Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Engineering

Bachelor Thesis

Comparison between SAP ERP and MS Dynamics 365

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Systems Engineering and Informatics
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Thesis title
Comparison between SAP ERP and MS Dynamics 365

Objectives of thesis

The objective of this thesis is to compare the advantages and disadvantages of using SAP ERP and MS Dynamics 365 in the enterprise level.
The partial goals of this thesis will be to
- give insight to real situations where companies use either one of these applications
- give a comparison of the gains made by these companies based on the application they used

Methodology

The methodology implemented to achieve the objectives of this thesis will be to utilize data found from companies that use SAP ERP and MS Dynamics 365. The practical approach would be to use a “before and after” type of analyzation to better understand the tangible changes brought by using either one of these software’. It will be a multi criteria analysis where by we would look at the gains from a money, time and employee utilization standpoint.

The proposed extent of the thesis

30 – 40 pages

Keywords

ERPs, materials management, companies, integration, sales and distribution, finance, production planning

Recommended information sources

A Comparative Study between the Different Sectors Using the ERP SoGware in Jeddah Region- KSA
A Successful ERP Implementation in an Ethiopian Company: A case Study of ERP Implementation in Mesfine Industrial Engineering Pvt. Ltd
Commercial ERP Systems and User Productivity: A Study Across European SMEs
MonetDB: Two Decades of Research in Column-oriented Database Architectures
SAP HANA® Platform – Technical Overview Driving Innovations in IT and in Business with In-Memory Computing Technology

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Declaration

I declare that I have worked on my bachelor thesis titled "Comparison between SAP ERP and MS Dynamics" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 16.3.2020 _____

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I would like to thank Professor Jan Tyrychtr for his constant advice and patience throughout this process. I also have gratitude for the Czech University of Life Sciences for offering this course with affordable prices and flexible schedules.

To Rediet, for her support and patience….

My family, for their unwavering belief.

Comparison between SAP ERP and MS Dynamics 365

Abstract

Managing a business is not an easy task to undertake. From catering the right amount and type of product to customers to managing of finances, business owners and managers find themselves juggling many business functions at once.

Enterprise Resource Planning (ERP) systems are designed to help managers centralize, integrate and automate different business functions in an organization to save costs, improve the collaboration between departments of the business, to improve productivity and make better decisions.

However, requirements of organisations' big business applications have gotten considerably more demanding by the day. Different enterprise resource planning software packages are on the market offering different features for their customers. SAP and Microsoft Dynamics ERP systems are compared in this bachelor thesis. These two business information systems are compared with respect of the unique feature they have to offer for organisations such as the means of deployment, cost and usability. Finally, results of the comparison are created and discussed.

Keywords: SAP HANA, MS Dynamics 365, ERP, CRM, SCM

Porovnány mezi SAP ERP a MS Dynamics 365

Abstrakt

Řízení podniku není jednoduchý úkol. Majitelé podniků a manažeři stojí před mnoha podnikovými rozhodnutími, od zajištění správného množství a typu produktu až po správu financí. Informační systémy typu ERP (Enterprise Resource Planning) jsou navrženy tak, aby pomohly manažerům centralizovat, integrovat a automatizovat různé podnikové funkce v organizaci za účelem snížení nákladů, zlepšení spolupráce mezi odděleními podniku, zlepšení produktivity a v neposlední řadě provádění lepších rozhodnutí.

Požadavky velkých firemních aplikací organizace se však dnes staly výrazně náročnějšími. Na trhu jsou k dispozici různé softwarové balíčky pro plánování podnikových zdrojů, které svým zákazníkům nabízejí různé funkce. V této bakalářské práci jsou porovnány ERP systémy SAP a Microsoft Dynamics. Tyto dva podnikové informační systémy jsou porovnány s ohledem na jejich funkce, které nabízejí organizacím a včetně prostředků na implementaci, nákladů a použitelnost. V závěru práce jsou provedeny a diskutovány výsledky provedené komparace.

