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Business Intelligence in the Strategic Management of Egyptian Institutions

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Abstract

All businesses and organizations seek excellence and economic prosperity in light of the many changes surrounding and affecting the working environment. The institutional and organizational need to obtain important strategic information to make strategic decisions increased. Maximizing benefits of resources and working conditions and profit became one of their most important goals, as well as raising the advantages and competitive position. In this context, institutions and business organizations are interested in developing their plans, goals and strategic objectives to achieve the highest efficiency and effectiveness to maximize their various benefits. The research examines and explains how to integrate business intelligence models, tools and applications, architectures and structures in the business enterprises and institutions. And contributes by concentrating on the great transformation of "Business Intelligence" BI from traditional BI to modern BI analyzing the tremendous increasing flood of data generated on a continuous bases. Following topics will be thoroughly introduced, investigated and discussed:

- Strategic management of institutions and organizations (ie strategic management, strategic goals and objectives, strategic planning, vision and mission, strategic business management ...)

- Business intelligence (concepts, emergence, functions, architecture, tools and techniques) traditional as well as modern

- Integration and use of Business Intelligence in the Institutions Strategic management (areas of deployment, various business intelligence activities contribution of business intelligence to the strategic management and processes)

The research also presents a very preliminary proposal of a "Business Intelligence" based "Performance Management" System for the Egyptian Academic Institution in High the Education Sector, that can be studied, analyzed in depth in future work. It aims to monitor the Key Performance Indicators in real time, perform analysis and predictions to make proper decisions and take correct action. By doing this it ensure the institutions high performance and improved competitive position.

Key words; Business Intelligence, Strategic Management, Competitive Intelligence, Performance Management, Predictive Analytics

ملخص بحث

الباحثة: د.م. بسمه محرم الحداد

" ذكاء الاعمال في الادارة الاستراتيجية للمؤسسات المصرية"

تسعي كافة مؤسسات الاعمال و المنظمات الي التميز و الازدهار الاقتصادي في ظل التغيرات العديدة المحيطة و المؤثرة ببيئة العمل .و عليه فقد ازدادت حاجة المؤسسات و منظمات العمل الي الحصول علي المعلومات الاستراتيجية الهامة لصنع القرار الاستراتيجي . و اصبح من اهم اهدافها تعظيم الاستفادة من مواردها و ظروف العمل بها للحصول علي و رفع الميزات و القدرات التنافسية بها. و في هذا الاطار تهتم المنظمات ومؤسسات العمل بوضع خطة و اهداف و غايات استراتيجية تسعي لتحقيقها و تنفيذها بكفاءة عالية لتعظيم النفع و الاستفادة. و يهتم هذا البحث بدراسة و تحليل علمي لكيفية دمج ذكاء الاعمال و نماذجة و ادواته و وتطبيق معمارياته و هياكله في العديد من مؤسسات الاعمال في المجالات و القطاعات المختلفة. وتظهر مساهمة البحث في التركيز علي التحول من ذكاء الأعمال التقليدي الي ذكاء الأعمال الحديث للتحليل الأني المستمر لفيض البيانات و المعلومات الذي يتولد في شتي الوسائل و المجالات علي مدار الساعة و ذلك عن طريق تناول المحاور التالية :

-   الادارة الاستراتيجية للمؤسسات و منظمات العمل (ما هي الادارة الاستراتيجية، الاهداف و الغايات الاستراتيجية، التخطيط الاستراتيجي و الرؤيا و الرسالة، ادارة الاعمال الاستراتيجية...)
-   ذكاء الاعمال (المفاهيم ، النشأة، الأنشطة ، معمارية ذكاء الاعمال، الادوات و الاليات) لذكاء الأعمال التقليدي و الحديث.
-   دمج و استخدام ذكاء الاعمال في الادارة الاستراتيجية للمؤسسات(مجالات الاستخدام ، اتاحه ذكاءالاعمال في المؤسسات المصرية، انشطة ذكاء الاعمال المختلفه، اولويات تطبيقه و مساهمة ذكاء الأعمال في الإدارة الإستراتيجية للمؤسسات و منظمات العمل.

يعرض و يتناول البحث مقترح مبدئي لنظام إدارة أداء مبني علي ذكاء الأعمال للمؤسسات الأكاديمية في التعليم العالي في مصر و الذي يُمكن ان يكون نواة للدراسة و التحليل المتعمق و التطبيق في دراسات مستقبلية. الهدف الرئيسي من النظام المقترح هو مراقبة مؤشرات الأداء بشكل أني و القيام بتحليلات و تنبؤات تساهم في إتخاذ القرارات الصائبة في الوقت المناسب من الجهات المناسبة. وذلك لتأكيد و رفع كفاءة أداء المؤسسات الأكاديمية في مصر و تحسين وضعها التنافسي.

الكلمات الدالة:

ذكاء الأعمال ، الادارة الاستراتيجية، الذكاء التنافسي، إدارة الأداء، التحليلات التنبؤية

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Chapter1: Introduction

We are living in a dynamic world, witnessing rapid global economic, technological, political and social transformation. That raised the need for highly efficient and effective strategic management at the international, national and micro level, such as institutions, organizations and businesses. Strategic management is a guaranteed way for growth and prosperity. It enhances the organization and business competitive advantages, improves its competitive performance, maximizes the benefits and fulfills the organizations strategic goals and objectives.

While the whole world is moving towards the Fourth Industrial Revolution (4IR), driven by the power of the new emerged technology breakthrough in many fields like "Artificial Intelligence", "Robotics", "Nanotechnology", "Biotechnology", "Internet of things" , "3d-printing", "Autonomous agents" …etc., the world of business management experience the same hype. Companies, organizations, enterprises started to recognize the importance of intelligent strategic management and to consider it as the ultimate goal to gain profitability, increase competitiveness and achieve better performance. Intelligent strategic management is all about how to strategic manage a company, organization, enterprise…etc. in a modern way based on **modern insights of prediction**, **on-time data processing**, **predictive analytics** and **intelligent business tools**. "Business Intelligence" based "Strategic Management" depends on strategic information, plans, strategies that managers can carry to achieve better performance and competitive advantage of the organization, supported by business intelligence concepts of making well informed decisions and taking proper actions at the right time with available, reliable data in a fully dynamic environment to fulfill the organizational goals and ensure its success.

The main goals of any company, organization or enterprise is to compete in its field of specialization and raise its competitive capabilities and advantages to be able to make well-informed decisions and take proper actions. Of course they aim to increase their profits, reduce their losses, reduce costs, maximize the use of resource and working conditions, increase their loyal customers, improve their production lines, deliver valuable services…etc. All this is surrounded with a general dynamic competitive organizational environment that emphasizes the need for more advanced strategic management processes based on Business Intelligence "BI", that goes beyond the four main managing functions of "Planning", "Organizing", "Leading" and "Controlling" to deal with

"Collecting data", "Monitoring", "Analyzing" and "Predicting" to be able to draw a clear strategic plan with well-defined vision, mission, certain goals and objectives. Organizations should also be committed to performance management, which links its goals to its processes and develop Key Performance Indicators "KPI"s that objectively measure performance and keep the organization on track.

1.1 Research Problem

The usual problem many organizations and enterprises face is the lack of right, trustworthy, valuable, on-time and accurate information and analysis to make proper decision. Many organizations fail to evaluate and control the business and the industry in which they are involved. They can't monitor or evaluate their competitors and their directions nor re-evaluate their strategies and objectives regularly to determine how successful they were and how to develop it.

Traditional and modern Business intelligence concept, techniques, tools and analytics represent the effective way to overcome these problems and gain more insight by facilitating strategic managers to **plan** for the **predictable** as well as the **unfeasible contingencies** to attain **sustainable competitive advantages** in a **daily changing environment** through collecting, monitoring and analyzing of related data and information intelligently **on-line** in **real-time**. These tools allow strategist and experts to observe the fast-changing surrounding environment through continuous monitoring of the work environment and predicting the industry direction to identify opportunities and overcome weakness.

Egyptian institutions, organizations and enterprises as well as international face many specific problems and challenges in the business environment as follows;

- **Exploding Data Volumes**; modern organizations in the era of "Big Data" suffer from the overflow of data. The cheaper data storage, the growing electronic connections and high connectivity (Internet, intranet, social networks, internet of things…) , and the regulatory changes(senior executives are actively involved in their firm's information assets) led to the dramatic increase in the data collected and stored by the organizations. Organizations have been storing electronic data in operational systems for years and have accumulated large data volumes (sales, customers, product defects…etc.). The large data volumes could make decision making more difficult, while the average manager used to spend two hours a day looking for data, half the information found is later useless.

- **Increasingly Complicated Decisions**; the Increasing global competition from across Multi-industry worldwide and the decisions that are based not only on structured transactional data , but also unstructured information available from Web-sites, e-mail messages, blogs, new media types, social media , internal documents, led to the complexity of the decision making process in terms of the variety of factors that need to be considered as well as the diversity of tremendously increased information
- **Need for quick real-time reflexes**; dynamic business environment, faster pace of change (volatility) within market domains (eg. market &environmental influences can result in overnight changes in an organization), quick vanishing of business opportunities, overcoming processing delays due to converting data from variety of sources into information, integrating information across the various sources and making the results (information & Knowledge) available to the decision maker, all this made it critical for mangers to quickly access actionable information as the responding time to change decreases as to be able to analyze, predict and take action in real time manner.
- **Technological Progress;** increasing and growing technologies and systems like, Decision Support Systems (DSS), Enterprise Resource Planning Systems (ERPS), Customer relationship management (CRM) , Scorecards, Dashboards, data warehousing, data mining, text mining, web mining, online data discovery, predictive online analytics made it easier to develop various supporting BI applications in the organizations.

1.2 Research Importance and Questions

The research argues that one has to adopt modern strategic management methods based on traditional as well as modern business intelligence concepts, tools and facilities in order to overcome such challenges and problems to achieve effective and efficient organizational strategic management.

This emphasizes the huge importance of accessing and introducing the right strategic information at the right time to the right person/decision maker to get thorough knowledge and analysis of the general and competitive organizational environment and to perform right and better decisions to attain the organizational strategic objectives. And to make best possible utilization of strengths, minimize organizational weaknesses, benefit from arising opportunities of the business environment and face any upcoming threats.

The research claims that using such concepts and tools and establishing "Business Intelligence" based "Strategic Management" systems will solve the organizational usual problems and enhance their performance and improve their

KPIs. The research will introduce the contribution of BI's different tools, technologies, architectures, functions and applications that can be integrated to fulfill the organizational objectives.

In this context some Research Questions and issues have been raised in an attempt to solve them during the following research:-

1- How can Business Intelligence affect strategic management and contribute to it?

2- What are the main benefits of integrating business intelligence tools and techniques in the organizations, institutions and business?

3- Which tools and approaches can be used and under which circumstances?

4- What is the business intelligence role during the strategic management processes?

5- What is the Business Intelligence Contribution to the strategic management model?

6- What is the Business Intelligence Contribution to the organizational Key Intelligence Topic, KIT

7- What is the Business Intelligence Contribution to the strategic analysis management tools

8- What is the role of business intelligence in the business performance management?

1.3 Research Objectives

The research main objective generally is to answer and tackle the research questions and try to overcome the institutions problems and challenges through providing what follows:

- Investigate the nature of traditional and modern business intelligence to link and align it to the strategic management processes and to business models of the Institutions and Organization.
- Emphasize the importance and necessity of adopting and using business intelligence, tools, techniques and applications in the institutions and business organizations on the national as well as the international level.
- The research should introduce and present the role of business intelligence in raising the competitiveness of business organizations in light of the dynamics of internal and external business environment factors and variables.

The research detailed objectives are as follows:

- Presenting and introducing the literature review and definition of "Strategy", "Strategic Management", "Strategic Management Model" "Strategic Mission, Vison, Goals, Objectives", "Organizational Techniques" and " Strategic Analysis Techniques"

- Presenting and introducing the literature review and definitions of "Business Intelligence" concept, method, tools, architecture and technologies

- Presenting the transformation of "Business Intelligence "and introducing it as a modern perspective and framework for organizations and enterprise rather than to define it as a pure information system

- Introducing business intelligence solution as
  - provide managers the ability to utilize large data volumes and predicting the future
  - provide managers to make well informed decisions incorporating all important factors using structured / unstructured information

- Presenting and introducing "Business Intelligence" capabilities and functionalities

- Presenting successful examples of "Business Intelligence" based "Organizational Strategic Management" systems

- Encouraging the Egyptian Institutions to integrate modern business intelligence tools and technologies in their business models and draw the decision-makers attention to the importance and benefits of deploying "Business Intelligence" based Management systems.

- As **a proof of concept**, proposing a very preliminary proposal of a "Business Intelligence" based "Performance Management" System for the Egyptian Academic Institution in High Education Sector that can be studied, analyzed in depth in future work to be implemented. It aims to monitor the Key Performance Indicators in real time, perform analysis and predictions to make proper decisions and take correct action in the academic institution to ensure the institutions high performance and improved competitive position.

- Introducing the proposed systems generic model and its components.

1.4 Research Approach

The research follows the analytical descriptive approach in presenting the intellectual and theoretical framework of the integration and development of business intelligence in the institutions based on previous studies and actual

cases. The research will also provide a preliminary proposal for a "Business Intelligence" based "Performance Management" System for Egyptian academic institutions in the Higher Education Sector

1.5 Research Outline

The research consists of five chapters like follows;

Chapter one; consists of the introduction, research problem, research importance, research questions, research objectives and approach.

Chapter two; titled "Strategic Management" consist of the definitions and theoretical background related to the strategic management, strategy, strategic management model, components. It also introduces the concept of competitiveness through intelligence, advantages and analysis. Then it introduces the key performance indicators, the strategic analysis techniques and ends up with the strategic management benefits.

Chapter Three; presents the "Business Intelligence" definition, and discusses the journey of BI capabilities from traditional to modern BI. And present the BI functions and activity. Products, Processes and Solution as well as generic and detailed framework of the BI architecture. In two detailed sections, the BI solution capabilities and the various technologies will be thoroughly introduced. Business competitiveness and business analytics will be presented at this chapter from a technical point of view. The chapter ends up by introducing the main factors shifting the enterprise and business to the modern BI.

Chapter Four; discusses and verifies the importance of using business intelligence in the management of institutions and organizations during the different managerial levels (strategic, tactical, operational) through examining its contribution to the strategic management model, key intelligence topics needs, strategic management analysis tools and its role in the business performance management processes. The chapter ends up with the benefits of business intelligence to organizational success.

Chapter Five, the last chapter presents the different application areas for business intelligence and present briefly some successful examples in the field of business intelligence and analytics. Finally it suggests an initial proposal of a Business Intelligence based Performance Management System for an Egyptian Academic Institution in higher Education that can make use of the business intelligence methods and technologies within its strategic management phases to improve its performance. The chapter end up with the conclusions and recommendations.

Chapter 2 : Strategic Management

Strategy, strategic management, strategic planning process, vision, mission, goals, objectives and strategic decisions, all these concepts, components and elements are essential for the business enterprise. It answers the main concerns of; where we are? Where we want to be? How to achieve there? How to acquire competitive intelligence? How to enhance our competitive position? Aiming to raise the overall performance, increase profitability, decrease costs, save time, develop competitive capabilities and enhance the competitive position, efficiency and effectiveness. Success of modern enterprises is subject to external and internal forces that should be dealt with and prepared for. They are prone to the increasing dynamics of the economic, social, political, technological … environment, as well as the increasing complexity of competitors, customers, suppliers, globalization of business and international competitions. Making well informed and correct strategic decision is based on containing competitive intelligence in the form of business intelligence functionalities and in introducing the right information at the right time to the right person. The chapter introduces the theoretical background of strategic management and many related aspects as follows;

2.1 Strategy

Strategy is considered to be the highest level of manager activities. It is a plan of actions and activities for top managers to ensure the fulfillment of the organizations goals over long-term, through utilizing and allocating the scarce resources within the organizational environment. It is a result of detailed strategic planning process and defined as **"A general direction set for the company and its various components to achieve a desired state in the future. It can also be defined as "knowledge of the goals, the uncertainty of events and the need to take into consideration the likely or actual behavior of others".** [1]

It draws the organizations objectives and goals, reduces the key policies, plans for achieving these goals, and defines the business the company is to carry

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[1] "Strategic Management", http://www.managementstudyguide.com/strategy-definition.htm

on, the type of economic and human organization it wants to be, and the contribution it plans to make to its shareholders, customers and society at large.[1]

Its main interest is the long term development rather than the routine operations, developing new products, new methods, new markets… taking in account the uncertainty of the surrounding changing environment and the different players and their reactions. It sets the organizations foresight for the future.

Henry Mintzberg, in 1992 provided 5 definition of strategy the "5 P's; Plan, Ploy, Pattern, Position and Perspective. A strategy as a plan includes guidelines to deal with future situations, a strategy as a ploy is a trick or maneuver action towards a competitor, it could be a certain pattern through some of the organizations action, or it can be defined as a certain position in regard to its surrounding environment. Finally a Strategy can be viewed as a perspective shared by the organizations members.[2]

The strategy is considered a well-defined roadmap of an organization, expressing its mission, vision, and organization direction and scope aiming to strengthen it over its competitors. When planning for it in the business enterprise, one has to consider the reaction and behaviors of the others, competitors, customers, suppliers and employees.

