*= MH Peng and B. Dutta; *Data cleaning*= MH Peng; *Investigation*= D. Dutta; *Data curation*= B. Dutta. and MH Peng; *Formal analysis*= B. Dutta.; *Initial draft*= MH Peng; *Final draft*= B. Dutta

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