

Integrating Business Intelligence and Analytics in Managing Public Sector Performance: An Empirical Study

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Abstract—Business intelligence and analytics (BIA) is emerging as a critical area to boost organizational performance. Nowadays, data is not only important and valuable to the organization but recognized as necessary to spike the organization performance and success. As a result, many organizations spend a considerable amount of investment toward obtaining faster accurate information on a real-time basis. The previous study revealed that even though many organizations use business intelligence technologies for obtaining information, yet they still lack analytics implementation. Therefore, this study aims to discover the integrated implementation factors of business intelligence and analytics in managing organizational performance, particularly for organizations of the public sector. In achieving this, a depth literature review was carried out to identify the influential factors in the implementation of business intelligence, business analytics, and performance management. The subject matter experts in Business Intelligence (BI), Business Analytics (BA) and Organisational Performance Management (OPM) were invited to participate in this empirical study, which was conducted in Malaysia. The study was carried out through interviewing experts, in order to identify the essential factors for business intelligence and data analytics implementation. Twenty essential factors and sixty-four sub-factors were identified and analyzed to construct the integrated factors in BIA and OPM implementation. The result of the study revealed four integrated factors of the BIA and OPM implementation, such as skill, documentation, visualization, and work culture. Finance, data management, software, strategic planning, and decision-making are other factors integrated with BI, BA, and OPM respectively. Finally, this study illustrates the integrated factors in a visual form.

Keywords—business intelligence; business analytics; organisational performance management; public sector; implementation factor.

I. INTRODUCTION

Data explosion and information have changed the way the organization manages its performance, ranging from intuition towards data-driven based on information, knowledge, intelligence, and wisdom. These occur as a result of uncertain economic conditions that urge the organization to manipulate resources wisely in order to remain competitive. These changes do affect not only companies and industries in the private sector but also include public sector organizations [1]. Managing and strategizing performance in the public sector also requires in-depth

analysis to evaluate inter-department, global and international environment [2]. Analysis of this information makes it possible to be able to drive better decision making in the formulation and implementation of a strategy to increase organizational performance. However, previous research has found out that, most organization did not implement data analytic maturely. Only descriptive analysis has been applied by them, even though they are supposed to utilize insight of data using predictive and prescriptive analysis to ensure precise and accurate decision been made [3]. Business Intelligence (BI) seems to be a useful technology to drive success in many organizations. The

reason is that it can collect, integrate, access and analyze data faster and easier to support the effective decision-making process. Currently, there is a high demand for advanced data management technology that can systematically manipulate data and at the same time solve data integration and management issues [4]. However, contemporary BI implementation is still lacking analytics practice [5]. This is because, most organization technically implement BI and analytics separately in managing their performance [6], thereby decreases the effectiveness level of BI implementation, especially in formulating strategy and improvement of overall organizational performance [3].

Based on the previous study, the focus has been on monitoring the performance of the organization through the usage of BI and also as a tool for data management. Whereas, it can also be used as business analytics tools to produce fast, reliable and accurate information so that that fast action can be taken [7], [8]. Therefore it is critical to integrate the elements of analytic into BI implementation to enable the transformation of data into actionable insight.

This article aims to provide a theoretical and empirical in-depth discussion on business intelligence and analytics implementation factors in organizational performance management. Based on this, the objective of the current study are (i) to conceptualize the implementation issues in the integration of BI and analytics, (ii) to identify the critical factors for the implementation of BI, analytics and organizational performance management, and (iii) to integrate BI, analytics and organizational performance management implementation factors. In order to address the first objective, a critical literature review was drawn on the implementation model of BI, business analytics and performance management. Afterward, an empirical study was carried out by interviewing experts that are in performance management, business intelligence, and analytics in some selected Malaysia organizations. After these, from the empirical study, the components and factors were identified and compared with the analysis carried out from the previous literature review through employing the use of the deductive and inductive method to integrate the elements harmonically.