2.2   Strategic Management defined

There is no unique and only definition for Strategic Management! In fact it is an umbrella term describing how an organization gain its competitive position and enhance its performance on the long run.

Strategic Management has been practiced since the middle of the 20th century, after a seminal contribution by Alfred Chandler and Peter Drucker who emphasized the importance of well-defined objectives and strategies that determine and guide organizational activities. The Strategic management **"SM" is concerned with the ongoing evaluation and control of a business and the environment within which it operates; it assess internal and external factors that can influence organizational goals and strategies to ensure the organizations success**.[3]

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[1] "Strategic Management", ibid

[2] Jochen Fries, "The Contribution of Business Intelligence to Strategic Management", Dissertation of the Master Degree in Business Information Management, Vrije University, 2006

[3] Konstantinos Zoumpatianos et al."Strategic Management for Real-Time Business Intelligence", research funded by the FP7 EU ERC(grant agreement no. 267856)

Strategic management can also be defined **"as the art and science of formulating, implementing and evaluating cross-functional strategic decisions that enable an organization to achieve its objectives"**.[1]

Another definition, **"Strategic management is a bundle of decisions and acts which a manager undertakes and which decides the result of the firm's performance. The manager must have a thorough knowledge and analysis of the general and competitive organizational environment so as to take right decisions"**.[2]

Concluding, strategic management can be defined as a bundle of managerial decisions and actions that decide the business or organizations performance and position. Its basic main functions is to set and develop the following throughout the various processes:

1. Clarifying a feasible, clear, inspiring, precise, unique, analytical and credible organizations **Mission**. The mission describes why an organization is operating, what it does, who it will benefit, why it's unique. It's directed to customers and clients and sets a framework to formulate its strategies and is on the top level of management for the whole organization on the long run. It also can be set on other organizational levels. According to dynamic and competitive environment, mission can be redefined while keeping its main fundamentals and components.

2. Clarifying an unambiguous, clear, rationale and realistic organizations **Vision** that harmonize with the organizations culture and values. It states how the organization should look like in the future, what the organization wants to develop, contributes in the organizations business plan and guides decision makers through their decision making process. It's mainly directed to the organization and its members.

3. Specifying the organizational **Goals** to be precise, measurable, realistic examining critical and specific issues. They should have a certain specified time-frame. They explain particularly what should be done to achieve the desired mission and vision through coordinating and integrating functional and departmental areas in the organization. And are dealing with financial and non-financial components of the organization.

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[1] Ovidijus Jurevicius,Strategic Management and strategic planning , https://www.strategicmanagementinsight.com/topics/strategic-management-planning.html, 2013

[2] Ovidijus Jurevicius, ibid

4. Specifying the organizational multiple **Objectives**, they can be short or long-term objectives, flexible to respond to environmental changes, feasible, realistic and operational. They are the core of planning in the organization in which policies are drawn to fulfill the objectives.

5. Analyzing alternatives and choosing **the best Strategy** that fit between the resources available to meet stakeholder needs and expectations and the environmental conditions. Managers make a choice of a set of strategies for the organization that will enable it to achieve better performance.

6. Identifying **internal and external forces** affecting the organization to deal with properly.[1]

Thus Strategic Management is an all about identification of goals and objectives, organizational activities and making strategic decisions that leads an organization to achieve its goals and objectives through a well-defined strategic plan.

It's also defined as "**Strategic Management is conducting an organization that has its ultimate objective the development of values, managerial capabilities, organizational responsibilities and administrative systems that link strategic and operational decision making, at all hierarchical levels and across all lines of authority.**" Next figure shows a "Bensoussan & Fleisher" general strategic management framework. It shows the organization and the external environment elements to be aligned over time. A leader should know which element affects which decision

Figure 2-1 Bensoussan & Fleisher Strategic Management Framework
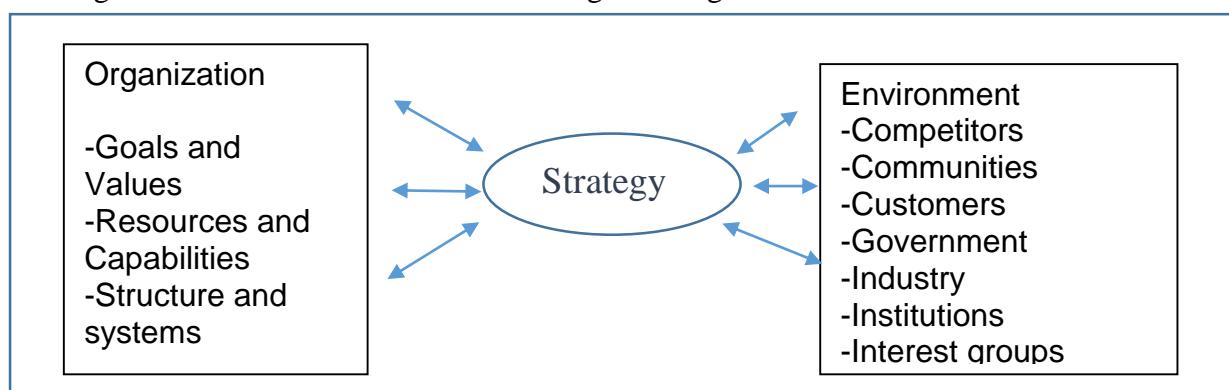
Jochen Fries, "the Contribution of Business Intelligence to Strategic Management", Dissertation of the Master Degree in Business Information Management, Vrije University, 2006

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[1] For more see:
- Moharram El Haddad, Strategic Management and Strategic Planning, Institute of National Planning, Lecture Notes 2016
- http://www.managementstudyguide.com/importance-of-vision-and-mission-statements.htm

Some business specialists assume, that the terms Strategic Management and Strategic Planning means almost the same, the difference is that the later one is used usually in business while the former is used in the academic environment.[1] By others strategic planning is confused with strategy formulation, because strategic plan is constructed in this stage. Whatever definition, all agree that strategic planning, analysis, management, creating decisions and executing certain actions is to achieve and attain sustainable competitive advantage in order to outperform competition.

2.3 Strategic Management Basic Model

Strategic Management practically is a continuous process that contains four main elements/components according to Thomas L. Wheelen and J. David Hunger [2] like follows:

2.3.1 Environmental Scanning

Collecting, monitoring, scrutinizing, evaluating disseminating and providing of information from the external and internal environments to key managers within the organization to analyze the effect of external and internal factors on the organization.

2.3.2 Strategy Formulation

Development of long-range plans for the effective management of environmental opportunities and threats according to organizational strengths and weaknesses (SWOT)" to fulfill the organizations objectives and achieve its main purpose

2.3.3 Strategy Implementation

The process of making the strategy work as planned and by which the chosen strategies and policies are put into action through the development of: Programs, Budgets, and Procedures. It includes designing the organization's, managing and allocating resources and developing decision making processes.

2.3.4 Evaluation and Control

Evaluating and monitoring external and internal factors, measuring performance, appraising activities in order to compare actual performance to the desired performance to meet the organizational objectives.

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[1] Ovidijus Jurevicius,ibid

2Thomas L. Wheelen & J. David Hunger "Strategic management and business policy: achieving sustainability",© Prentice Hall , 2009

Figure 2-2 *Components of Strategic Management Process*
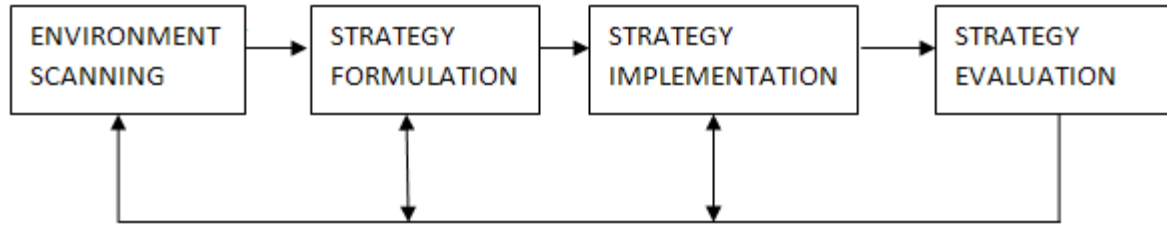
Ovidijus Jurevicius,Strategic Management and strategic planning ,
*https://www.strategicmanagementinsight.com/topics/strategic-management-planning.html, 2013*

The following figure shows the components of the basic model of strategic management, in which one can see how the components are reacting together.

All of these components contain various activities and have different function that are presented in the next figure, showing the basic model of strategic management by Hunger and Wheelen.

Figure 2-3 *Basic Model of Strategic Management*
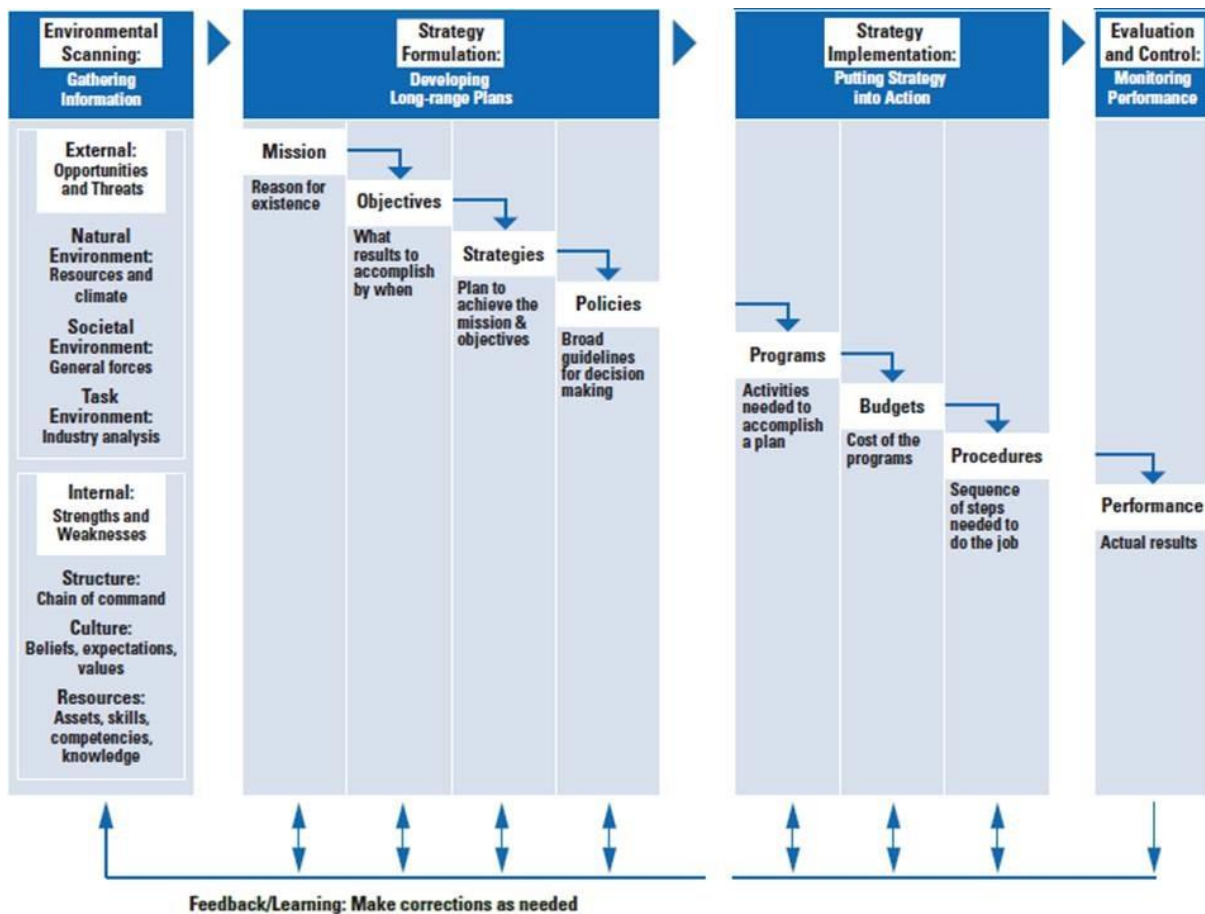
Thomas L. Wheelen & J. David Hunger "Strategic management and business policy: achieving sustainability",©
Prentice Hall , 2009

In the basic model of Hunger and Wheelen, the main elements have been defined as follows;

- "Mission, the purpose or reason for the organization's existence
- Vision, describes what the organization would like to become
- Objectives, the end results of planned activity
- Strategies form a comprehensive master plan that states how the corporation will achieve its mission and objectives

    - Corporate

    - Business

    - Functional

- Policies, the broad guidelines for decision making that links the formulation of a strategy with its implementation
- Performance, the end result of organizational activities
- Feedback/Learning Process, revise or correct decisions based on performance"[1]

2.4 Competitiveness through Intelligence, Advantages and Analysis

Modern organizations operate within a competitive environment. Following, the topics "Competitive Intelligence", "Competitive Advantages", "Competitive Analysis" will be introduce.

2.4.1 Competitive Intelligence

For an organization to succeed, it should analyze the competitor organizations as well as their own. They have to discover its weakness, forecast the threats, identify opportunities and gain from their strength. Managers should consider competitor strategies while formulating theirs to assess their competitive position against their competitors to act or react correspondingly which is one of the highest challenges, due to the huge amount of information it's facing every day. For modern organizations to do this, they have to take advantage of all real- time available information either internal or external. They should make sense of collected information, translate it, store it, communicate it, realize it, present and interpret it to the decision makers to gain value and develop its competitive advantages accordingly. Doing this in

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[1] Thomas L. Wheelen & J. David Hunger, ibid

regrades of the changing nature of information in terms of volume, availability, importance and complexity in structure and semantics importance is difficult and challenging to any organization. And in order to overcome these challenges and deal with the flood of structured as well as unstructured data and information, organizations should reconsider their plans and strategies and make use of new intelligent technological support based on classical as well as modern Business Intelligence, which in the world of business and enterprise is called **"Competitive Intelligence"** or **"Business Competitive Intelligence"** which will be precisely defined in chapter three but from a technical point of view.[1]

2.4.2 Competitive Advantage

Competitive advantage is what keeps great organizations ahead of their competitors. The company, which has a competitive advantage, performs financially much better than other companies in the industry or better than the industry average[2]. **Competitive Advantage** is defined as **"anything that a firm does especially well when compared with competing firms".** Competitive advantage increases when a firm or organization does something that the competitors cannot do or owns something that they desire. Competitive advantage strongly relates to strategic management and differs according to the various organizations and circumstances. On one hand and in recessionary times , a bundle of cash that can buy struggling firms can be considered a competitive advantage while on the other hand a firm that has lesser-fixed assets in comparison with competitor firms has more advantage and gains a plus in an economic downturn.

"Sustained competitive advantage" should be developed as an organization can lose the source of competitive advantage after a period of time as other organizations monitor and copy its strategy and imitate it to gain the same sort of advantages resulting in the original organization losing its competitive advantage and position. Therefore organizations should continually formulate, implement and evaluate strategies to adapt responsively to the changing external business environment and market keeping an eye on the competitors. [3] An organization that is capable of outperforming its competitors over a long period of time has **Sustainable Competitive Advantage.**

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[1] Felicia Albescu et.al , "Business Intelligence & Knowledge Management – Technological Support for Strategic Managemnt in the Knowledge Based Economy,© Revista Informatica Economica ,nr.4(48)/2008, Romania

[2] Strategic Management and strategic planning, ibid

[3] http://www.managementstudyguide.com/competitive-advantage.htm

With the upraise of Internet, Intranet, electronic customer communication, competitor websites, boom of social media and easy communications, a huge amount of electronic data, tremendous volumes of information and knowledge full of intellectual property and assets resulted in a highly competitive market, that changed the enterprise rules. Therefore competitive advantage sources became easier to reach, organization directly sell to the consumers and interlink the suppliers, customers, creditors, and other stakeholders into its value chain. By removal and absence of intermediaries, organizations can reduce costs and improve profitability in this highly digital environment depending on how it will draw and apply its competitive analysis, utilize its digital platform, and social media to gain its sustained competitive advantages.

Finally, one can state that proper strategic planning; i.e. analyzing, creating, implementing, and monitoring data and information continuously most probably lead to achieving competitive advantage. But competitive advantage can't be achieved without strategic planning and **Competitive Analysis**.

2.4.3 Competitive Analysis

Business environment nowadays is driven by business competition, "survival of the fittest", which from the positive side is a powerful driver for creativity and innovation. But from the other side, it means to be the best but to keep an eye on other players. This helps the organization to anticipate their next move, try hard to exceed their strengths and try to overcome their shortfalls.

Valuable **"Competitive Analysis"** is essential for effective strategy formulation and execution. It starts with and begins with identifying present as well as potential competitors and supports decision-maker during the decision making processes. It provides them with right information at the right time concerning probable sources of competition. Thus, one has to analyze all possible strategic actions and reactions affecting profitability for all the organizations competing in this industry, to be able to understand and predict critical market-changing actions that may be taken by competitors and other competition-impacting stakeholders. Good designed competitive analysis allow the organization to concentrate basically on organizations with which it will be in direct competition, which is important when an organization faces a few potential competitors.