Klíčová slova: SAP HANA, MS Dynamics 365, ERP, CRM, SCM

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List of Abbreviations

ERP: Enterprise Resource Planning

SCM: Supply Chain Management

CRM: Customer Relationship Management

MCA: Multi Criteria Analysis

DSS: Decision Support Systems

BI: Business Intelligence

HANA: High Performance Analytic Appliance

1. Introduction

Enterprise Resource Planning (ERP) software are software used by businesses to automate and better optimize critical business operations such as supply chain, customer relationship, accounting, sales and the like. ERPs try to facilitate the data flowing through the different departments of the organizations using them and try to provide better real-time decisions to the business executives.

SAP HANA is perhaps among the most well known ERPs worldwide. SAP HANA is a modern platform for real-time analytics and applications. (Schneider, et al., 2012) It is an application that analyzes system transactions and provides in depth analysis on how to make the processes run smoother, faster and more efficiently. “HANA” stands for “high-performance analytic appliance” and the name itself speaks for the in-depth and quick insights a customer can expect from the application. While MS Dynamics, introduced by Microsoft, is a software package that integrates ERP and CRM applications that work seamlessly to improve the management of a specific business. It is a package that works very closely with other Microsoft products including, but not limited to, SharePoint, Excel, Outlook and Power BI.

2. Objectives and Methodology

2.1. Objectives

The objective of this thesis is to compare the advantages and disadvantages of using SAP ERP and MS Dynamics 365 in the enterprise level.
The partial goals of this thesis will be to

- give insight to real situations where companies use either one of these applications
- give a comparison of the gains made by these companies based on the application they used

2.2. Methodology

The methodology implemented to achieve the objectives of this thesis will be to utilize data found from companies that use SAP ERP and MS Dynamics 365. The practical approach would be to use a multi criteria analysis where-by we would look at the gains from a money, time and system requirement standpoint. Multi Criteria Analysis (MCA) is a well-defined approach for measuring the performance of alternatives that are based on multiple features. This decision analysis tool enables the inclusion of relative importance, or weight, for each criterion. In MCA, desirable objectives are specified, and corresponding attributes or indicators are identified. The actual measurement of indicators need is not only in monetary terms, but also based on the quantitative analysis (through scoring, ranking and weighting) of a wide range of qualitative impact categories and criteria. In this thesis, the practical part employs the use of the Standard Level method in MCA to establish the dominant option in each of the criteria considered and establish a dominant “winner” (if there will be one).

An additional approach would be to compare these two softwares by looking at the cost of providing two servers, that have the same exact features, on the cloud on the two respective platforms these ERPs use.

3. Literature Review

3.1. Information Systems

Information systems are a set of software that help the user to better organize, analyze and utilize data. According to King (King, 2009), IS can play varied roles in an organization starting from a service provider up to other areas in the organization where IS is viewed as being critical to the future success of the business.

3.1.1. **Components of an Information System**

IS is a complex tool, composed by set of people, technical resources and methods, which provides collection, transfer, storage and processing data for the purpose of creating and presenting information needed by management users. (Tyrychtr & Vasilenko, 2015) There are several pieces involved in an information system and these include the hardware, software, databases, network and processes. Hardware is the physical part of the system and includes items such as printers, mouse, keyboard, and screens to name a few. Software is the set of programs that tell the hardware how to operate. There are two types of software and these are system software and application software. System software is the preinstalled and system critical software such as operating systems and programs that help the application software to function, while application software is designed for purposes such as creating documents, spreadsheets, webpages and the like. It allows the user to perform certain activities of IS and it can consist of several programs itself. (Tyrychtr & Vasilenko, 2015) Databases are a collection of data or information that are stored in a computer and usually stored in tables with columns and rows.