Given the above, the present research is organized as follows. Section II discusses the theoretical study, which is based on a critical literature review. It also elaborates the method used in the empirical study to identify elements related to the implementation of BI, analytics and performance management. Section III, on the other hand, presents the identified elements and an in-depth characterization of each element related to integrated elements of BI and analytics implementation in managing organizational performance. Lastly, Section IV concludes the results and contribution of this research.

II. MATERIAL AND METHOD

The theoretical study of this research focuses on four main areas of BI, analytics and organizational performance management, which are; implementation process, implementation model, a maturity model, and critical success factor.

A. Business Intelligence

Business Intelligence (BI) can be referred to as the technologies, applications, and practices that are usually employed to give support to decision making in business [9]. With the use of BI, managers can transform and manipulate information from data to valuable knowledge or insight [10]. In 1959, Luhn introduced the term BI with vague meaning [11]. However, in order to strengthen the BI concept, Howard Dresner [12] gave it clearer components in 1989. In business intelligence implementations, there exist five basic components to be considered. These are; (i) data source, (ii) transfer & load (ETL) engine, (iii) extract, (iv) analysis engine and front-end application, and (iv) data warehouse [9].

Data warehouse introduction in BI is the beginning of a transformation in decision support landscape towards data-driven. Data analysis focus is from using previous data and moves to the real-time concept of information. Additionally, BI provides enhanced visualization features that are user-friendly, appealing and easy to comprehend, such as scorecard and dashboard to carry out decision making in strategic actions that will improve organization's performance and operation [13].

However, the effectiveness of BI implementation depends on how it can be carried out. Kimball Lifecycle methodology to develop BI outlined phases of BI implementation [14]. According to Kimball, the BI implementation phase started with project planning and followed by identifying business requirements, design, development, installation, and enhancement. This Lifecycle has been used as a guideline in many other BI implementation research [15]–[17]. In this study, Kimball Lifecycle is used as a guideline of holistic BI implementation.

BI implementation is a complex process that requires a thorough understanding. Therefore, success factors play an important role in ensuring the realization of BI implementation. These are the factors that demonstrate the ability of the organization to implement and gain value from its implementation. As a result of critical literature review, factors of BI implementation have been classified into four categories. These are; enabler, process, governance, and technology. Table 1 shows factors that influence BI implementation success.

In recent time, BI has been applied in medical [18], education [19], retails [20], banking [21], manufacturing [22] and public sector management [23] sector. This is because, it able to improve the effectiveness of strategies formulation, operational planning and strengthen relationships with customers. Also, it able to improve business processes and collaboration between departments, thus increase organizational performance [22]. BI technology is still overgrowing with the insistence of its users to get future forecast information. Therefore, its implementation needs to be integrated with advanced analytics to be used in an increasingly challenging business environment.

TABLE I
BI CRITICAL SUCCESS FACTOR

Category	Factor	Reference
Enabler	Top Management Engagement	[24]–[26]
	Suitable team	[26]
	Skill	[27]
	Attitude	[28]
Process	BI Development	[25], [27]
	Data Management	[27], [29], [30][25], [27], [29]–[31]
	IT and Business Alignment	[25]–[28], [31], [32]
Governance	BI Performance	[25], [27], [28], [30]
	Financial	[31], [32]
Technology	Infrastructure	[26], [27], [32]
	Hardware and Software	[26], [27]

B. Business Analytics

Business analytics (BA) is an activity of applying analytics to strengthen strategic and operational business activities. It is defined as “delivering the right decision support to the right people at the right time” [33]. It contains the process of data collection, data analysis, and data transformation to support decision-making with the support of human and technology [34]. The definition of BA can be classified into few categories of analytic movements, such as the process of data transformation to information, its use in decision-making, its competitive ability, and the paradigm in specific business processes that apply BA in its decisions and activities [2]. BA implementation represents a combination of a few data analysis procedure for gathering unstated information directed to practical insight. In which each procedure shall combine various analytical methods and techniques for effective BA implementation strategy. The problem to be solved will determine the appropriate analytical method to be used. Hence, BA effectiveness depends on the accuracy of the identification of problems.