Competitive analysis main objectives are like follows:

- Studying the market
- Predicting & forecasting demands and supply
- Formulating the company's strategy

- Studying the market trend and pattern
- Planning for organizational growth, diversification or expansion
- Predicting new trends in the industry or sector
- Analyzing competitors strength and weakness presents opportunities and threats for one's organization
- …etc.[1]

But before going through various phase to fulfill the main objectives, an organization should identify the competitor's type to be one of the following,

- currently offering the exact products and/or service as your organization
- offering similar products and/or services to the ones you currently offer
- might potentially offer the same or similar products and/or services as your organization in the future
- Could offer products that would remove the need for your product and/or service.

And accordingly re-evaluate, plan, react and make decisions.

Decision maker should answer many various question about the organization, the industry, and the competitors including the following:

- How do our competitors think, what are their strengths, what are their weakness, what are their new projects, their current clients or the new potential ones?[2]
- "What is our current status or situation? What are our options? In which direction(s) do we want to go? Which direction can and should we go?
- How can we effectively get to where we have decided we are going?
- How will we know that we have reached our desired goal(s)?
- …etc."[3]

Where from to get these information and how to analyze it using business intelligence will be explained in more details during the next Chapter, it also introduces many other questions under the title "Herrings KIT" [3].

While "Michael Porter in Porter's Five Forces Model has assumed that the competitive environment within an industry depends on five forces- Threat of new potential entrants, Threat of substitute product/services, bargaining power

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[1] http://www.managementstudyguide.com/competitor-analysis.htm

2Jeff Shjarback, "Benefits of Competitive Intelligence Analysis © Todd West Media – Professional Website Design Services Made Affordable – Portland, Maine

[3] Craig S. Fleischer, Babette E. Bensoussan, "business and competitive analysis, effective application of new and classical message, © Pearson Education ,2015

of suppliers, bargaining power of buyers, Rivalry among current competitors", [1] He also presented the competitive strategies through the following two concepts:

"Lower cost strategy- the ability of a company or a business unit to design, produce and market a comparable product more efficiently than its competitors

Differentiation strategy- the ability of a company or a business unit to provide a unique or superior value to the buyer in terms of product quality, special features, or after sale service"[2]

2.5 Key Performance Indicators

The concept of metrics and measurement has showed up in organizations and in the enterprise since some decades, no matter how large or small an organization is. If an organization wants to progress in the business market, managers should take the right action at the right time. Key Performance Indicators (KPIs) support managers and decision makers to objectively manage results and determine what strategies, processes and tasks are helping to achieve goals and which activities must be adjusted to correct declining results.

According to Peter Drucker ; KPIs are assumed to be the critical (key) indicators of progress toward an intended result. KPIs provides a focus for strategic and operational improvement, create an analytical basis for decision making and help focus attention on what matters most. He made his famous statement: "What gets measured gets done."

Using KPIs often means working to improve **leading indicators** that will later drive lagging benefits. Leading indicators are precursors of future success; **lagging indicators** show how successful the organization was at achieving results in the past.[3]

A Key Performance Indicator is defined **as "a measurable value that demonstrates how effectively a company is achieving key business objectives. Organizations use KPIs at multiple levels to evaluate their success at reaching targets. High-level KPIs may focus on the overall performance of the enterprise, while low-level KPIs may focus on processes**

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[1] http://www.managementstudyguide.com/competitor-analysis.htm
[2] Thomas L. Wheelen & J. David Hunger, ibid

[3] KPI Basics, http://kpi.org/KPI-Basics

in departments such as sales, marketing or a call center". KPIs could be intuitive simple affordable KPI-dashboards to establish and monitor and make confident business decisions and accordingly adjust tactical, strategic and operation goals, or they can be more sophisticated to compare current performance of the organization to previous periods and make proper decision.

For a KPI to be valuable, result in effective actions and raises the positive value of an organization, the developing team should first start with understanding what the organizational objectives are, how to achieve them, and who can act on this information. They should measure the right thing to get a correct view. This process is iterative and should involve feedback from analysts, department heads and managers. After this phase, a better understanding of which business processes need to be measured with KPIs and with whom that information should be shared exists.

Good KPIs should provide objective evidence of progress towards achieving a desired result, measure what is intended to be measured to help inform better decision making, offer a comparison that gauges the degree of performance change regarding time, can track efficiency, effectiveness, quality, timeliness, governance, compliance, behaviors, economics, project performance, personnel performance or resource utilization, and are balanced between leading and lagging indicators.[1]

One has to measure the right things that really affect. For example if the objective is to increase the sales of a certain brand by 7% in year 2017 for example, how should the KPIs look like? Is it the no. of shopping bags, or the no. of sales at a certain hour per day, or a particular day in a week or a certain season…etc. It's not so easy to define the right KPI and establish the metrics, usually the business is more complex than that and the goals have more than one factor or aspect that will determine their success. It's not just about to increase the sales but to decide how the success will be determined.

Thus the most important thing when establishing KPIs, is to decide how this measurement correlate to the business success. A relevant KPI should follow the SMART criteria to achieve the objectives. SMART stands for; Specific, Measurable, Attainable, Relevant within a time-frame.

KPIs are often confused with business metrics although they should be defined according to the following rules and each business outcome should get its certain KPI :

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[1] KPI Basics, http://kpi.org/KPI-Basics

- "What is the desired outcome?

- Why does this outcome matter?

- How are you going to measure progress?

- How can you influence the outcome?

- Who is responsible for the business outcome?

- How will you know you've achieved your outcome?

- How often will you review progress towards the outcome?"[1]

As an Example*: "for the objective "increasing sales revenue for a certain year", the KPI will be called Sales Growth KPI. And it could be defined as follows: increase sales revenue by 20% this year, achieving this target will allow the business to become profitable, progress will be measured as an increase in revenue measured in dollars spent, by hiring additional sales staff, by promoting existing customers to buy more product, The Chief Sales Officer is responsible for this metric, Revenue will have increased by 20% this year, the KPI will be reviewed on a monthly basis".*[2] Other common examples, is the sales growth, incremental sales and working Capital.

Another example for establishing KPIs for an internet marketing program. It's not just about increasing sales but first decide how to determine success. Many factors should be included like, site visits, visits per page, the click to conversion ratio, the number of email and newsletter, 'unsubscribe' requests, the click through rates for visitors coming to the website from a social media site, etc. these factors can inform about internet marketing techniques driving traffic to the website but it never tells if this traffic comes from target groups, or what percentage of the traffic from each source is actually resulting in a purchase, or if these conversation are related to a certain time during the day, or week or even the year! Integrated Business intelligence introduced in the

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[1] What is a KPI , " Measure your performance against key business objectves,https://www.klipfolio.com/resources/articles/what-is-a-key-performance-indicator
[2] What is a KPI , " Measure your performance against key business objectves,https://www.klipfolio.com/resources/articles/what-is-a-key-performance-indicator

following chapter is one of the best approaches when establishing and monitoring business KPIs.[1] Thus, in this section we learned what competitive advantages, competitive analysis and KPIs are and how they are related to strategic manager as they support making right decisions and action.

2.6 Strategic Analysis Techniques

Modern organizations and firms that apply strategic management, strategic planning and use strategic analysis tools and techniques, gain benefits, compete well, enhance their competitive position, sustain and increase their competitive advantage much more than other ones that don't use any. There are many and various tools and techniques that can be applied for strategic analysis. The main challenge is to select the best for a certain problem or opportunity to achieve maximum profit and success by supporting organizations during their strategic decision making process. Strategic analysis can be defined simply as **"an approach to facilitating, researching, analyzing, and mapping an organization's abilities to achieve a future envisioned state based on present reality and often with consideration of the organization's processes, technologies, and business development and people capabilities"**.[2] One of the main concerns is to link and connect strategic, tactical, and operational aspects of an organization by analyzing present state, future state, risks, financial and non-financial aspects to achieve the desired state. This can be done by many various tools and techniques that can be highly based on classical as well as modern business intelligence. Next and in brief some of the strategic analysis techniques will be presented.

2.6.1 SWOT Analysis

SWOT, stands for (Strengths, Weakness, Opportunities and Threats)and is one of the most famous strategic analysis tools that analyzes the overall strategic position of the business and its environment by focusing on internal strength and weakness as well as external opportunities and threats, which enables or hinders achieving the organizations goals and objectives. Its main goal is to identify the strategies that will create a firm specific business model that will best align an organization's resources and capabilities to the requirements of the environment in which the firm operates. It monitors all positive and negative factors inside and outside the organization analyzing its

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[1] Arbuda Dave, KPIs and Business Intelligence: What and Why to Measure, © Elegant MicroWeb, Ahmedabad, Gujarat, India 380051, Nov 23, 2015

[2] Ritchard Lannon, stategy Spotlight: 8 Tools & Techniques To Apply To Strategic Analysis & Planning, BAtimes for Business Analytics, © BA Times.com 2017, https://www.batimes.com/articles/8-tools-and-techniques-to-apply-to-strategic-analysis-and-planning.html

environment and affecting its success that supports forecasting and predicting changing trends and helps decision makers. During SWOT analysis, there is a continuous need for real-time monitoring to keep track of the internal or external factors and react accordingly. Operational data should also be continuously scanned to avoid unexpected unwanted situations. This analysis could be applied for the organization as well as its competitors, which will improve the competitive position. The SWOTs analysis four main factors are as follows:

- Strengths: capabilities provided to accomplish the organizations mission including human competencies, process capabilities, financial resources, products and services, customer goodwill and brand loyalty. Broad product line, committed employees, huge financial resource …etc are assumed an organizations strength.
- Weakness: are factors that deteriorate the organizations success and prevent achieving its goals and objectives. Examples are depreciating machinery, narrow product range, , insufficient research and development facilities, poor decision-making, etc. Weaknesses should be eliminated or minimized
- Opportunities: appear when an organization can take benefit of conditions in its environment to plan and execute strategies that enable it to become more profitable
- Threats: appears when conditions in external environment threaten the reliability and profitability of the organization's business. Examples of threats are - unrest among employees; continuously changing technology; price wars and reducing industry profits; etc.

Successful organizations should build on their strengths, correct their weakness and protect themselves against internal weaknesses and external threats. They have to monitor the overall business environment and recognize and exploit new opportunities faster than its competitors. SWOT Analysis provide information that helps in synchronizing the firm's resources and capabilities with the competitive environment in which the firm operates.[1]

The following table presents a simple SWOT Diagram, showing the internal and external factors of an organization.

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[1] For more please see:
-http://www.managementstudyguide.com/swot-analysis.htm
- Jochen Fries, ibid
-Konstantinos Zoumpatianos et al, ibid

Table 2-1 SWOT Diagram of the Organizational Internal and External Factors

	Opportunities (external, positive)	Threats (external, negative)
Strengths (internal, positive)	**Strength-Opportunity strategies** Which of the company's strengths can be used to maximize the opportunities you identified?	**Strength-Threats strategies** How can you use the company's strengths to minimize the threats you identified?
Weaknesses (internal, negative)	**Weakness-Opportunity strategies** What action(s) can you take to minimize the company's weaknesses using the opportunities you identified?	**Weakness-Threats strategies** How can you minimize the company's weaknesses to avoid the threats you identified?

http://www.bplans.com/downloads/swot-analysis-template/

2.6.2 PESTEL

PESTEL or PESTLE is an ideal tool to strategically analyze what influence different outside factors – **political, economic, sociocultural, technological, environmental and legal** – exert on a business to later chart its long term targets. PESTEL gives an overview of diverse macro-environmental factors that any company should consider and perceive outside environments for the business to benefit from opportunities to the max while to minimize threats as much as possible. PESTEL Analysis key factors are:

- "Political – What opportunities and pressures are brought by political bodies and what is the degree of public regulations' impact on the business?
- Economic – What economic policies, trends and structures are expected to affect the organization, what is the influence's degree?
- Sociological – What cultural and societal aspects will work upon the demand for the business's products and operations?
- Technological – What impact do the technological aspects, innovations, incentives and barriers have on the organization?
- Environmental – What environmental and ecological facets, are likely to predetermine the business?"[1]

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[1] Market Publisher Report Databases, https://marketpublishers.com/companies/?gclid=CKHp3-ThsNQCFcRuGwodXh0FKg

Figure 2-4 PESTL Analysis Diagram

Market Publisher Report Databases1, https://marketpublishers.com/companies/?gclid=CKHp3-ThsNQCFcRuGwodXh0FKg
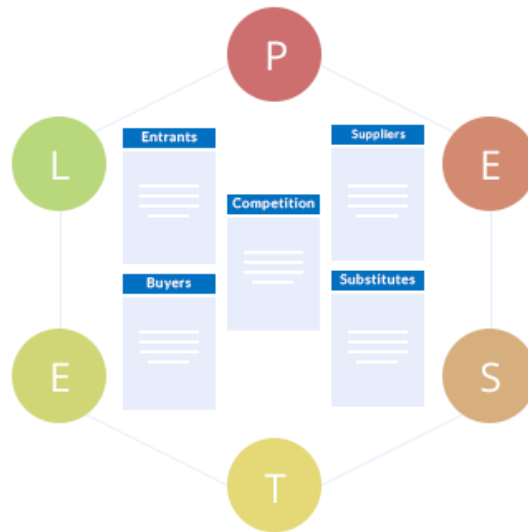
2.6.3 BCG Analysis

BCG matrix is the most renowned corporate portfolio analysis tool. It provides a graphic representation for an organization to examine different businesses in it's portfolio on the basis of their related market share and industry growth rates. . It is a two dimensional analysis on management of SBU's (Strategic Business Units) , these two dimensions reveal likely profitability of the business portfolio in terms of cash needed to support that unit and cash generated by it. BCG classifies business portfolio into four categories based on industry attractiveness (growth rate of that industry) and competitive position (relative market share). The general purpose of the analysis is to help understand, which brands the firm should invest in and which ones should be divested.

"Relative market share is one of the dimensions evaluating a business portfolio. Higher corporate's market share results in higher cash returns. This is because a firm that produces more, benefits from higher economies of scale and experience curve, which results in higher profits.

Market growth rate. High market growth rate means higher earnings and sometimes profits but it also consumes lots of cash, which is used as investment to stimulate further growth. Therefore, business units that operate in rapid

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[1] PESTEL Analysis Diagram , Market Publisher Report Databases,
https://marketpublishers.com/companies/?gclid=CKHp3-ThsNQCFcRuGwodXh0FKg

growth industries are cash users and are worth investing in only when they are expected to grow or maintain market share in the future."

Although BCG analysis is easy to perform, helps understanding strategic positions of business portfolio but has many limitations as the market is not clearly defined, the true nature of business is not totally reflected, doesn't include other external factors that can change the whole picture and many others limitations, which can be overcome by applying modern business intelligence and predictive analytics.[1] There are many other strategic analysis tools and techniques that can be also examined like VIRO, Maturity Model, Root Cause Analysis, Porter's Five Forces…etc.

2.7 Strategic Management Benefits

There are many benefits of strategic management as the identification, prioritization and exploration of opportunities. It's important in the unstable environment as it is essential for strategic thinking in learning organizations. It supports a cost benefit analysis to decide if the organization is profitable. Strategic management directs the organization to orient itself to its market and consumers and ensure that it is actualizing the right strategy. Besides the financial benefits and profits it has also non-financial benefits, like being cautious about external threats, alert to competitor strengths or weaknesses, flexible to changes. It enhances the problem solving facilities and provide capabilities of the organization and helps it to rationalize, actualize change and communicate the need for transformation, in an easy way to its employees. Simply it gives the organization;

- Clearer sense of strategic vision for the firm

- Sharper focus on what is strategically important

- Improved understanding of a rapidly changing environment

- Improved organizational performance

- A match between the organization's environment and its strategy, structure and processes.[2]

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[1] For more see:
- http://www.managementstudyguide.com/bcg-matrix.htm
- Market Publisher Report Databases, https://marketpublishers.com/companies/?gclid=CKHp3-ThsNQCFcRuGwodXh0FKg
[2] 2 Thomas L. Wheelen ,ibid

Chapter3: Business Intelligence

In the extremely changing environment we are living in, organizations, enterprise, opportunities, challenges are growing and the demand for well-informed and rational business decisions highly increases. Leaders and managers need to get the right real-time information in the right format at the right time to deal with complicated business situations and competitions. They should rely on precise and relevant data put in an easy format to sense. Organizations have to fulfill functions and achieve goals, they should be able to define strategies, draw objectives and make right decisions. And to perform different business process like purchasing from suppliers, assembling, packaging, preparing manuals, marketing plans, selling products… managing human resources, hiring new staff, paying salaries, etc.[1] Thus organizational information, management and decision support systems started to emerge and develop; executive information systems "EIS", enterprise resource planning "ERP', customer relationship management "CRM", transactions…and accounting systems etc. In parallel Business Intelligence "BI" showed to solve all these problems and be a great support to the business managers during all the phases and processes of their business on different levels. Managers realized the effective business intelligence capabilities. During this chapter we are going to present business intelligence definition, concepts, components, tools and technologies.