Network is the frame that aims to connect all the different hardware components in the information system to each other. It includes computer networks, mobile networks, voice and other technologies. (Tyrychtr & Vasilenko, 2015)The internet is an example of networks as it connects millions of people worldwide. Since people working in the same organization would usually need access to use the same information system, they would need access to the same network. Processes can be highly specific and different according to the need presented by the specific entity using the information system. They explain the procedure taken to analyze ad achieve the answers that the user is looking for.

There are different types of information systems. Some examples are Enterprise resource planning, decision support system, management information system, and supply chain management systems.

Types of IS	Function	Example
Function areas of IS (FAIS)	Support business activity in specific functional area	Systems for payroll processing
ERP	It integrated all functional areas of the organization	Systems like Oracle, SAP, Helios
MIS (Management Information System)	Creates summarized reports of the transaction data (usually within one functional area)	Total Sales report
DSS (Decision Support System)	Provides access to data and analytical tools	What-if analysis of changes in budget
SCM (Supply Chain Management) system	Manages the flows of goods, services and information between organizations	Walmart Retail Link System is online connected to Walmart supplier

Table 1 Types of Information Systems (Rainer, et al., 2012)

3.2. Management Information Systems

A management information system (MIS) is a system that employs the use of people, information and technology to support business managers by giving the best analysis on a particular issue to help optimize their decisions. It is used to create summarized reports of the transactions that a business manager might encounter. (Tyrychtr & Vasilenko, 2015)

MIS can be defined as "A system to convert data from internal and external sources into information and to communicate that information, in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible." (Lucey, 2004)

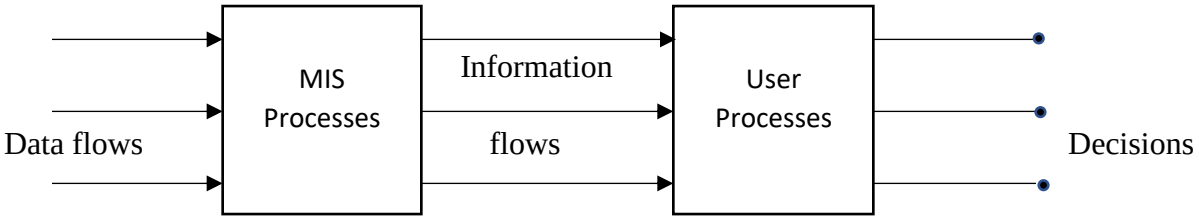

Figure 1 Decision focus of MIS (Lucey, 2004)

In order to effectively implement MIS, there needs to be sufficient conditions to make it work. Top level management needs to be involved from the designing stage and needs to give support throughout the implementation and reporting of the results. MIS leaders need to be working hand in hand with other business leaders in a company to make sure that the organization is using the right technology with the right data to produce the right information to be used in the right way.

One of the key elements in implementing MIS technology is finding the right system for the specific department or task that needs to be done. Tasks such as marketing and sales need to use customer relationship management (CRM) software while tasks such as logistics would naturally use supply chain management (SCM) software.

3.3. Supply Chain Management (SCM)

Supply Chain Management (SCM) is the management of material and information flows both in and between facilities, such as vendors, manufacturing and assembly plants and distribution centers (DC) (Douglas J. Thomas *, 1996). It includes a string of different processes that include logistics, storage, transportation, demand planning, inventory management and more. Effective SCM needs coordinated efforts from all stakeholders involved in the planning, production, storage and sales of goods. if done properly, SCM can bring higher profits, lower costs and lower wastage of resources for the implementing party.

SCM processes began as paper based schemes but through time they have shifted to the digital world. SCM has two major phases which are SC planning and SC execution. SC planning is a phase that uses demand planning to study and analyze past trends and practices to accurately

forecast future needs in order to better prepare and anticipate the needs before they even arise. This is done through statistical modelling and data analysis. Then, production planning takes place as the company outlines a more detailed plan of how, where and when they will produce the goods concerned.