In order to understand the process involved in business analytics implementation, several business analytics standards have been reviewed. The most famous standard employed by organizations is the CRISP-DM [26]. It involves six levels of processes that begin with understanding the needs to perform analytics in an organization, to business analyst who shall define suitable data to be used and its source. The establishing data was analyzed through the use of data mining methods to provide a solution for the identified problem. In the identification of data, three levels are involved, these are; (i) data preparation, (ii) data quality, and (iii) format transformation. The process continues with the development of a model that consists of designing a sequence of data analysis techniques. This may contain prescriptive or analysis method, descriptive and predictive. After that, the developed model needs to be evaluated using the selected testing method. Moreover, the final process is to apply obtained information in decision-making.

To apprehend business analytics implementation, several related previous studies have been reviewed. In summary, there are 11 activities that have been identified as shown in Table II. Most of the previous researches started business analytics implementation with identifying problem or opportunities. In which it later continues with data management, such as collection and transformation of data. The typical process is performing data analysis to extract valuable information from data. After these, the model will be developed, evaluated and used for the business decision. However, few studies emphasized the importance of understanding the data to ensure that collected data can provide accurate insight or suggestion. Also, few researchers also emphasized on the importance of transforming data analysis result for the decision-makers. This is because not everyone can accurately understand data analysis results and transform it into a strategic business move. Other business analytics implementation process such as measuring the impact of model usage and model maintenance got less attention from most researchers. However, in terms of business analytics implementation, it is believed that it can ensure sustainability. The success of implementation in business analytics also depends on the skill and knowledge of data analyst [28], and the ability of appropriate software used [10].

TABLE II
BUSINESS ANALYTICS IMPLEMENTATION ACTIVITIES

Activities	[35]	[36]	[37]	[2]	[38]	[39]
Identify problem/opportunity	√	√	√	√		√
Understand data	√	√	√			
Collect data	√	√	√		√	√
Transform data	√	√			√	√
Analyze data	√	√	√		√	√
Develop a model	√	√	√			
Evaluate model	√	√	√			√
Use model	√	√	√			√
Translate output		√			√	
Measure the impact			√			
Maintenance			√			

C. Organizational Performance Management

Managing performance is a critical task in the organization to ensure every source is organized to improve the overall performance of an organization. One of the main activities in managing performance is analyzing business process and its related metrics. This to ensure optimization of general organization achievement [29]. Among the categories of performance management are; organizational performance management (OPM), performance management for employee (PME), performance management for the executive manager (PMM), and the reliability of

performance [30]. This research was conducted to inquire into the implementation of BI for Organizational Performance Management (OPM). It focuses on strategizing organizational goals by taking into accounts metrics and processes that impact organizational performance.

OPM is aimed to interpret the organization's objectives into actions. This includes determining the strategic plan, monitoring its implementation, and distributing performance achievement [31]. At the same time, OPM implementation shall increase the performance to its maximum level by continuously evaluate and improve operational processes [32]. The implementation of OPM will also support a proactive environment within an organization to produce a strategy that is aligned with organizational objectives [33]. According to previous research, OPM implementation is more challenging in the public sector rather than in the private sector. This is because the main objectives of the private sector are usually based on the company's profit; however, the public sector has intangible objectives that are difficult to classify [34]. Therefore, managing the public sector's performance requires business intelligence and analytics technology to assist in decision making as well as to ensure strategic planning is aligned with the organization's objectives.

D. Business Intelligence and Analytics Models

Several previous studies had been carried out on BI, BA and OPM implementation. The Gartner Business Analytics Framework (GBAF) [35] has developed an integrated framework of these three fields. However, this framework still lacks implementation from public sector performance management perspective and the full implementation of the integration.

Also, other studies also considered identifying BI, BA and OPM elements and thus proposed frameworks for BI implementation [36], [37], while [38] proposed the framework of enterprise resource planning and business intelligence systems used for organizational performance. Other studies recommended the implementation framework of BI by focusing on the application of data mining techniques [5], [39]. While, a study by [2], [40], [41] investigated the BI and business analytics integration. In conclusion, the existing frameworks are not comprehensive in the perspective of BIA implementation that integrates into managing organizational performance.