3.1 Business Intelligence Definition

Historically, the concept of business intelligence is not new. Since ancient times, humanity developed ways and tools to collect and analyze intelligence and information to support decision making. However business intelligence, in its scientific context has been mentioned for the first time 1958, by an IBM researcher, Hans Peter Luhn, in an IBM journal article titled, "A Business Intelligence System" , in which he described it as an **"automatic method to provide current awareness services to scientists and engineers".** After that, BI has been widely used in the nineties by Howard Dresner, a Gartner analyst, who popularized BI as an umbrella term to describe a set of concepts and methods to improve business decision-making by using fact (data)-based (driven) decision support systems to support organizational strategies, he presented the idea that the data in IT systems can be exploited by the business

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[1] Gert H.N. Laursen & Jesper Thorlund, "Business Analytics for Managers Taking Business Intelligence Beyond Reporting© 2010 by SAS Institute, John Wily & Sons Inc.

itself.[1] Since that time BI got different definitions, there has been no agreement upon one of them, as it developed continually according to different views, approaches, waves and experiences. Business Intelligence definition emerged from a one dimensional to a multidimensional definition; some defined it as transformation from data to information and then to knowledge, some presented it as a process acquiring and processing information to support organizations strategy while others viewed it as a set of technologies, tools and application supporting, analyzing and reporting corporate data to enhance decision making to improve the organizations position. So BI definition varied from a process, to a product, to a set of technologies, or a combination of all these together. Following different definitions of BI from different point of views are presented;

"Turban et al." 2008, defined "BI" **as an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies**.[2]

Gartner's IT glossary's definition includes traditional BI function as well as the modern concept of Performance Management, it states; "**Business intelligence (BI) is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance**"[3].

The IBM article "A step-by-step approach to successful business intelligence" stated that business intelligence "**is a key factor for organization to achieve their goals to improve performance, grow revenue, develop stronger customer relationship, increase workforce effectiveness, as it supports informed decision making at every level (strategical, tactical, operational) enabling managers, executives and knowledge workers to transfer these decision to the best effective action in a certain situation**".

University of Michigan's definition, "**Business intelligence delivers insight and perspective to an enterprise by enabling data-driven decision-making**"[4].

While the data warehouse institute defined it as processes, tools and technologies to turn information to knowledge, and knowledge to plans that drive profitable business actions. It includes data warehousing, business

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[1] Arisa Shollo, "The Role of Business Intelligence in Organizational Decision-making", © The Author, Ph.D. series 10/2013
ISSN 0906-6934,Print ISBN: 978-87-92977-32-8, 2013

[2] Efraim Turban et al. , "Decision Support and Business Intelligence Systems, © Pearson Education, Inc., 9th edition , 2011, ISBN 10: 0-13-245323-1

[3] Gartner, IT Glossary, http://www.gartner.com/it-glossary/business-intelligence-bi/ © 2017 Gartner, Inc. and/or its Affiliates, 2017

[4] MAIS & AIMS, "A Business Intelligence Strategy Proposal for The University of Michigan", a joint effort between Michigan Administrative Information Services "MAIS" and Advisors on Information Management Strategy AIMS, May 2005

analytics tools, knowledge management. The BI process is supposed to transform data to information, information to decision, and decision to actions.

A more detailed definition, "Business intelligence (BI) is a technology-driven process for analyzing data and presenting actionable information to help corporate executives, business managers and other end users make more informed business decisions. BI encompasses a wide variety of tools, applications and methodologies that enable organizations to collect data from internal systems and external sources, prepare it for analysis, develop and run queries against the data, and create reports, dashboards and data visualizations to make the analytical results available to corporate decision makers as well as operational workers" [1]

Concluding, BI **is the science of accessing, analyzing and manipulating business data (real time/ external/ internal/ strategical/ tactical/ operational/ financial/ sales/ marketing/ HR/…etc.) in different ways according to different behaviors; to understand the past and why things happened then realize the present and what is happening, then to predict the future to know what will happen and make proper decisions.**

Merging all these definitions and views, one can simply agree that**, "Business Intelligence as a concept is neither a new system, nor a software program nor a single project nor even a product. Business Intelligence** also known as **"Academic Analytics"** or **"Analytic Applications" is a "Framework" and "Architecture" collecting integrated operational as well as decision-support applications databases providing the business community with real-time and easy access to business data and supporting their decision making process".** [2]

3.2 A Journey of BI capabilities from traditional to modern BI

As the BI s history early started and transformed through a whole century, the BI Capabilities experienced the same transformation. Since 1970, at the very beginning, BI concept was simply introduced as the Management Information Reporting Systems, "MIS" used as strategic managerial reporting purpose, where reporting was two dimensional, static without any analytical facilities. It then developed through the concept of Decision Support System DSS and Executive Information system EIS in the eighties, which supported top strategic managers and executives whose   highest concern was Knowledge discovery.

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1 All Rights Reserved, Copyright 2005 - 2017, TechTarget
2 Sabherwal &Becerra , "Business Intelligence Practices, Technologies, and Management" , © 2011 John Wiley & Sons, ISBN 978-0-470-46170-9

During the ten following years till the nineties, Business Intelligence rapidly evolved through several stages depending on technology used and new capabilities featured as "Online Analytic Processing OLAP , dynamic multidimensional (on-demand or ad hoc) reporting, forecasting and prediction, trend analysis, drill- down to details, status access, critical success factors which introduced the term BI. Thus the fundamental concept of "EIS" was transformed into the "BI" concept itself. By 2005, BI systems started to include Artificial Intelligence and effective analytical capabilities and became more complex and sophisticated by using neural networks, mining techniques, sophisticated mathematical and static tools. Since 2010 and up till now new terms, tools and techniques appeared like agile business analytics, self-service features, smart data discovery and machine learning in BI. The following figure illustrates the BI evolution through presenting various tools and techniques of BI"[1].

Figure 3-1 Evolution of Business Intelligence (BI)
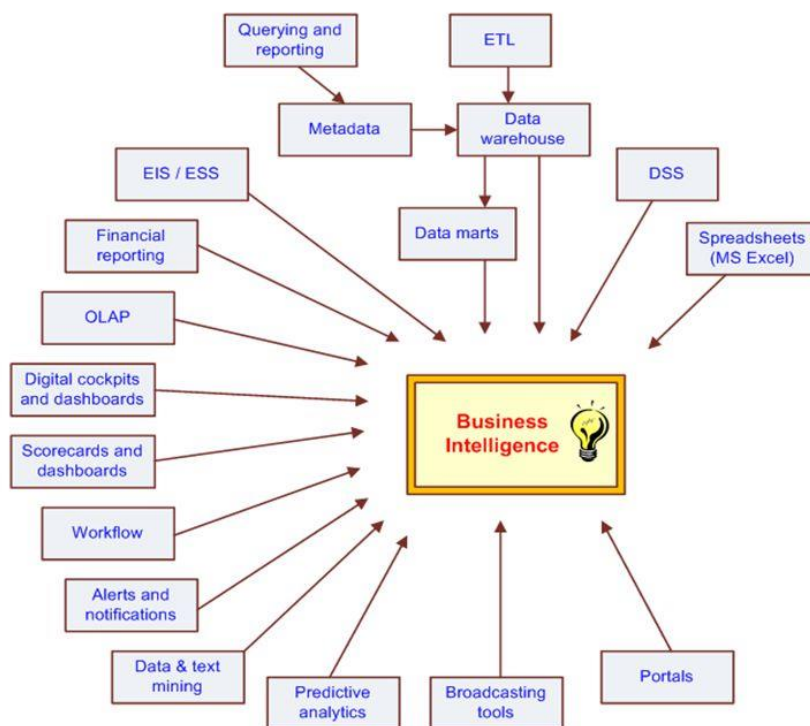
Efraim Turban et al. , "Decision Support and Business Intelligence Systems, © Pearson Education, Inc., 9th edition , 2011, ISBN 10: 0-13-245323-1

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[1] Efraim Turban et al. , "Decision Support and Business Intelligence Systems, © Pearson Education, Inc., 9th edition , 2011, ISBN 10: 0-13-245323-1

Before presenting Business Intelligence architecture, components, tools and technologies one has to mention other very important and related terms and concepts that boomed recently and were founded along the way since the BI has been first introduced, and which sometimes are engaged or embedded in BI itself or confused with it or even used as a synonym of BI; like **"Competitive Intelligence"**, **"Business Performance Management"**, **"Business Analytics"**, **"Predictive Analytics".** In fact all these terms are very much related and engaged strongly in the business environment, there are no obvious clear boarders as they are very much intersecting in their functions, techniques and concepts. Nevertheless we will try to draw the main boarders of the differences between them. Nowadays, BI and business professionals categorize all these terms and functionalities under a larger umbrella called "Modern BI". The following table highlights some differences between traditional and modern BI for enterprise strategic management.

Table 3-1 Differences between Traditional BI and BI for Enterprise Strategic Management

Factor	Traditional BI	Modern BI
Scale	Departmental	Enterprise-Wide
Focus	Historical	Timely, real time data
Decisions	Strategic & Tactical	Strategic & Tactical & Operational
Users	Analysts	Everyone
Orientation	Reactive	Proactive
Process	Open-ended	Closed-loop
Measures	Metrics	Key Performance Indicators
Views	Generic	Personalized
Visuals	Tables / Charts	Dashboards/ Scorecards/…
Collaboration	Informal	Built-in
Interaction	Pull (ad hoc queries)	Push (alerts)
Analysis	Trends	Exceptions
Data	Numeric only	Numeric, Text, …

3.3 Business Intelligence Architecture

According to Turban et al. the BI system has four main component;

- **Data warehousing**; data marts including a wide range of data sources (external/internal), (historical/real- time) to support informed decision making

- **Business analytics**; various tools for manipulating, mining and analyzing collected data through
  - Reports & queries; static/dynamic reports, various query type, multidimensional visualization, information discovery, drill-down…etc.
  - Data/text/web mining; using mathematical/statistical tools to detect unknown relationships and information, and intelligent tools as neural network, predictive analytics techniques…etc.

- **Business performance management/ corporate performance management;** for monitoring and analyzing performance, evolving BI architectures and tools as a sort of modern BI, starting by monitoring, measuring, comparing data and performance indicators to facilitating planning and forecasting as a core of business strategy. Traditional BI, DSS, EIS provides bottom up extraction of information from data while modern business performance management BPM applies top-down enforcement of the business strategy

- **User interface**; includes dashboards, corporate portals, and visualization tools ranging from multidimensional data cubes to virtual reality to view performance measure, trends and exceptions.

The following figure shows a generic Model of the BI Architecture;

Figure 3-2 High Level Architecture of BI

A High-level Architecture of BI
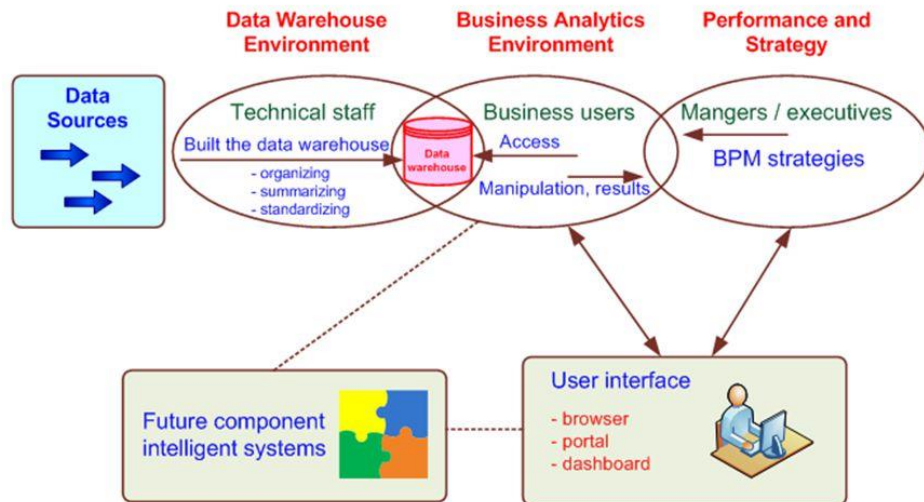
Efraim Turban et al. , "Decision Support and Business Intelligence Systems, © Pearson Education, Inc., 9th edition , 2011, ISBN 10: 0-13-245323-1

A more detailed architecture of BI will be showed in the next figure. It introduces the detailed BI Architectures containing the main components including the Various Data Sources, either internal or external including various types of data from different systems as Enterprise Resource Planning ERP, Customer Relation Management CRM, Human Resource Management, Production Management, Distribution Management, Custom Apps, Spreadsheets…etc. to be send to the **Integration Services** such as Extract Transform Load "ETL"(it's a crucial process of data warehousing to retrieve data from a variety of heterogeneous operational databases, then it will be transformed into the right format for consistency then loaded into a data warehouse.), Enterprise Application Integration EAI, Operational Data Feeds for integration in the BI System. Then the **Data Management Services** provide corresponding analyzed data and information to the different **Reporting and analysis** tools for reporting, querying, analysis, mining and forecasting. Finally the required information will be delivered to customers through the **Information Delivery and Consumption Services** to be directly used by users and managers.

Figure 3-3 Detailed BI Architechture

Source Systems;
Enterprise Resource Planning ERP,
CustomerRelation Management CRM,
Human Resource Management, Production
Management, Distribution Management,
Custom Apps, Spreadsheets…etc.

Integration Services;
Extract Transform Load
ETL, Enterprise
Application Integration
EAI, Operational Data
Feeds

Data Management Services;
Data Warehouses, Marts, Data
Vault, Data Stores, Rules
Databases, OLAP Cubes

Reporting and Analytical Services;;

Operational Reporting

Analytical Reporting
Querying
Batch Reporting,
Scorecards/ Dash boards, Predictive/ Prescriptive
Modelling, Data / Txt Mining/Forecasting

**Information Delivery and
Consumption Services**; Web
Portals. Extracts, Publications,
Direct User Access, Internal Portals
…etc.

3.4 Business Intelligence Functions and Activities

There are many and different categorization of the BI function and styles according to the different vendors. Generally the basic BI functions include reporting, monitoring, analysis, mining, presenting, forecasting and predicting and can be deployed using different tools and technologies. Following are the main BI functions affecting the enterprise strategic management;

Reporting: BI's first main concept was reporting information, knowledge and intelligence to managers and applications such as logistics and financial management to make according decisions. Many types of reporting have been used varying from production reporting tools covering large amounts of data used by professionals, to desktop report writers generating queries and reports for any user with small pool of data to managed query tools accessing complex data to very advanced software and interfaces presenting the reports and queries graphically in multi dimension and multi colors…etc. Modern Dashboards for monitoring analyzing and presenting are nowadays widely used without any need for IT professionals and running on any digital or mobile device providing stunning visualization techniques, alerts for exceptions trends…etc.

Online Analytical Processing "OLAP": is an approach to answer multi-dimensional analytical queries, it enables users to analyze multidimensional data interactively from multiple perspectives, these dimensions are considered as main perspective, entities or components of a measurement.. The three OLAP main characteristics to be added to the managed query tools are the **multidimensionality, hierarchy** and **interaction**. OLAP consists of three basic analytical operations: consolidation **(roll-up), (drill-down), and (slicing and dicing)**.

For example the sales report usually includes location, salesperson, and amount of sales, time of sale…etc. these different entities could be viewed from various points of view. A market manager will be interested to view the market share first while the product manager will be interested to analyze the sold product types. While the general manager will be interested to view the whole picture, for instance to know in which season which products in which store have been most sold. To answer this kind of queries, one can add dimensions (drill down twice on product and season) to split the data into more details. "Time" as a dimension can be subdivided into year, month, and week, day… while drilling-up refers to aggregation of data to less details. Slicing and dicing enables users to slice and dice data while observing the graphs, they can take out (slicing) a specific set of data of the OLAP cube and view (dicing) the slices from different viewpoints. Viewpoints are the various dimensions (such as looking at the same sales by salesperson or by date or by customer or by product or by region, etc.).

OLAP tools started as reporting tools then emerged and developed to be more interactive with users and is considered a great support tool for managers to monitor and analyze the data and make business decisions. Various types started to be widely used like; **WOLAP** – **Web-based** OLAP, **DOLAP** – Desktop OLAP, RTOLAP – Real-Time OLAP[1].

Data Mining: "are a variety of techniques identifying pieces of information in bodies of data. It extracts information in such a way that it can be used in areas such as decision support, prediction, forecast, and estimation"[2]. Data mining tools are able to analyze and introduce the vast amount of data that a company collects. The term started by discovering unknown patterns and hidden relationships in data collected by an organization and has been stretched to include various forms of data analysis to increase sales and profit. Data mining is a process that uses statistical, mathematical, and artificial intelligence techniques (mathematical modelling, descriptive/predictive modelling, databases, pattern recognition, machine learning, neural networks…) to extract and identify useful information and knowledge (pattern) from large and complex sets of data[3].