Much friction, and thus waste of valuable resources, results when supply chains are not integrated, appropriately streamlined, and managed. (Cooper, 2000) One of the reasons that a supply chain is complex is that it has a lot of actors (stakeholders) involved. These include the raw material suppliers, producers, transportation, distributors, retailers, customers and many more. because it has such a complex network of bodies, there are bound to be oversights and lapses in the planning and execution of SCM models.

3.4. Decision Support System (DSS)

A decision support system (DSS) is a software based system that supports business managers in their decision making activities. DSS integrate specific capabilities, such as "what-if" processing, optimization , and simulation, to support managers as they deal with various types of decisions. (Sprague, 2002) Decision support system typically utilizes sales figures, Projected revenue figures and the consequences of different decision alternatives from experience to identify and solve problems and make decisions.

There are several Decision Support Systems. These can be categorized into five types.

3.4.1. **Communication-driven DSS-** this type of DSS helps groups of individuals working on common assignment. This groups can be internal teams of a certain department of a company. Web or a client server can be an example of a technology used to deploy DSS on an organization. Communications-driven DSS use network and communication technologies to facilitate decision-relevant collaboration and communication. In these systems, communication technologies are the dominant architectural component. (Boschker, 2010)

3.4.2. **Data-driven DSS**- Data-driven DSS refers to a category or type of Decision Support System that emphasizes access to and manipulation of a time-series of internal company data and sometimes external data. (Power, 07 Apr 2008). it

involves the utilization of database to come up with specific answers for specific cases. This model focuses on access and control of a stored data inside an organization to help the decision maker learn from past patterns and experience.

3.4.3. **Document-driven DSS:** supports decision making by analyzing given time-series of data and returning new information gained by those analysis. (Ivana Nižetić) The purpose of such a decision support system is to search web pages and find documents on a specific set of keywords or search terms Most data driven DSSs are targeted at managers, staff and product suppliers. A document driven DSS model uses documents in a variety of data type such as text documents, spreadsheets and database records to come up with decisions and manipulate the information to refine strategies.

3.4.4. **Knowledge-driven DSS**: Use problem-solving capabilities to derive appropriate actions for stated problems. Expert systems and recommender systems follow the knowledge-driven approach. (Knowledge-driven systems for episodic decision support, 2015) These DSS combine the expertise of people and computers to provide managers with recommendations for different cases of decision-making activities. The knowledge comprises of information about a specific matter, understanding of issues inside that area, and expertise at tackling these issues.

3.4.5. **Model-driven DSS:** Model-driven DSSs are complex systems that help examine decisions or choose between different options. Model-driven DSS use limited data and factors provided by decision makers to support decision makers in examining a situation, but in general large data bases are not needed for model-driven DSS. These are used by managers and staff members of a business. Provide decision support by using accounting, financial, representational, or optimization models. These systems provide access and manipulation of the model. (Joachim Baumeister, 2015)

3.5. Customer Relationship Management

CRM (Customer Relationship Management) is a business approach that seeks to create, develop and enhance relationships with carefully targeted customers in order to improve customer value and corporate profitability and thereby maximize shareholder value. (Payne, 2005)CRM allows firms to gather and oversee a lot of client information and afterward act depending on that data. The tactic a company takes when implementing CRM strategy can be categorized into *"*Operational*"* and *"*analytical*"* CRM.

3.5.1. **Operational CRM** : automates the business processes highlighting the day-to-day tasks of sales, marketing, and service functions across a range of customer touch points and channels. (Iriana & Buttle, 2008)

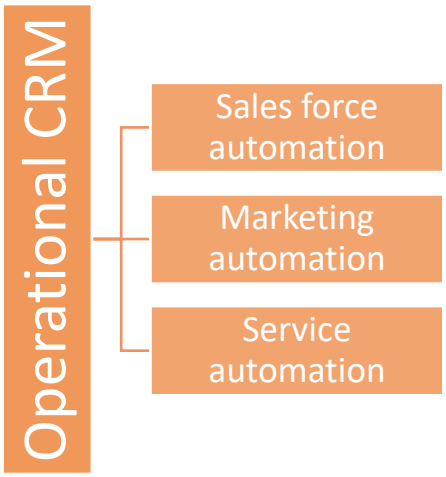

Figure 2 Classifications of Operational CRM (Source: Own)

Sales Force Automation is an application within an operational CRM software that manages all the activities related to sales.