Previous studies revealed that there are several characteristics identified in the framework where the implementation of BI, BA, and OPM should be integrated and comprehensive throughout the organization [42], particularly in IT section, management and financial [43]. The organization should have a complete, effective and efficient life cycle process for optimum performance [44], [42], [45]. This will help the organization in making a relevant decision that is aligned with the organization's strategy and goal [43], [45]. Any decision and change in the strategies must be followed by appropriate actions from other parties involving IT, management and data analysis. Hence, it created a new innovative environment using intelligence and implied information [46].

In matured BI implementation, the organization should be ready with the integrated technology architecture [42], [45]

which include software and hardware to support BI activity and analytics. The firm and dynamic architecture is required for easy customization according to the dynamic needs of the organization today [44] and also to ensure the quality and reliability of information obtained for supporting the analytic implementation and decision making [42]. Matured analytic implementation applies a prescriptive analysis that requires real-time data [40].

E. The Empirical Study

This research used the phenomenological approach to construct a complete and in-depth study in the overall implementation of business intelligence and analytics. The inductive and deductive approach was also carried out to gain an in-depth understanding and exploration of this topic through the researcher's observation and interpretation [47]. Based on the fact that interview is one of the primary methods in phenomenological approach [48], it was decided that the approach of the interview is to be used for this study in order to obtain data. During the fieldwork, several numbers of interviews were done with experienced experts who were identified to be able to provide quality and reliable data thus ensuring the reliability of the findings. The following subsections explain the approach and activities undertaken during the empirical study.

1) *Interview Protocol*: Based on the investigation from the theoretical phase, the interview questions were designed and formulated. The suitable and qualified participants were identified based on their experience and expertise to confirm the reliability of data collected. The participants of this study are the subject matter experts in three areas as previously stated. The first category of respondent or participant consists of managers and experienced business intelligence practitioner. The second category is the experts who have a broad background in practicing business analytics; meanwhile, the third category consists of experts who involve with overall organizational performance. Eighteen (18) participants were selected, requested to participate and interviewed. The reasons for their selection were based on their work function and their involvement in the public sector. They were later segregated into three categories. Table 3 and Table 4 illustrate the demographic and participant's background.

In order to select the participants of this interview, three methods were used. First, this study used the purposive sampling that was conducted at the preliminary stage. To target specific groups in this study, a sampling technique was used [49]. To do this, during a closed professional forum, participants in BI and BA fields were identified. Next, while conducting the interview, the participants were requested to suggest other candidates in their fields that suitable to be the respondent for this study. This method is also known as the snowball sampling method. The final method used during this phase of participant's selection was conformance sampling which was conducted after all interview session and data analysis has been carried out. Few participants have been selected to verify the information gained from the interview.

TABLE III
DEMOGRAPHIC BACKGROUND OF PARTICIPANTS

Position	Business Intelligence	Analytics	Performance Management
Consultant	4	-	-
Director	2	-	3
Deputy Director	1	-	3
Head of Data Scientist	-	3	-
Senior Data Scientist	-	2	-
Total Participants	7	5	6

TABLE IV
PARTICIPANTS' EXPERIENCE BY FIELD

Experience	Business Intelligence	Analytics	Performance Management
> 10 years	2	-	2
5-10 years	5	5	4

There are several criteria taken into account in specifying the sample size of this study. Among others is the time needed for analysis, the resource available and saturation level [50]. The saturation level is achieved when the phenomenon study does not give any additional and new information. If this is reached, the following repeated acts of study is no longer necessary to be conducted [51]. However, the previous study revealed that for a phenomenology study, at least five informants are sufficient to develop the term and meaningful interpretation [52].