Data mining involves six common classes of tasks[4]:

- **Anomaly detection** (outlier/change/deviation detection) – The identification of unusual data records, that might be interesting or data errors that require further investigation.
- **Association rule learning (dependency modelling)** – identifies relationship between variables. For example, a supermarket might gather data on customer purchasing habits. Using association rule learning, the supermarket identifies products, which customer frequently buy at the same time and use this information for marketing purposes. This is sometimes referred to as market basket analysis.
- **Clustering** – is the task of discovering groups and structures in the data that are in some way or another "similar", without using known structures in the data. It identifies groups (customers) sharing same characteristics. These characteristics are not predefined like in classification. Clustering supports

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[1] For more details look at
- Felicia Albescu et.al , "Business Intelligence & Knowledge Management – Technological Support for Strategic Managemnt in the Knowledge Based Economy,© Revista Informatica Economica ,nr.4(48)/2008, Romania
- Online Analytical Processing , https://en.wikipedia.org/wiki/Online_analytical_processing
[2] Felicia Albescu et.al , ibid
[3] Efraim Turban et al. , "Decision Support and Business Intelligence Systems, © Pearson Education, Inc., 9th edition , 2011
[4] For more info look
- Efraim Turban et al , ibid
- Felicia Albescu et.al , ibid
- https://www.elegantjbi.com/businessintelligence-in-action.html

segmentation as a market method identifying classes of customers with certain needs.

- **Classification** – is the task of generalizing known structure to apply to new data. It defines characteristics of a certain group according to its past history. Decision trees and neural networks are popular techniques used for classification. For example, an e-mail program might attempt to classify an e-mail as "legitimate" or as "spam" or a bank could decide which customer is approved to get a loan according to his past information including income, balance sheet, debt rate, using a decision tree and induced business rules of approval. While in other cases neural networks are able to relate hundreds of input variables with goal variable so to unveil hidden relations and getting insight from data. The network is able to learn these relations which makes them very useful for prediction and forecasting.

- **Regression** – estimates a relation between one dependent variable and multiple independent variables. Accordingly one can predict or estimate future scores of the dependent variable as well. As an example predicting sales of rainbows depends on weather, price. So one can find a function that models the data with the least error that is, for estimating the relationships among data or datasets.

- **Summarization** – providing a more compact representation of the data set, including visualization and report generation.

Data mining first started with structured data then it developed to unstructured data, text mining and web mining which have been lately widely used. Data discovery tools are modern tools of data mining, analyzing and smart visualization. Plug n play predictive analytics allows users to perform classification, clustering, associative, time series and other predicative and forecasting analysis without data scientist or statistician skills.

3.5 BI Product, Process, Solution, & Tools

The key intellectual output of BI is knowledge that enables decision making with information and data being the inputs, where the data sources could be internal or external and the information quantitative or qualitative, structured or unstructured. The output of the system - BI Product- is the information and knowledge that facilitates the customer with processes to understand, cope with competition, identify growth opportunities, improve performance, and enhance efficiency through monitoring, analyzing and distributing such information and knowledge, which is called BI process. The following figure shows the BI process, solutions and product. Whereas the BI tools are developed by BI vendors and used in the BI solutions that are deployed in the organizations and support the BI process.

Figure 3-4 A Framework of the BI Tools, Solution and Product
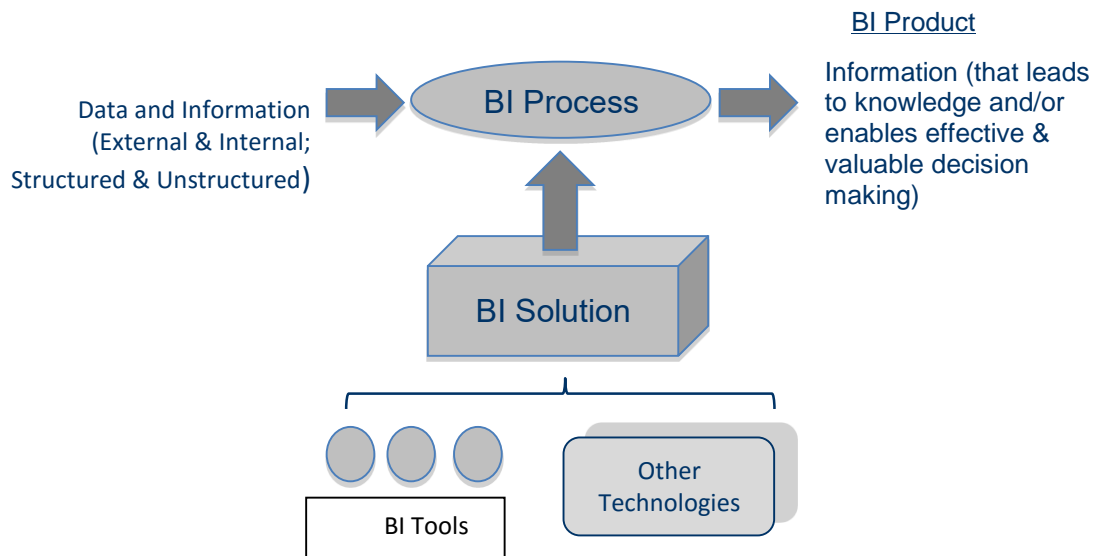
3.6 Business Intelligence Solution Capabilities

According to "Sabherwal & Becerra" [1], business intelligence solutions four main capabilities, inputs and outputs are as follows :

3.6.1 BI Organizational Memory capability

Is the ability of storing information (historical) and knowledge (especially explicit) to benefit the next capability. The organizational memory contains structured data and information (e.g. data base records) and structured explicit knowledge (e.g. knowledge repositories, answers to FAQ) as well as unstructured data, information and knowledge (e.g. historical version e-mail

messages, audio &video files of sites, prior presentations, memos, documents).

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[1] *Sabherwal &Becerra , ibid*

All this represents the organizations accumulated history that could be sometimes inaccurate, inconsistent and not fully integrated[1].

3.6.2 Information Integration capability

While organizational memory focuses on the past, the integration capability represents the ability to link the past structured & unstructured content(data, information & knowledge) from various sources including organizational memory with the new, real-time, content. This capability integrates

- Structured info and knowledge from ERP, transactional systems, knowledge repositories
- The external info and knowledge from environmental scanning and web mining
- Unstructured info & knowledge from text mining, web mining & digital content management systems.

Its input is the past content stored over time from organizational memory, and the real-time based on emerging events. During this phase: monitoring business trends, competitive benchmarking, manage enterprise–wide content search across different types of contents (word doc., e-mails, databases, and xml/html), the ability to incorporate non quantitative data, text mining, and integration with web portals. The output of this phase is a synthesized content about the past and the present, to be used more effectively and efficiently to create new insights.

3.6.3 Insight Creation capability

Is the ability to develop new insights and use them in the short-term or long-term to make better decisions? Integrated data, information and knowledge from the previous two phases are the input for insight and decision making. This phase focuses on utilizing the raw materials to produce new insights, effective decision making based on continual rather than periodic analysis. The output of insight creation is:

Description of what happened, by identifying trends or patterns in prior events and actions or classification of customers based on past buying behavior.

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[1] *Sabherwal &Becerra , ibid*

This does not create insight but enables real-time decision making by using existing information about decisions made in the past similar to the case.

Understanding of what happened, by identifying the underlying causes, based on considerations such as correlations over time, gaining insights into inherent relationship so that a model (cause-effect model) could be developed, which enables real-time data management but it contributes to the development of insights and models

Prediction of future behavior, which could depend on a model that is developed based on an understanding of the past, and then tested & refined using additional information over time. These models will be used to predict what will happen and facilitate real-time decision making (responding to shortage of product or a price change by a competitor). Prediction provide additional insights to some extent.[1]

3.6.4 Presentation Capability

, is the ability to use appropriate reporting and balanced scorecards tools …etc. and make BI more valuable and user-friendly.

The following table summarizes the BI's various capabilities, their inputs , outputs, and available technologies.

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[1] *Sabherwal &Becerra , ibid*

Table 3-2 BI Solution main capabilities, inputs, outputs and technologies

Input	BI Capabilities	Output	Technologies & Tools
Roles, tasks, and users' inputs regarding preferred nature of presentation	Presentation	Information presented in user-friendly fashion and in ways most appropriate for the specific role, task, and situation	• OLAP • Visualization • Digital Dashboards • Scorecards • Business Performance Management
Users' inuts about the analyses that may be appropriate	Insight Creation	New insights and information to support learning and real-time decision making	• Data Mining • Business Analytics • Real-time Decision Support
Real-time data, Unstructured Information, External Information	Information Integration	Synthesized information about the past and present (structured and unstructured, external and internal)	• Environmental Scanning • Text Mining • Web Mining • Radio Frequency Identification Devices
Data, information, explicit knowledge (mainly internal, structured) stored in systems as events occur	Organizational Memory	Historical information and explicit knowledge accumulated over time (mainly structured and internal)	• Data Warehousing • Enterprise Resource Planning • Knowledge Repositories • Digital Content Management Systems • Document Management Systems

3.7 Business Intelligence Technologies and Tools

As a matter of fact, there are plenty of "Business Intelligence technologies, tools, software and vendor in the enterprise. Which and when and how to use them depends on various business functions and goals. Following we will present "Sabherwal &Becerra" four categories of BI Tools according to the different business intelligence capabilities presented in the previous sections[1];

3.7.1 Technologies enabling Organizational Memory Capability

Technologies storing structured data and information

- Transactional Systems: called operational systems, transaction process systems, or source systems. Capture all the relevant information for one accounting period (i.e. month/quarter/year/etc.)
- Enterprise Resource Planning (ERP): leads to consistency with standardized process and have a larger scope than transactional systems, they capture organizational memory related to all business processes in which the organization is engaged. ERP Systems are software packages composed of several modules such as human resources, sales, finance, and production, providing a cross-organization integration of data through embedded business processes.
- Data Warehouses (DW):The collection of data extracted from various operational systems, transformed into consistent data, and loaded for analysis (ETL)

Technologies storing unstructured information & explicit knowledge

- Document Management Systems: Capture unstructured information, also called unstructured content management.
- Knowledge Repositories: Retaining explicit knowledge.
- Digital Content Management System: archiving Audio and Video files

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[1] *Sabherwal &Becerra , ibid*

3.7.2 Technologies enabling Integration Capability

- **Environmental Scanning:** Acquisition and use of information about events, trends and relationships in a company's outside environment, the knowledge that assist top management in its task of charting the company's future course of action
- Text Mining: mining the content of unstructured data, by automatically reading large documents of text written in natural language. This data source may not reside in a structured database but is more likely to be in an unstructured file and gain more value from the explosion of textual information.
- Web Mining: focuses on searching the web and mining online text.(Web crawling with on-line text mining, emails online documents, call centers)
- Radio Frequency Identification devices: obtain information regarding the location of goods, and transmit it (Radio, light or sound waves)to be stored and used with relevant information.

3.7.3 Technologies enabling Insight Creation Capability

- Data Mining or Knowledge Discovery in databases: Extraction of useful knowledge from the identification of previously unknown relationship among variables.
- Business Analytics: Significant ways to get new insights from the existing information, discovery by using existing information, discovery by finding useful patterns in observation
- Real-time decision support: The use of models based on data mining or business analytics to support operational decisions in a real-time fashion

3.7.4 Technologies enabling Presentation Capability

- Online Analytical Processing (OLAP): exploring and analyzing multidimensional data in highly interactive fashion with varying levels of aggregation used for reporting, analyzing, modeling and planning for business optimization. It can be used with data warehouses or data marts

for enterprise intelligence systems that process quires to discover trends and analyze critical factors[1].

- Visualization: refers to the use of computer graphics to create a visual representation of large collections of information.
- Digital Dashboards: display metrics in various ways (eg., tables, charts, graphs, maps, colors and speedometer in a customizable interface so that users can interactively obtain information about the current statues.
- Scorecards: Monitor and show performance by focusing on certain outcome metrics and comparing them to a target, monitor tactical and strategic goals, focuses on four organizational perspectives :Financial, Customer, Internal business process , learning and growth
- Corporate Performance Management.

3.8 Business Competitive Intelligence

During the previous chapter the term Competitive Intelligence has been defined from the business point of view, now it will be presented from the BIs technical point of view. Due to the modern enterprise challenges, integrating "Business Intelligence" and "Knowledge Management" became crucial. New merged techniques emerged from both disciplines and "Competitive Intelligence Systems" rose. Competitive Intelligence has been studied and defined recently by business intelligence professionals and strategic analysts and they concluded that **"Competitive Intelligence deals with the collection, selection and interpretation of publicly-held information that emphasize competitor's position, performance, capabilities and intentions"[2].**

Competitiveness is a natural relationship between various businesses. Competitors are organizations or companies doing the same functions and services or producing similar products in the present time or in the future to seek similar objectives as profitability, growth and excellent reputation. They can also offer substitutes or change habits. Thus it's worth it to monitor and analyze competitors, what they are doing, what are their next steps, exploit their weakness and undermine their strength. Thus Competitive Intelligence is the analytical process to transform scattered data and information about competitors and customers into valuable, relevant, accurate, and usable strategic knowledge market evolution, business opportunities and threats to deal with. The increasing availability of world-wide commercial data bases, on-line mass-media and the

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[1] Jayanthi Ranjan, "Business Intelligence: Concepts, Components, Techniques and Benefits, Journal of Theoretical and Applied Information Technology" © 2005-2009 JATIT

[2] Felicia Albescu et.al , ibid

huge number of public data sources made it easy to generate information and knowledge about competitors, that can be used as references, benchmarks or any sort of strategic analysis[1].

According to the Society of Competitive Intelligence Professionals "SCIP", there are four stages for monitoring competitors, which is also called the four "C"s[2];

1- **Collecting Competitors Information**; to identify the requested information and the important key areas for decision makers that focus on answering various intelligence business requirements, which are called Key Intelligence Topic "KIT" and which can be categorized in three main categories according to Herring[3], so rather than collecting information at random, focus should be on planned intelligence needs to answer various question concerning the followings;

    a. **Strategic Decision & Issues KIT's needs**; what are the companies inputs for a good competitive environment, a competitive strategy, how and with whom to proceed, where are our competitors, strategic investment decisions, should we expand our present production or build new products, how do our technological plan looks like, when and how will our competitors respond to our plans, where they can be attacked, …etc.

    b. **Early- Warning KIT's needs** ; which areas of possible technological breakthrough affecting future competitiveness, technological developments, status and performance of suppliers, disruption in supplies, industry procurement policy, our perception by customers, international changes, regulatory issues, long term trends…etc.

    c. **Key Player KIT's needs;** profiles of competitors including their strategies , plans, performance and R&D, in-depth assessments of key competitors and capabilities, new and emerging competitors, current and future competitive environment, new customers and needs, views, attitude and perception, new industry players, new technologies and products, …etc.

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[1] Felicia Albescu et.al , ibid
[2] Felicia Albescu et.al ,ibid
[3] Jan. P Herring, "Key Intelligence Topics, A Process to define and identify Intelligence Needs", Competitive Intelligence Review, Vol 10(2) 4-14 (1999) © 1999, John Wiley & Sons Inc.(refer to Appendix)

All these concerns and information could be provided by the many data sources we already have including on-line web sources, forums, web logs, customer and governmental sites in addition to the usual databases and marts.

2- **Converting Information into Intelligence**; during this stage we should make sure that we got right, accurate, up-to-date, complete data that could be transformed to valuable information and knowledge. Creating knowledge is a product of people interactions with peers, systems and environment in which they operate. Certain technologies have been developed in this context like database management systems, data mining techniques, data warehousing and knowledge discovery to improve data analysis and decision support. The process of converting information to intelligence (knowledge) consists of three main steps; collate and catalogue information, integrate it with other format of information, analyze and interpret it[1].

3- **Communicating the Intelligence**; the resulted competitors intelligence produced all along the Countering way should be selected, evaluated and disseminated to corresponding decision makers in various stages.

4- **Countering;** using the collected intelligence in the decision processes. Deep professional analysis will be carried on; as an example SWOT, BCG, Porter's Five Forces Model, PEST, …etc. in addition new "Artificial Intelligence" techniques promised a great support during these stages in analyzing, interpreting the gathered information, providing solutions, supporting decision making, and the most important of all to integrate Business Competitive Intelligence in the Strategic Management Process[2].

At the end of these stages, one should be able to make right decision and gain high competitive performance over rivals.

3.9 Business Analytics

For a company to compete, it's not important to do functions that other companies do alike or even better but to do things that others can't do as well. A company should identify its special core competencies, which secure its survival in the future and develop it continuously to meet the market requirements. These competencies should not be necessarily physical machinery, warehouses, DataMart's or software but it should include things that

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[1] Felicia Albescu et.al , ibid
[2] Felicia Albescu et.al ,ibid

they can do especially better than others, it should lie in the field of knowing how to handle internal processes, what customers want now, what they will need in the future. Thus, companies should deliver right data, information and knowledge at the right time to the right people to be able to make rational decision that meets the company's strategic, operational and tactical conditions. This whole process is called **Business Analytics** and is defined as "delivering the right decision support to the right people at the right time"[1] . Modern **Business Analytics** have been developed from being just a pure IT discipline, driven by the organizations technical department and resulting with endlessly amount of useless data to a successful BI initiative, very much linked with the company's strategy; mission, vision, and goals resulting in business processes supporting business objectives[2].   Nowadays, while we are entering the analytical age of Big Data, where competitive advantages will be gained by companies making more advanced use of information, most business processes are linked together via electronic systems, run smoothly in a coordinated way and generate electronic traces that are collected and stored for reporting purposes. Business Analytics allow business to go beyond traditional BI reporting by rational use of data and information to succeed and make profits. **Analytics is an advanced discipline within Business Intelligence**.