2) *Interview Question Design:* Several stages of outlining questions of the interview were conducted in order to confirm the quality and reliability of the study findings. At the first level, main objectives of this research were divided into several sub-objectives. The matrix from previous literature reviews that consist of business intelligence, performance management as well as business and data analytics implementation were outlined into suitable objectives. After that, the appropriate questions of the interview protocol were drafted. The design of the interview protocol was based on the conceptual framework as discussed in our previous paper [53]. The conceptual framework was derived from the theoretical study phase which contained four main components or layers of business intelligence, analytics and performance management. The layers are human resource, governance, process and application, and tools.

Lastly, the process of content validation and verification took place by sending it to two field experts. The constructions of interview questions consist of four sections namely: demographic data of the participants, business intelligence, business analytics, and performance management.

3) *Analysis Method:* Data analysis of the interview was done by adopting the qualitative data analysis as suggested by [49]. Fig.1 illustrates the steps of qualitative data analysis. Transcription of the audio data into a text form was also conducted in order to analyze the data thoroughly.

The text was read and discussed rigorously to identify the codes appeared in the textual content.

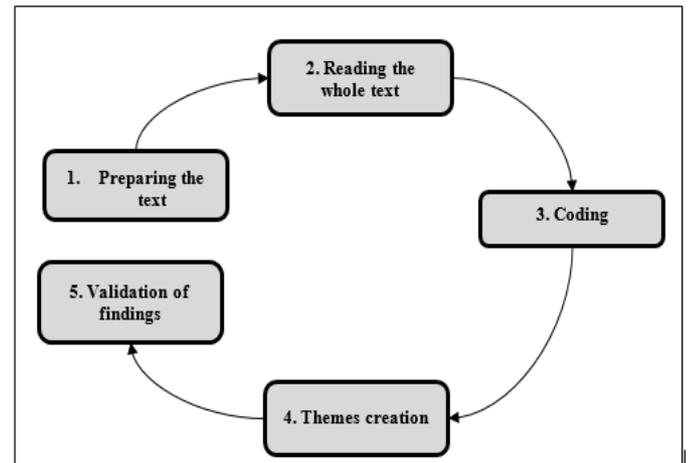


Fig 1 Steps in qualitative analysis approach

Content analysis was then applied to the gathered data to make sure that all the significant factors were fully extracted. The result identified 136 codes whereby each code was separated into groups with the same meaning. The appropriate themes were identified after analyzing codes in each group. To reduce the size of the groups, codes with similar meanings were then combined. Twenty essential factors which consist of 64 subfactors have been identified and finalized. After all that, several respondents were selected to double check and reconfirm the findings in order to escalate the reliability of these empirical findings.

III. RESULTS AND DISCUSSION

The empirical study which was conducted through several interview sessions as discussed in the previous section had revealed 20 factors which were considered as the significant factors for integrated implementation of business intelligence and analytics with performance management in public sector. Table 5 reveals the factors and the descriptions derived from this study, which are; BI practitioner, performance manager, top management, subject matter expert, data scientist, BI implementation, requirement analysis, data visualization, data management, decision making, analytics, performance monitoring, strategic planning, finance, documentation, software, hardware, change management, skill, and culture.

TABLE V
INTEGRATED BUSINESS INTELLIGENCE, ANALYTICS AND PERFORMANCE MANAGEMENT FACTORS

Factors	Description
Subject Matter Expert	The parties who have in-depth knowledge of a strategy or the subject to be studied.
BI Practitioner	Technical staff that develop and manage business intelligence technology
Performance Manager	Those managing and detailing the requirements of top management to ensure organizational goals are achieved.
Data Scientist	The party is responsible for analyzing organizational problems and find answers

Factors	Description
	to the problems with the data.
Top Management	Parties responsible for the control and management of the entire organization.
Requirement Analysis	The process to collect, identify and compile information about the needs of organizations in using BIA technology.
Data Management	Process, store, organize, search, and maintain data during execution of BIAPM to collect data safely and orderly.
BI Implementation	BI design and development process to be used to support the analytical and organizational performance management.
Analytics	The process of data analysis using the descriptive predictive and prescriptive technique to obtain insight into data.
Decision Making	The process of gathering information, setting the proposed action and analyze the proposal in terms of pros and cons before making a decision
Visualization	The process of presenting numerical data presented in a graphical form that is easily understood by users.
Strategic Planning	The process of planning and laying out the direction of the organization. He set a course for the organization that will be a guide for staff in the organization.
Performance Monitoring	Activities to ensure that goals and objectives are consistently achieved in an efficient and effective situation.
Documentation	Continuous practice of storing information relating to the BIAPM implementation. It is a source of reference, the transfer of knowledge and fundamental review of the tasks undertaken.
Finance	Management and control of financial matters for the success of the implementation of BIAPM in terms of infrastructure and human resource allocation
Change Management	Approaches used for managing changes to BIAPM requirements
Software	Computer application programs required to support the implementation of business intelligence and analytics in managing organizational performance.
Hardware	Equipment required for BIA implementation
Skill	Competence or skill in performing a task.
Work Culture	Act, behave and think in carrying out the task

After that, the factors are then classified and segregated into several subfactors to aim for better classification and measurements. After the process of organizing, analyzing and coding, the total numbers of broken-down subfactors are 64 which are shown in Table 6. Based on the informant's feedbacks, we discover that there are two subfactors of performance monitoring which are inappropriate and not relevant in this context. The subfactors are penalty and reward. Therefore, they are taken out from the list of subfactors.

A. The Integrated Factors BI, BA and OPM

The result of the empirical study has disclosed the essential factors and subfactors for the BIA and performance management implementation. This study aims to integrate the factors to form an integrated framework for business intelligence, analytics and performance management (BIAPM) implementation in the public sector. The association among subfactors are categorized based on the significance of each subfactor towards other subfactors.

The analysis and findings conclude that there are four factors integrated into the three fields, which are skill, documentation, visualization and workplace culture. The findings prove that in order to integrate BIAPM implementation, every party involves should have appropriate skills to drive each field. The findings also show that effective integrated BIAPM implementation is supported by skilled staff with a positive working culture. Also, each staff should have the ability to work in a team and must be highly motivated to ensure that the project runs smoothly. Each team should also be able to prepare sufficient documentation to support the project. Another important element in the integrated BIAPM implementation is the visualization of data. This is due to the importance of portraying data to be understood by every party even though they come from different background.

TABLE VI
INTEGRATED BUSINESS INTELLIGENCE (BI), ANALYTICS (BA) AND ORGANIZATIONAL PERFORMANCE MANAGEMENT (OPM): THE SUBFACTORS

Factors	Sub Factors	Field
Requirement Analysis	Requirement Elicitation Data Security Software Criteria Identification of Data Source Storyboard	BI
BI Implementation	BI design BI Development Data Transfer Testing	BI
Data Management	Data Source Data Criteria Data Standardization	BI, BA
Analytics	Identify Problem Analysis Design Data Collection Data Analysis Model Development Quality Analysis	BA
Visualization	Display Story telling Self Service BI	BI, BA, OPM
Decision Making	Report Analysis Decision Insight	BA, OPM
Strategic Planning	Vision & Mission Objective Success Factor Analysis Strategy Action Plan KPI Target Spread of Information	OPM

Performance Monitoring	Measurement Observation	OPM
Documentation	Business Definition User Manual Metadata Operational Data Analysis	BI, BA, OPM
Finance	Financial Source Budget Financial Management	BI, OPM
Change Management	Time Management Data Scope BI enhancement	BI
Software	Database ETL tools BI tools Analytic tools Accessories	BI, BA
Hardware	Server Network Accessories	BI
Skill	Training Knowledge Experience	BI, BA, OPM
Work Culture	Motivation Teamwork Adaptability Positive Attitude	BI, BA, OPM

B. The Integrated Factors of BI and BA

The factors that combine BI and BA are namely; software and data management. These are two important elements that relate directly and need efficient integrated workflow between both fields. Both fields require suitable software to support the work process, and the most important thing is that the software can integrate workflow from one field to another. This is to ensure the enhancement of the integrated implementation in BPM.