Although many businesses don't differentiate between business/pure/ advanced/predictive Analytics, it's worth to be mentioned, that according to "Evan Stubbs", **"Business Analytics"** is different than **"Pure Analytics"**, or "**Advanced Analytics**". **Pure Analytics** is the basis of business analytics and it can be defined as **"any data-driven process that provide insight"**. It may report historical information or provide predictions about the future events; the end-goal of analytics is to add value through insight and turn data into information[3]". Common examples of analytics include:

"**Reporting**; summarization of historical data

Trending; identification of underlying patterns in time series data

Segmentation; identification of similarities within data

Predictive modeling; predicting future events using historical data

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[1] Gert Laursen & Jesper Thorlund , "Business Analytics For Managers, Taking Business Intelligence Beyond Reporting, © 2010 by SAS Institute, published by John Wiley & Sons Inc.
[2] Gert Laursen & Jesper Thorlund , ibid
[3] Evan Stubbs , "The Value of Business Analytics, Identifying the Path to Profitability" , © 2011 by SAS Institute, published by John Wiley & Sons Inc

All these applications and others are based very much on data, use various mathematical techniques to transform raw data and add value to the original data by generating knowledge[1].   While traditional business management , reporting and performance management focus on what happened by analyzing and presenting historical information, advanced analytics focus on why things are happening, what will happen next, and what is the best course of action. In order to do this, high-order statistical and mathematical techniques such as operation research, parametric or nonparametric statistics, multivariate analysis, algorithm-based predictive models (decision trees, gradient boosting, regression, …etc.), machine learning, data mining, neural networks…etc. could be used.

Whereas analytics focuses on creation of insight and not very much what to be done with it (answers a question at a point in time), **"Business Analytics" is about sustained value delivery, tracking value and measuring performance and benefiting from all this to achieve business outcomes by focusing on "Business relevancy", "Actionable Insight", and "Performance measurement" making sure that information has contextual relevancy to business and delivers real value.**

Therefore, a Business Analytics embedded Business Model should consist of three major elements,

- **Technological Elements**; that can collect, store, merge and deliver real world electronic data to analysts to be presented to the end-user through any of the visual presentation techniques; HTML, reports, graphs, spreadsheets…etc. or even a self-service BI model, where the data and information will be presented directly to the end-user.
- **Human Competencies**; these people are able to retrieve data, deliver it as information, generate knowledge targeting specific decision processes and finally make the right decision.
- **Business Processes**; are processes that make use of the information and the new generated knowledge. As an example a business process is how to optimize your inventory or price a new product…etc.

Hence, according to "Gert & Jesper", **"Business Analytics" is an interaction of IT technology, strategy, business processes, a broad spectrum of human competencies, organizational circumstances, and cooperation across the organization. Business Analytics takes Business Intelligence beyond reporting** by processing lead information, that is the innovative

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[1] Evan Stubbs , ibid

decision support needed to revolutionize business process and that is opposed to traditional business intelligence producing lag information in the form of reports helping to monitor, maintain, and make evolutionary improvement in the processes. Both types are supporting decision making, where lead information helps organization to compete, while lag information maintains and optimize already existing processes[1].

3.10 Factors shifting Enterprise and Business to the Modern BI Environment

A Gartner's recent study predicts the rapid growth of organizations adopting business intelligence with more focus on business-led, data analytics and self-services features of modern BI rather than traditional BI (IT-led system-of–record reporting)[2]. The study estimates that the global BI and analytics market will grow from $18.3 billion this year (2017) to $ 22.8 billion year 2020, whereas the market value will slow down for a while due to the increased vendors' competition. According to the study, there are many factors influencing modern BI and analytics markets and its adoption as follows;

- Emergence of easy friendly user **modern BI buying models and tools** support more accessibility, agility and analytical insight at the enterprise level leading to more success.
- The smart wave of new **BI capabilities** of smart data discovery, machine learning and automation of entire analytics workflow **privileged new innovator startups and established vendors** to compete with traditional vendors as a result the potential value gained of reducing time due to the insights from advanced analytics and the reaching broader and more accurate set of customers.
- The business **need** to analyze **complex data** sets, models and diverse data sources leads to more **investments** in deploying fast automatic tools for **data preparation**, cleaning, enriching and finding.
- As more automated tools and **embedded analytics** in the business applications, as more business analytics value. Embedding and **extending analytics** contents leads to more BI adoption.

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[1] Gert Laursen & Jesper Thorlund , ibid

2 David Weldon, "7-forcesdriving modern business intelligence growth". Information Management, March 2017 © https://www.information-management.com/news/7-forces-driving-modern-business-intelligence-growth

- **Streaming online data** generated by devices, sensors and people should lead organizations to make faster and more accurate decisions. More investments should be set to offer customers online data, events and various data sources.
- According to Gartner's study "**Cloud deployments** of BI and analytics platforms have the potential to reduce cost of ownership and speed time to deployment".
- The study added that "The availability of an active marketplace where buyers and sellers converge to exchange analytic applications, aggregated data sources, custom visualizations and algorithms is likely to generate increased interest in the BI and analytics space and fuel its future growth".

Chapter 4: "Business Intelligence" based "Strategic Management"

Following we will try to align the business intelligence methods and technologies explained in chapter three with the strategic management process, functions and plans explained in chapter two to check how the concept of BI, its technologies and tools supports the Enterprise Performance and Strategic Management and how integrating of BI technologies in the business model can also verifies the Key Intelligence Topics.

As mentioned before, continuous monitoring, considering, predicting the future and acting in real-time are the main features of modern intelligent enterprise and organizations. The ability of an enterprise to adapt quickly to the changing business environment and make right insightful strategic decisions will lead to its success. Over the last two decades data has become the essence and main driver of Organizations management and success which empowers business users to innovate and gain competitive advantage. As explained thoroughly in the previous chapter, Business Intelligence is a concept that involves delivery and integration of useful real- time business information and data, creation of new knowledge based on past experience, taking well-informed responsive and anticipative decisions, planning and making accurate predictions regarding the future, based on the past and the latest information delivered[1]. Business intelligence acquires tactical insight to optimize business processes by identifying and monitoring business trends; detecting previously unseen problems, opportunities, anomalies; monitoring competitors or customer/consumer behaviors; predicting outcomes and providing alerts that require management action. It also acquires strategic insight to align multiple business processes with key business objectives through integrated performance management and analysis. Thus it will be able to detect cost-cutting ideas, decide new innovations, new products, new actions, and new scenarios, roll ERP data into accessible reports, react quickly to retail demand and optimize prices. Which results in smarter management decisions, improved performance and increased efficiencies at all levels of management either operational, tactical or strategical. During this chapter we will introduce the role of business intelligence tools and technologies in the enterprise and organizational strategic management.

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[1] *Sabherwal &Becerra ,ibid*

4.1 Business Intelligence contribution to the Strategic Management Model

At strategic levels; executive decisions, affecting the whole organization or enterprise on various departmental and functional level, should be carried on. They aren't as much frequent as tactical or operational decisions although during this phase top managers need to analyze consolidated aggregated information and a large variety of parameters to monitor all corresponding business activities in order to realize and determine future threats and benefit from upcoming opportunities. Chapter two presented the strategic management definition, basic model, different components and the external and internal data required to improve the whole performance. It also explained how top managers need to get insight and make successful strategic plans by digging deeper into data. This can be achieved by using business intelligence techniques and activities, which were explained from a technological point of view in chapter three and now they will be introduced in order to align with the different phases of the strategic management processes of chapter two ;

4.1.1 Reporting Tools

Provides **what has already happened**, can easily get data relevant to trends, production overviews, market share evolutions and the like to be used by data miners to conclude all anomalies, opportunities, threats and basic parameters.

4.1.2 OLAP & Visualization Tools

Serves for **Analysis** activity, it allows users to cross-analyze and understand **why things happened**. They can perform deep data research to connect data elements and present them in a way that makes their relationships more obvious. It's a great support to make an informed decision on the strategically level (refer to chapter2).

4.1.3 Scorecards & Dashboards & Alerts

Monitoring **what's happening,** allowing us to make decisions to get good results proactively and avoid bad performance from the start based on real-time data analysis. They are business intelligence tools for monitoring, measuring, and matching progress and key performance indicators with the

organizational predefined objectives and goals. They communicate what organizations try to accomplish, align the daily work with the strategy and accordingly prioritize projects, products and services. This usually embraces four main perspectives to be viewed to enhance strategic objectives and plans[1];

- **Financial Indicators**, one of the most important perspectives of an organization is its financial performance and use of financial resources. In order to control financial ratios, profits, return on investments…etc.
- **Customers/stakeholders**, presents the organizational performance regarding its customers and stakeholders as the customer satisfaction, customer retention, customer feedback, and customer needs …etc.
- **Internal Business Processes**; regarding the efficiency and quality of the products and services. Monitoring current and past KPI's like market share, production duration, and new product lines…etc.
- **Organizational capacity(learning and growth)**, is concerned with organizational performance of human resources, infrastructure, technology, culture and other capacities like no. of employees , training programs, qualifications, learning techniques…etc.[2]

4.1.4 Data Mining (forecasting & prediction)

Is the process of developing business intelligence from data that organizations collects, organizes and stores to gain a better understanding of their customers, vendors, business processes, supply chain, and to solve complex organizational problems. It supports market segmentation and demand forecasts and contributes to the strategic plan.

4.2 Business Intelligence Contribution to the Organizational "Key Intelligence Topics" Needs

In the same context we argue that business intelligence techniques and activities supports Herrings Organizational **"Key Intelligence Topics Needs"** **"KIT"** mentioned in chapter three in a technical context and presented fully in the Appendix[3]. We will align the BI techniques and activities with the corresponding organizational intelligence needs Herring

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[1] http://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard
[2] http://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard
[3] See appendix for Herrings Key Intelligence Topics

presented in his three tables concerning three main topics of "Strategic Decisions and Issues", "Early Warning Topics", and "Key players in the Marketplace" to investigate how BI supports these needs as follows[1];

4.2.1 "Strategic Decisions and Issues" KITs;

- Formulating the future global organizational and industry scenarios and defining the competitive environment, one can highly make use of BI intelligence included in demand forecast, production planning, environmental research, SWOT analysis, BCG analysis.
- Formulating organizational global competitive strategy can benefit very much from the BI competitive analytics and BI's predictive analysis and tools. Competitor assessment and Risk assessment are one of data mining applications based on neural networks.
- Globalization of the organization and decisions regarding with whom one should proceed and what the competitors are doing can be all tackled through analyzing aggregated and consolidated data. Market developments and industry globalization can be provided by reporting, OLAP and visualization techniques.
- Strategic investment decisions and interest rate prediction and financial ratio calculation can be easily determined using reporting, datamining techniques and scenario analysis. The same can be used for new products or production expansion decisions.
- Technological competitiveness can be monitored and controlled with usual reporting as well as scorecards and alerts. As for instance to track a certain new technology and how it expands or declines etc.
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4.2.2 "Early Warning" KITs

Identifying forthcoming threats and opportunities for the company in the market. Some examples of Early Warning KITs include: technological breakthrough, technological developments, new entrant threats, government regulations, and transformation in social or political or economic systems, untapped market, and any shifts in bargaining power. All these could be very much controlled and monitored through traditional business intelligence techniques of reporting, monitoring and analyzing but one can leverage highly

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[1] Jochen Fries, ibid

from using the business intelligence modern concepts and tools for getting insight, predicting and forecasting the environment around and using competitive performance analysis, predictive analytics and taking business intelligence facilities and functions beyond reporting as explained thoroughly in the previous chapter.

4.2.3 "Key Player in the Marketplace" KITs

Arising from market competitors, new entrants, and substitute products. However, Key Player KITs can also deal with none threatening means such as new suppliers or contractors which have entered the market as well. It usually deals with external data that could be incomplete or unreliable, so organizations need to deploy modern BI techniques in a manner to easing the data analysis. Customers, competitors or stakeholders profiling depends also very much on real –time and complex data models as well as classification, clustering and prediction techniques.

4.3 Business Intelligence Contribution to the Strategic Management Analysis Tools

As well as with Herrings Key Intelligence Topics, we can argue, that the different strategic analysis techniques (SWOT, BCG, etc.) discussed in chapter two can be very much supported with the business intelligence tools and techniques of chapter three, either traditional or modern. As an Example in SWOT analysis we define the internal strength and weakness and the external opportunities and threats. So using a decision tree can draw the decision to expand a certain product line as an organization strength, while from the other side the classification and clustering can unveil the hidden relation between the increased market share and market quality and therefore add the product quality to the organization strengths. Monitoring and controlling customer behaviors and financial issues can be translated into strengths and weaknesses to be considered in the analysis and the strategic management. As for the external opportunities or threats it's an advantage to use all the modern business intelligence tools for visualization, monitoring, prediction and forecasting. The same applies for the other various strategic management techniques.

4.4 Business Intelligence Role in Business Performance Management

In the business literature and like explained in chapter two, Strategic Management has different synonyms, "Business Performance Management" BPM, "Corporate Performance Management" CPM, "Enterprise Performance Management" or "Strategic Enterprise Management" SEM, they all imply almost the same meaning or highly overlapping . According to the BPM Standard Group, it has defined BPM or SEM as "**a framework for organizing, automating, and analyzing business methodologies, metrics, processes, and systems to drive the overall performance of enterprise. It helps organizations translate a unified set of objectives into plans, monitor execution, and deliver critical insight to improve financial and operational performance**"[1]

As organization or enterprise involves business processes, methodologies, and technologies to control, monitor and manage the business, they also include business metrics and performance indicators that should be monitored and measured. These metrics and indicators result in the so called "Key Performance Indicators" KPI's that should match and coincide with the business goals and objectives. Thus any organization should define and specify its KPIs well to be monitored, measured and compared all along the business management processes generally and the strategic management processes especially. And in order to do this, organizations, should seek for high performance by integrating BI technologies during its various processes to align with its strategic plan and to prevent organizations from optimizing local business at the expense of the overall corporate performance. In doing this they should deploy the Business Intelligence concepts and techniques.

A BI–based Business Performance Management system is a system that integrates business technologies in the business model to monitor and control the organizations performance. Almost every major business function has a performance management element that can be realized and defined through various key performance indicators (refer to chapter two). These should be collected, stored and compared with the desired targets and goals through the following actions:

- "Collecting and storing the business measures and the current state indicators regularly.

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[1] *Pugna Irina Bogdana et.al., ibid*

- Gathering and storing benchmarks and targets (threshold values) and business rules (interpretations of comparison results between current performance indicators and etalon values)
- OLAP analysis facilitating roll-ups and drill downs of performance measurements along aggregation criteria
- Keep analysis alerts allowing decision makers to evaluate quickly business processes to re-direct any unsuccessful process[1]"

The main target is to align performance metrics to business strategy which means aligning activities of strategic management, resource management, risk management, etc. with metrics and indicators within an appropriate business intelligence platform.

Business intelligence will support the business performance management strategic processes by providing:

- Information enabling managers to understand business
- Performance oversight to manage the business
- Performance effectiveness to improve the business[2]

Thus we can easily argue, that the BI-based-Business Performance Management system supports decision makers especially on the strategic level, by making use of quantitative and qualitative, lagging and leading, balanced against targeted objectives and benchmarks. As the performance measurements happen more frequent, strategic management must be capable to proactively influence the outcome. In order to do this, it should contain monitoring and tracking capabilities to generate real-time, complete and accurate information to make decisions. All this can be fulfilled through using traditional and modern Business Intelligence Techniques.

4.5 Importance and Benefits of Business Intelligence to organizational success

After we have presented the Business Intelligence support to the strategic management model, its phases, processes, analysis techniques, key intelligence topics and to the business performance management, its obvious to recognize that the contribution of Business Intelligence became crucial for most enterprises and organizations due to the importance and benefits it facilitates to the business. Due to the wide variety of tools, techniques and technologies of BI, one can summarize the main enterprises benefits through following;

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[1] *Pugna Irina Bogdana et.al, ibid*
[2] *Pugna Irina Bogdana et.al, ibid*

- **Getting insight of consumer behavior**; BI allows continuous monitoring of consumer and customers behavior and analyzing their buying trends, to easily identify problems and potential solutions quickly, reduce customer concerns and improve retention, predict what consumer needs, how the current and future consumption will look like, and act accordingly by improving quality of customer services provided or developing new products to attract more customers and increase profits.

- **Improving operational performance and visibility**, by optimizing internal business processes; providing real-time information, analyzing content and context of the data and increasing the organizational operational efficiency.

- **Making successful strategic plans**, accelerating and improving decision making and providing faster and more accurate data access and reporting. The BI analytical facility turns data into actionable information by identification of new opportunities, facilitating new insights through discovering of unknown patterns, identifying market trends, tracking innovative projects more effectively and illustrating important hidden connections between various areas of the business, that will help to understand the implications of various organizational processes better and enhance planning for the future.

- **Improve enterprise efficiency**; by increasing productivity, driving new revenues; and gaining competitive advantages over business rivals[1].

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[1] For more see:
- http://searchdatamanagement.techtarget.com/definition/business-intelligence
- Sabherwal &Becerra , ibid
- The Importance of Business Intelligence in your Organization, © Todd West Media – Professional Website Design Services Made Affordable – Portland, Maine – http://www.toddwestmedia.com/594/the-importance-of-business-intelligence-in-your-organization.html, October 25th 2016,

Chapter 5: "Business Intelligence" based "Strategic Management" in Practice

This chapter presents the different application areas for business intelligence and introduces briefly some successful examples in the field of business intelligence and analytics. Finally, the researcher proposed an initial proposal of a "Business Intelligence" based "Performance Management" System for an Egyptian "Academic Institution" in higher Education sector that can make use of the business intelligence methods and technologies within its strategic management phases to improve its performance. As a matter of fact and according to the research's title, it was planned to investigate different Egyptian institutions and organizations to know their readiness to integrate business intelligence techniques in their business model but unfortunately this appeared to be difficult under the circumstances of scarcity of data and lack of willingness of organizations and institutions to share their confident information. It also will demand more time and a lot of effort that can be covered in another research in the future. Thus, the researcher was convinced to design a generic model to be studied and fully analyzed and implemented in a further research.

5.1 Business Intelligence Application Areas

Business Intelligence; Predictive Analytics, Competitive Intelligence, Business Strategic Management and Business Performance Management can be deployed in almost all areas in life according to the level of management. Many applications are already implemented for various business functions and objectives like; Algorithmic Trading, Fraud Detection, Systems Monitoring, Application Performance Monitoring, Customer Relationship Management, Demand Sensing, Operational Intelligence and Risk Management, Payments and Cash Monitoring, Data security monitoring, Supply chain optimization, RFID/sensor network data analysis, Enterprise Mashups and Mashup Dashboards, Transportation industry…etc.

These activities could be applied in various areas according to Eric Siegel[1], who introduced many applied BI Predictive Analytic applications areas in practice as follows:

- **Family & Personal Predictions**, location by Nokia, friendship by Facebook & LinkedIn, Love by match.com, pregnancy by Target,etc.

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[1] Eric Siegel, "Predictive Analytics, The Power to Predict Who Will Click, Buy, Lie or Die", © 2013 by Eric Siegel, Published by John Wiley & SonsInc, ISBN 978-1-1-118-35685-2

- **Marketing, Advertising & the Web predictions**, Purchases in order to target marketing applied in banks, shops…, cancellations in order to retain customers, Successful sales in order to prioritize sales by IBM, mouse clicks in order to select which content to display by google & education portals …etc.
- **Financial Risk & Insurance Predictions**, costly workplace injuries, death, by life insurance Company, loan default, etc.
- **Healthcare Predictions**, death, influenza, breast cancer by health insurance companies and university researchers,…etc.
- **Crime fighting & fraud detection predictions**,
- **Education Predictions**, awarding of grants, grades, knowledge for education …etc.
- And many more…

5.2 Applied Business Intelligence-based-Management Examples of Success

Following we will briefly present various business intelligence application models that are applied or can be easily applied in real life;

5.2.1 Uber Technologies Incorporated, the taxi service company

"Founded in March 2009 operates using the Uber mobile application. This application allows consumers with smartphones to request a driver in order to satisfy transportation needs. Uber pairs (matches) available drivers, who provide their own vehicle, with patrons looking for rides. Costumers are charged based on the distance and time of travel. The app already has the customer's payment information and a GPS device tracks the trip distance so the rider can enter and exit the car while payment is charged automatically to his credit card. Neither the rider nor the driver deal with payments. The ride-share company takes a percentage of the fare, and the rest goes to the driver.

This business model is built on asset sharing and based on modern business tool as the drivers use their own cars. Uber has developed a collaborative ecosystem in which the driver assumes the risk of winning rides, while the platform helps minimize that risk through the **application of big data.** The platform also creates agility through an **internal decision-making** system that responds to market changes in real time. This lets Uber apply usage-based pricing and direct drivers to locations where the probability of finding a fare is high. Finally, Uber uses a scheme whereby customers rate drivers. **Via the big data platform,** a would-be customer can see on his or her mobile device the closest drivers and their ratings. The rating system pushes drivers to offer clean cars and quality service, and it also provides at least a bit of personalization. Allowing the customer to decide between the closest car and the one (maybe a

bit farther out) with the highest rating may not sound like much, but it is still far ahead of traditional taxi services. Uber adds continuously advantages and facilities to improve its efficiency and keep its distinctive competitive position, like, Uber car Pooling, Uber follow me, flying Uber. According to Uber.com (2015), the services provided by this California-based company are now available in sixty-four countries and over 300 cities worldwide. Today, several other companies have mimicked its business model characterized by digital disruption and BI based convenience technology"[1].

5.2.2 Airbnb Company

"Founded in 2008 and experienced a phenomenal growth since that: It now has more rooms than either InterContinental Hotels or Hilton Worldwide. Airbnb represents 19.5% of the hotel room supply in New York and operates in 192 countries, in which it accounts for 5.4% of room supply (up from 3.6% in 2015). The founders of Airbnb realized that platform technology made it feasible to craft an entirely new business model that would challenge the traditional economics of the hotel business. Unlike conventional hotel chains, Airbnb does not own or manage property—it allows users to rent any livable space (from a sofa to a mansion) through an online platform that matches individuals looking for accommodations with home owners willing to share a room or a house. Airbnb manages the platform and takes a percentage of the rent. Because its income does not depend on owning or managing physical assets, Airbnb needs no large investments to scale up and thus can charge lower prices (usually 30% lower than hotels charge). Moreover, since the home owners are responsible for managing and maintaining the property and any services they may offer, Airbnb's risks are much lower than those of traditional hotels. On the customer side, Airbnb's model redefines the value proposition by offering a more personal service—and a cheaper one. Before platform technology existed, there was no reason to change the hotel business in any meaningful way. But after its introduction, the dominant business model became vulnerable to attack from anyone who could leverage modern technology to create a more compelling value proposition for customers. The

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[1] For more see;
- Mastrorillo: Getting Taken for a Ride by Uber Technologies Incorporated Published by Scholarship@Western, 2016
- StelioS KavadiaS, KoStaS ladaS, and ChriStoph loCh , "The transformative business model, how to tell if you have one " , Harvard Business Review october 2016
- www.Uber.com

new business model serves as the interface between what technologies enables and what the marketplace wants"[1].

5.2.3 A hotel franchise

Uses BI analytical applications to compile statistics on average occupancy and average room rate to determine revenue generated per room. It also gathers statistics on market share and data from customer surveys from each hotel to determine its competitive position in various markets. Such trends can be analyzed year by year, month by month and day by day,monet by moment giving the corporation a picture of how each individual hotel is faring. And accordingly make a proper decision to support a certain hotel and enlarge its capabilities while close another one, which doesn't meet the franchise objectives

5.2.4 A bank

Bridges a legacy database with departmental databases, giving branch managers and other user's access to BI applications to determine who the most profitable customers are or which customers they should try to cross-sell new products to. The use of these tools frees information technology staff from the task of generating analytical reports for the departments and it gives department personnel autonomous access to a richer data source.

5.2.5 A Telecommunications company

Maintains a multi-terabyte decision-support data warehouse and uses business intelligence tools and utilities to let users access the data they need without giving them carte blanche to access hundreds of thousands of mission-critical records. The tools set boundaries around the data that users can access, creating data "cubes" that contain only the information that's relevant to a particular user or group of users.

5.3 Preliminary Proposal for a "Business Intelligence" based "Performance Management" System for Egyptian Academic Institution in Higher Education

During the previous sections we presented various BI application areas and some successful examples of integrated Business Intelligence models, and showed how it supported the decision making processes, and improved the

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[1] StelioS KavadiaS, ibid

competitive advantage and enhanced the overall efficiency and performance. Now and in this section the researcher introduces an initial preliminary proposal of "Business Intelligence" based "Performance Management" in higher education universities and institutions in Egypt.

Any observer of the higher education sector in Egypt will notice that Egyptian academic institutions and universities face different challenges and problems that threatens their main objectives and goals, and that negatively affect its efficiency, competitive positions and business processes. One of the most threatening challenges is the over flood of data that should be processed properly to support well-informed decision. These problems can be solved and the challenges overcome by benefiting from business intelligence and analytics in the academic universities and institution in the higher Education sector. Following the problem and the model will tackled in more details.

5.3.1 Egyptian Academic Institution Components

Before introducing some problems and challenges, lets present the academic institutions main various components. Each of these components include many different data sources, indicators and many relations to the others; as follows;

- Academic Staff
- Registering Students & Researchers
- Registered Student and Researchers
- Enrolled Students & Researchers
- Alumni & Grants
- Academic Materials
- Students Development and Learning Assessment
- Students Health Services
- Financial Analytical Data
- Students Hostels
- Conferences
- Student social states
- …many others

The following figure shows the academic institution and universities different components.

Figure 5-1 Academic University Components
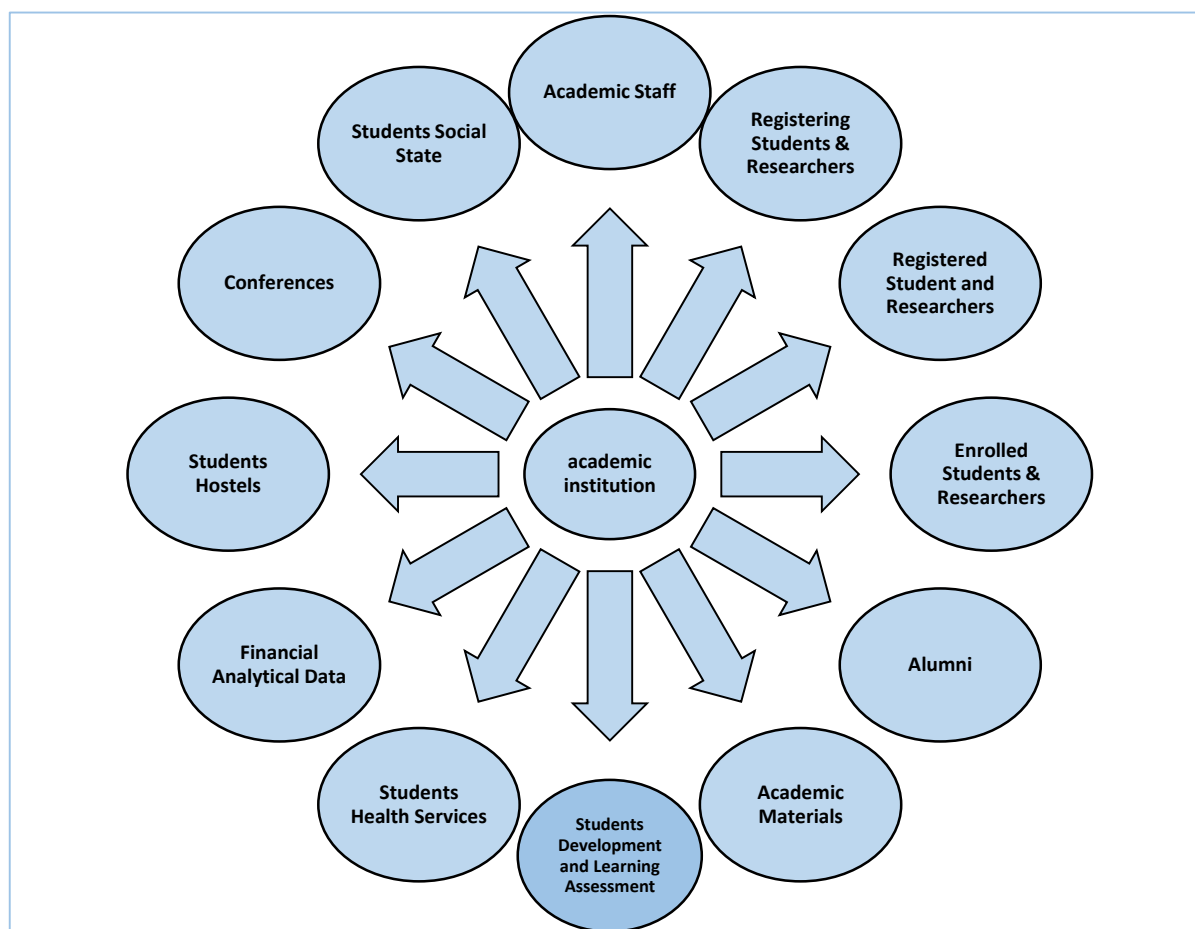
By the Researcher

Each of these components include many indicators generating a huge amount of data, as an example the academic staff contains all the following parameters and indicators;

- **Academic Staff**; % of new to total staff, % of academic to non-academic staff, distribution of staff, staff salary, % of students to staff members, % of academic research to researchers…etc.

This is the case for each and every component, which means a hundreds of indicators and hundred thousands of data records.

5.3.2 Challenges facing the Egyptian Academic Institution Management System[1]

5.3.2.1 *Disconnection between Analytics and Business Processes*

All this data are considered as a challenge, they should be collected, gathered, stored, analyzed and used to make proper decisions concerning various business processes in the university. These data used to be processed

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[1] Challenges inspired by a conference on "Higher Education" in Saudi Arabia

manually all over decades. Now while most Egyptian universities and institutes invested in their technological infrastructure, the data can be processed electronically and universities provide databases, data marts, computers, application and software.

Nevertheless they are still facing the same challenge…

The university has a lot of applications that creates a lot of data and generates a huge amount of information, from which we want to extract the most important useful information for a certain business process. We want to automatically find the hidden patterns and relation to discover the added value of certain information. We want to predict the future, we want to estimate the indicators, we want to perform predictive analytics, we want to dig into the data …we want to get insight and make real-time proper decisions whether on the operational, tactical or strategic level. We want to improve the business processes, we want to raise the student's performance, and enhance the provided services to fulfill the strategic objectives.

As an example we want to track course enrollments during registration period to automatic open additional sections according to pre-defined rules. Thus one of the main challenges at the university is the **disconnection between analytics and business processes**. Although we have the systems and we provide the data, we still can't analyze it proper at the right time by the right person.

Many of the Egyptian universities just deal with data in the past using reporting techniques to know **what happened**, unfortunately they don't use data to know **why it happened** or **what will happen** and **how**? They just use simple reporting techniques without to **learn from the past** or to **manage the present** or **predict the future**. In order to do this Egyptian universities should integrate modern business intelligence methods and technologies explained thoroughly all over the chapters, to face these challenges.

A problem many Egyptian universities face, as an example, if in a certain year or semester, there are many student that are not willing to register in a specific course;

- First of all we should be able to recognize the situation and detect the decrease in number of registrations and accordingly low indicator of this course (dashboard can be used effectively).
- Second of all we should relate the student's attitude or behavior (not registering) to certain factors or indicators (don't like the teacher, don't like the academic material, and don't like the schedule…).(classification, clustering, web mining, online data discovery, predictive analytics

- Third of all, we should realize the factors affecting the student's behavior.
- And then take the right action and right decision accordingly.

Actually this is not the only problem universities can face demanding the proper use of BI and Analytics, there are many others concerning the various management phases, universities component

- Enrollment Management, admission and reporting
- Student success and learning, grades, evaluation
- Retention and graduation
- Financial aid and budgeting etc.

5.3.2.2 Integration Challenges

The institutions deploy and activate different applications from different vendors, on different platforms, they face integration problem. Thus it's preferred to try to deal with one vendor to get synchronized applications.

5.3.2.3 Structured versus Unstructured Data Management Challenges

Many Egyptian universities and academic institutions still use during the business and decision making processes structured data only, although they have a lot of unstructured data sources (Web, Blogs, media, etc.) which certainly can and should influence the decision.

5.3.2.4 Business Requirements rapid Change

Over the time, business requirements change rapidly as the institutions seek continuously a better performance, which means they need better applications and more advanced high quality tools.

And to overcome these challenges and be able to solve various problems, academic institutions should seek for the use of modern Business Intelligence, analytics and technologies that have been deeply discussed and explained in previous chapters. In this context there are many applications that can be suggested concerning the different university components, which have the power to enhance the services delivered and improve the overall performance of the institution on the local level or even the national and international level. In the next section we introduce an initial model to be more studied, analyzed and planned thoroughly in the future as it needs more time and a lot of investigations concerning the Higher Education Sector on ground.

5.3.3 A Proposed "Business Intelligence" based "Performance Management" Generic Model for an Egyptian Academic Institution

Following we will present an initial preliminary BPM generic model for an Egyptian academic institution. The proposed system, main objective is to monitor and control the university performance and keep it up through real-time performance management while monitoring the key performance indicators and keep them into the desired level. From all the discussions along the research, let's assume that the university has various data sources that can be operational databases, historical data, external data (web/internet), and existing data in data warehouses. It can be relational databases, it can include structured information (tables/sheets/excel files), or unstructured information just like plain text, log files, multimedia files. It can reside on many platforms. And lets assume the following processes

1. The university gathers and collects a lot of data from the different internal as well as external data sources like; (its website, the applied ERP System, the e-learning component, the e- registering component, decision information systems available, etc.).
2. The data will be pulled through to the Extraction Load Transform "ETL process into the data warehouse. First the data will be extracted from different data sources, then it will be transformed to be cleaned, filtered, splattered, enriched and the relevant data will be loaded in the data ware house.
3. Key performance indicator will be developed, as an example percentage of high performing students, the universities rank according to some sub-indicators …etc.
4. After that they will be collected, monitored and matched to check for the targeted performance value.
5. The information and especially the key performance indicators can be finally disseminated across different hand-held devices (smart phone, web browser, laptops, IPad s …etc.,

Accordingly decision makers can evaluate the situations, get insight from the information and analysis forehand and take proper action, make a right decision and can also re-define the strategic targets or objectives of the institution. Through predictive function, decision makers can foresee the upcoming problems.