Data management is one of the critical elements of BPM implementation. This study discovers that the requirement of data comes from the performance manager and data scientist. Data source and criteria of required data are identified for data design standardization. The data model is developed to enable static data reporting design or as an input for data analytics. The data management shall be considered not only for structured data but also applicable to unstructured data. Detailed and specific management for unstructured data is critical as well [54]. Therefore, data management plays an important role in business intelligence and data analytics.

C. The Integrated Factors of BI and OPM

This study also reveals that financial is a factor that integrates between BI and OPM. Three subfactors have been identified in the financial factor, which are financial resources, budget, and financial management. It is important to ensure the availability of financing sources to support the development and maintenance of BIAPM implementation. Financial planning should consist of software and hardware requirements as well as the needs of strategic planning operation. It also should consider a few perspectives such as technology. However, financial management shall focus on efficiency and effectiveness in managing financial source to ensure that BIAPM implementation can achieve its

objective. Findings from this study reveal that one of the important factors to increase the success of BIAPM implementation is related to efficient financial management.

D. The Integrated Factors of BA and OPM

This study has identified two factors that integrate BA and OPM which are strategic planning and decision making. Strategic planning is a process to strategize action of an organization. It sets the direction of the organization that will guide its members to achieve their goals. There are altogether eight (8) subfactors in strategic planning namely; vision and mission, objective, success factor analysis, strategy, action plan, KPI, target, and spread of information. The implementation of strategic planning directly relates to both performance management and data analytics. In each subfactor, data analytics play big role to give analytic insight to assist strategic planning and decision making.

Fig. 2 illustrates the integration between these factors and the fields. These findings reveal the summary of factors that are essential in the integration of business intelligence and analytics implementation of the organizational performance management in public sectors. It also illustrates that each factor is interrelated within the three major fields defined in this research.

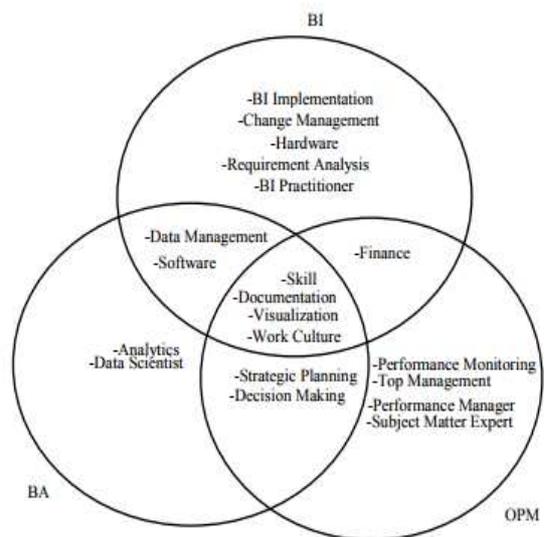


Fig. 2 The integration between factors and fields (BI, BA, and OPM)

IV. CONCLUSIONS

This research has presented a summary of business intelligence, business analytics, performance management and their execution in public sector organizations. Apart from that, the recent BIA execution and related works are also discussed. The paper deliberates further the empirical data collected from a series of interview sessions to identify the important factors during the implementation of integrated BIA and OPM in the Malaysian public sector. The findings identify 20 factors and 64 subfactors as the essential factors of business intelligence and analytics implementation in managing performance in related organizations. The factors identified are top management, performance manager, BI practitioner, data scientist, subject matter expert, requirement analysis, BI implementation, data

management, analytics, visualization, decision making, strategic planning, performance monitoring, documentation, finance, change management, software, hardware, skill, and culture. As for subfactors, this research reveals two factors that are penalty and reward of performance monetary factor as irrelevant and unsuitable to be applied in public sector organizations. Consequently, further analysis was conducted to combine the factors coherently as mentioned in Section III. Future work will examine further the relationship between all of the factors in order to obtain the correlation and its applicability in the proposed framework. The primary target of this research is to develop the BI and analytic implementation framework for organizational performance management specifically for the public sector.

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