Now we can argue that integrated business intelligence technologies at the academic institutions promise a great progress and improvement on the local as well as on the national level. It will be deployed as a group of business solutions

for different topics and on various management level but it can easily be integrated to coincide and match together.

5.3.3.1 Benefits of the proposed "BI" based "PM" System for the Egyptian Academic Institutions

The proposed system promises a great support for top managers during their strategic management, beyond detecting, measuring and reporting, BI extends its functionality to communicate findings about these indicators, making strategic decisions and providing change based on these findings it assures the following;

- Support critical institutional outcome.
- Set technologies and processes that help decision makers use data to understand and analyze institutional performance.
- Apply data- driven management to make correct decisions and actions.
- Provide right information to the right people at the right time to support decision-making and institutional effectiveness
- provides direct data access and dynamic faster reporting through a user friendly web interface
- provide real-time KPIs
- Provides better data storage, management, retrieval, and analysis
- Align business processes with strategic business objectives through integrated performance management.

The Following Figure introduces the preliminary generic Model of the proposed "Business Intelligence "based "performance management Performance Management System for an Academic Institution in Egypt. The proposed System contains the Business Intelligence Environment including;

- **Data Source Layer** presenting the **Source System**, with all relevant external and internal data including Operational Data, Relational Data, CRM, HR, e-registering, e-finance, e-learning…
- **ETL Layer** presenting the **Integration Service** for extracting, transforming, and loading the data in the matching Format
- **Data Warehouse Layer** presenting the **Data management Services** including data ware house, data marts, OLAP Cubes…
- **BI Capabilities** presenting **the Reporting and Analytical Services**
- **Users Layer** presenting the **Information Delivery and Consumption Services**

- **Decision Support Layer** presenting the communication facility between the proposed BI-based Management System for each individual institution with various Decision Makers on the national level to allow institutions to integrate and communicate with all key players and peers in the Higher Education Sector.
- **The Key Performance Indicators** is a sample of KPIs or indicators that could be collected, gathered, stored, monitored, presented and communicated through proposed system to enhance performance, services and fulfill the institution objectives.

All these components have been explained in Chapter three in the BI Architecture thoroughly (please refer to chapter three).

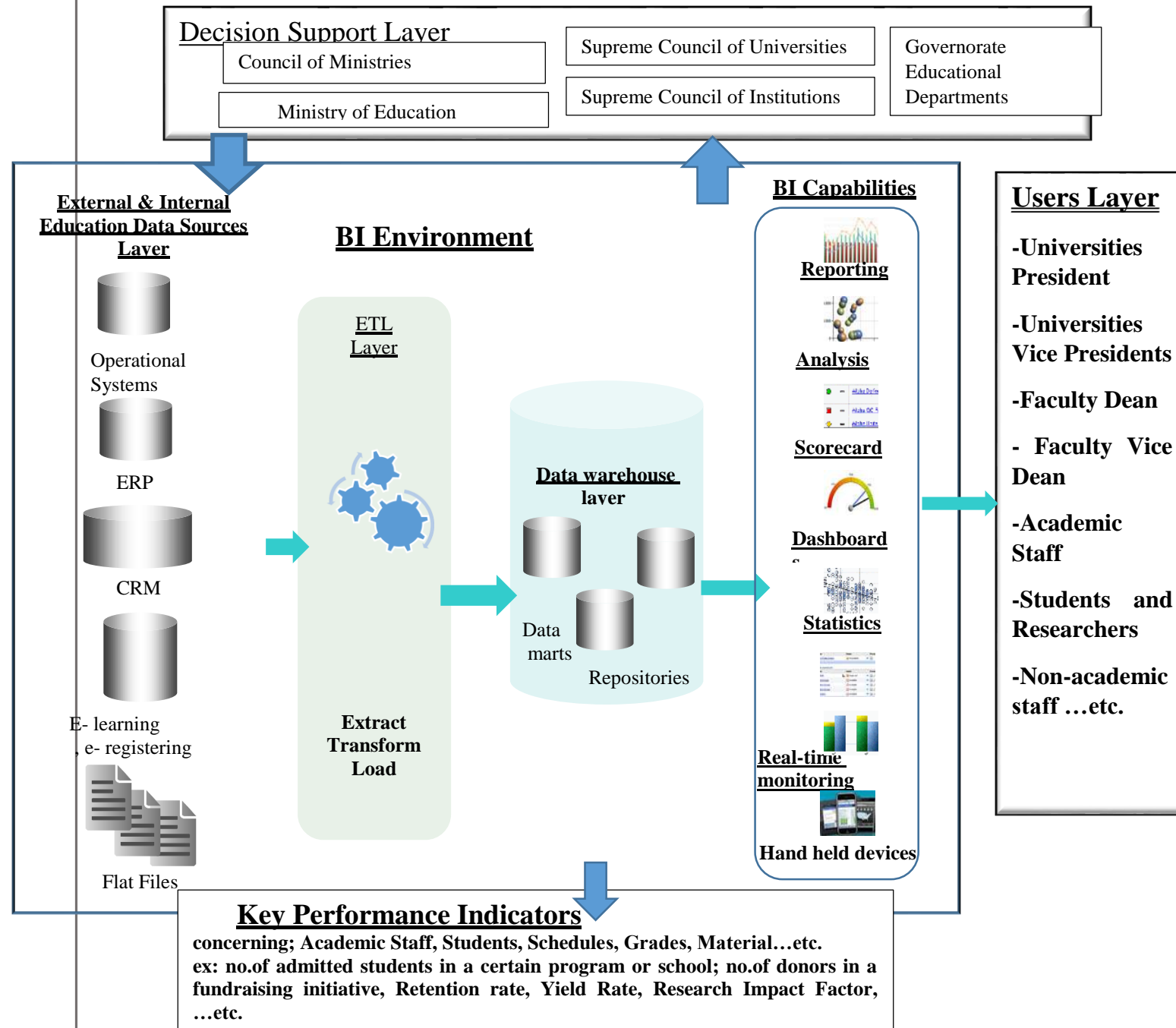Business Intelligence in the Strategic Management of Egyptian Institutions

Decision Support Layer

Council of Ministries	Supreme Council of Universities
Ministry of Education	Supreme Council of Institutions

Governorate Educational Departments

External & Internal Education Data Sources Layer

BI Environment

BI Capabilities

Users Layer

-Universities President

-Universities Vice Presidents

-Faculty Dean

- Faculty Vice Dean

-Academic Staff

-Students and Researchers

-Non-academic staff …etc.

Operational Systems

ERP

CRM

E- learning , e- registering

Flat Files

ETL Layer

Extract Transform Load

Data warehouse laver

Data marts

Repositories

Reporting

Analysis

Scorecard

Dashboard

Statistics

Real-time monitoring

Hand held devices

Figure 5-2 Proposed "Business Intelligence" based "Performance Management" Generic Model for Egyptian Academic Institutions

Key Performance Indicators

concerning; Academic Staff, Students, Schedules, Grades, Material…etc.
ex: no.of admitted students in a certain program or school; no.of donors in a fundraising initiative, Retention rate, Yield Rate, Research Impact Factor, …etc.

By the researcher, The Proposed "Business Intelligence" based "Performance Management" Generic Model for Egyptian Academic Institutions

5.4 Conclusions & Recommendations

5.4.1 Research conclusions

The research most important conclusions, is proofing the benefits of integrating **traditional** and **modern Business Intelligence** concepts and technologies during the **Strategic Management** and the **Business Model** of organizations and institutions. The following introduces various groups of conclusions from different point of views:-

Generally;

- Business Intelligence Contribution for most enterprises and organizations became crucial due to the importance and benefits it facilitates to the business.
- Business Intelligence tools and technologies support the enterprise performance and strategic management by improving performance, increasing efficiencies at all levels of management either operational, tactical or strategical
- Business intelligence acquires strategic insight to align multiple business processes with key business objectives through integrated "Performance management" and analysis.
- Business intelligence acquires tactical insight to optimize business processes by identifying and monitoring business trends; detecting previously unseen problems, opportunities, anomalies; monitoring competitors or customer/consumer behaviors; predicting outcomes and providing alerts that require management action.

In more details;

- Business Intelligence provides **insight of consumer behavior**; it allows continuous monitoring of consumer and customers behavior and analyzing their buying trends, to easily identify problems and potential solutions quickly, reduce customer concerns and improve retention, predict what consumer needs, how the current and future consumption will look like, and act accordingly by improving quality of customer services provided or developing new products to attract more customers and increase profits.
- **Business Intelligence improve operational performance and visibility**, by optimizing internal business processes; providing real-time information, analyzing content and context of the data and increasing the organizational operational efficiency.

- **Business Intelligence provides successful strategic plan;**, accelerating and improving decision making and providing faster and more accurate data access and reporting. The BI analytical facility turns data into actionable information by identification of new opportunities, facilitating new insights through discovering of unknown patterns, identifying market trends, tracking innovative projects more effectively and illustrating important hidden connections between various areas of the business, that will help to understand the implications of various organizational processes better and enhance planning for the future.
- **Improve enterprise efficiency**; by increasing productivity, driving new revenues; and gaining competitive advantages over business rivals
- Business intelligence tools and techniques, either traditional or modern support very much various strategic analysis techniques like SWOT, BCG, etc.
- BI technologies in the business model verifies and supports Herrings Organizational **"Key Intelligence Topics"** Needs

Technically;

- BI utilizes various activities and tools to fulfill the institutions objectives; reporting tools to provide what has already happened, OLAP and Visualization Tools for analysis and to understand why things happened, Scorecards & Dashboards & Alerts to monitor what's happening, data mining tools and techniques for forecasting and prediction.
- Using various business intelligence tools and techniques like Online analytical processing "OLAP", data mining, forecasting, reporting, analysis helps in measuring the overall performance of the enterprise
- Data mining is an effective means of making the most of the information available in the framework and creating promising new opportunities at the institutional level
- Data mining first started with structured data then it developed to unstructured data, text mining and web mining which have been lately widely used. Data discovery tools are modern tools of data mining, analyzing and smart visualization. Plug n play predictive analytics allows users to perform classification, clustering, associative, time series and other predicative and forecasting analysis without data scientist or statistician skills

Regarding the proposed system;

- "Business Intelligence" based "Performance Management" system supports decision makers especially on the strategic level, by making use of

quantitative and qualitative, lagging and leading, balanced against targeted objectives and benchmarks.

- Integrated business intelligence technologies at the academic institutions promise a great progress and improvement on the local as well as on the national level

- The proposed "Business Intelligence" based "Performance Management" System for Egyptian Academic Institution in Higher Education helps facing the university challenges and problems and improve its performance and efficiency by aligning the business model with the targeted performance

- The proposed system, main objective is to monitor and control the university performance and keep it up through real-time performance management while monitoring the key performance indicators and keep them into the desired level.

Modern new Business Intelligence Technologies;

- Since 2010 and up till now new terms, tools and techniques appeared like agile business analytics, self-service features, smart data discovery, big data platform and machine learning in BI

- Modern BI, technologies and Platforms emerged recently, will craft an entirely new business model that creates more compelling value proposition for customers and that challenges the traditional model

- "Business Analytics" is an interaction of IT technology, strategy, business processes, a broad spectrum of human competencies, organizational circumstances, and cooperation across the organization.

- While traditional "Business Intelligence" provides lag business information, "Business Analytics" takes Business Intelligence beyond reporting by processing lead information, that is the innovative decision support needed to revolutionize business process. Both types are supporting decision making, where lead information helps organization to compete, while lag information maintains and optimizes already existing processes.

- International Gartner's study estimates, that the global BI and analytics market will grow from $18.3 billion this year (2017) to $ 22.8 billion year 2020, whereas the market value will slow down for a while due to the increased vendors' competition.

- The study added that "The availability of an active marketplace where buyers and sellers converge to exchange analytic applications, aggregated data sources, custom visualizations and algorithms is likely to generate increased interest in the BI and analytics space and fuel its future growth".

- Many international companies already gained and made use of modern BI technologies as Big Data Platform, Predictive Analytics, Online Data Discovery, Self-Services like Uber , Airbnb and others.

5.4.2 Research Recommendation

From this point of view the researcher advises to make use of traditional and modern Business Intelligence concepts, tools and technologies in the enterprise seeking for high performance and efficiency to benefit on the local, national as well as the international level by;

- Encourage Egyptian institution and organization to make use of the business intelligence new technologies
- Dedicating certain budget to finance the transformation to the new business models.
- Studying, analyzing and implementing the proposed system and many others in the higher education sector in Egypt as it will definitely enhance the whole education process.
- Adopting, deploying and developing similar systems in different sectors improving performance, efficiency and competitive advantages.
- Providing technological and technical facilities for the implementation such as programs, tools, platforms…
- The business need to analyze complex data sets, models and diverse data sources leads to more investments in deploying fast automatic tools for data preparation, cleaning, enriching and finding.
- Generally, there is a great need to encourage institutions and organizations to benefit from these technologies

Future Work

Studying, analyzing deeply the proposed system aiming to deploy it and benefit from its implementation in the future

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Appendix

Herrings Key Intelligence Topics

Following we will present the three tables of the famous Herrings Key Intelligence Topics defining the organizational actual intelligence needs for three main topics. The first table presents the Strategic Decisions and Issues, the second presents the Early Warning Topics and the third presents the Key Players in the Marketplace.

Table 5-1Examples of Strategic Decision and Issues

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1. Provide intelligence inputs for the company's strategic plan to create "our" future competitive environment.

2. Formulating "our" global competitive strategy: Assess the role of competitors in achieving our business objective(s).

3. Globalization of (Our) Industry: How/with whom should we proceed? What are our competitors doing? With whom?

4. Asian/South American/etc. market development: Assess current competitive situation; describe the most likely future situations.

5. Strategic investment decisions: Identify and assess changes in the competitive environment, including:
- Key/critical industry investments by others
- Cash requirements of other industry companies
- Involvement/role of investment community
- Possible alternative sources for future investments, including alliances, acquisitions, etc.

6. Should we expand our present production capacity or build a new plant with a more cost-effective manufacturing process?

7. What plans and actions must we take to maintain (our) technological competitiveness vis-a-vis key competitors?

8. "Product" development program: Identify and assess the programs of our leading competitors and assess the status of other competing technologies.

9. New product development and roll-out: How and when will the competitors respond? How will they affect our plan?

10. How will our new distribution/sales/marketing strategy be viewed by the industry? Our competitors? Our distributors?

11. Protection of "our" proprietary information/technology
- Competitor's efforts to acquire it?
- Others interested in it?

12. Human resource issues: Hiring and retaining key employees.

Early Warning Topics

Table 5-2 Examples of Early-Warning Topics

1.Areas of possible technological "breakthrough" that could dramatically affect our current and future competitiveness.
2. Technological developments, affecting either production capabilities or product development and their uses by competitors and others.
3. Status and performance of Key Suppliers.
- Their financial "health"
- Cost & quality problems
- Possible acquisition and/or alliances
4. Possible disruptions in supplies of crude-oil/components/etc.
5. Change in (our) industry procurement policies and processes.
6. Change in customers/competitors perceptions of us/our services.
7. Companies and/or combinations of companies, considering possible entry into our business or markets.
8. Changes in international political, social, economic or regulatory situations that could effect our competitiveness.
9. Regulatory Issues: Near-term changes; deviations in long-term trends; other governmental changes that could impact current regulatory regimes, e.g. people, policy, etc.
10. Intelligence on Alliances, Acquisitions, and Divestitures among our competitors, customers, and suppliers:
- Reasons and forces causing them
- Objectives and purposes of completed deals
11. Financial Initiatives by major competitors:
- Changes in current financial strategy(s)
- Alliances, acquisitions, divestitures, etc.
12. Interests and efforts by others to acquire our company.

Key Player in the Market Place Topics

Table 5-3 Examples of Key Players in the Marketplace

1. Provide profiles of our major competitors, including their strategic plans, competitive strategies, financial & market performance, organization & key personnel, R&D, operations, sales & marketing, etc.
2. Provide in-depth assessments of Key Competitors, including:
   - Their competitive intent vis-a-vis us and our major customers
   - Strategic plans and goals, including international objectives
   - Key strategies: Financial, technological, manufacturing, business development, distribution, and sales and marketing
   - Current operational and competitive capabilities
3. Identify new and emerging competitors, particularly those coming from entirely different industries and businesses.
4. Describe and assess our current and future competitive environment, including: customers and competitors; markets and suppliers; production and product technologies; political and environmental; and the industry's structure, including changes and trends.
5. New customers, their needs and future interests: What are they and how are our Competitors trying to satisfy them?
6. Industry and customer views, attitudes and perceptions regarding "worth" of our branded products, services, etc.
7. Identify and assess new industry/market players, including: Suppliers, major distributors, customers and/or competitors that are considering entry into our business.
8. New technology/product developers: What are their plans and strategies for competing in our industry?
9. Need significant improvement in market share and growth data, including that of our competitors.
10. Management and operations need better intelligence concerning regulatory and environmental activities for planning and decision making.
11. The investment/financial community: What are their views and perceptions of our business and industry?
12. What are the interest and purpose of various suppliers and industry observers in gathering information about our company?