Marketing Automation helps organizations easily access customer information so that they can build and execute targeted campaigns and drive leads.

Service Automation is associated with important aspects of customer relationship such as responding to and answering customer questions, solving issues with the product that customers have, etc.

3.5.2. **Analytical or Back Office CRM**: uses the information gathered using operational or front office CRM to find a better way to serve customers. This

includes customer profiling, analysis and reporting. Apart from that, it helps organizations manage internal data sets such as number of products sold, demand, purchase history, marketing campaigns sent, customer responses, conversions, etc.

3.6. Business Intelligence

Business intelligence (BI) is a term that encompasses concepts such as data mining, visualization, statistical modelling, querying and reporting just to name a few. According to (Tyrychtr & Vasilenko, 2015) BI is a process though which organizations can use virtual and digital technology for collection, management and analysis of structural or non-structural data. It is a set of tools that allow the head of an organization/business to have a top-to-bottom detailed overview of the entity's activities and can enable the subject to make informed decisions that can impact the business in a positive manner.

The main parts of a BI architecture are components for data extraction, data storage, data analysis, presentation and sectoral expertise. (Novotný, Pour, & Slánský, 2005)

The fundamental process works in such a way that data is collected, tracked, analyzed and used to decide the best course of action for the company. BI uses business analytics and data analytics as critical parts of the process but is not only limited to these two. Data scientists can use data analysis to delve deeper into the collected data to look for patterns and trends by using statistical modelling. It helps them answer the ever so important question of "What's the next big thing?" and helps the company in question to prepare well ahead of time to answer this dilemma.

Business analytics is done as part of the BI strategy of a company by implementing data mining, predictive analytics and statistics. Data mining is the concept of using query language to extract useful information from databases that exist already. It aims to discover, among other things, previously unknown connections between data sets/events. It employs artificial intelligence, database technology, query language and machine learning to provide useful information to the user. Predictive analytics uses this information to make assumptions about the future and to help the company to be prepared for any unforeseen circumstances.

Results of BI can be best expressed through graphics. Data visualization is used to present the findings of BI though graphs, dashboards and charts in ways that are easily understood and not quickly forgotten by the human mind. It helps drive more constructive and intuitive conversations about the results of the analysis.

BI provides tangible results if implemented properly. It will help organizations make cost effective decisions and thus allows it to make higher profits. The organization will be able to keep its competitive advantage by staying ahead of the curve by using predictions that are well timed and accurate. It can track employee performances and be used to motivate people in the organization to optimize their routines in the most time and cost-effective ways, it can also be used to offer incentives to the hardest working and most effective individuals within the organization. It spots gaps in the market and unmet needs by analyzing customer data which can be the next area of opportunity for the company.

The world of BI is ever-changing and needs constant efforts from the user if they want to stay up to date. BI tools are becoming more and more customized to fit the business needs of the organization in question. As the internet age continues, the amount of data available is so huge that we need more powerful data mining tools to filter out the actual relevant information that we need. Data quality is a big issue in the modern age and Data quality management needs to be implemented to uphold the integrity and truthfulness of data that is used to construct the predictions and forecasts that the company will later invest in.

3.7. Enterprise Resource Planning

Enterprise resource planning (ERP) is a term that is often used confusingly and interchangeably, so it is natural that it has multiple definitions. According to (Tyrychtr & Vasilenko, 2015) ERP is IS for planning, business management and business processes, which integrated and automates a large number of processes associated with the business. To gain a wider understanding of the matter it is better to think of all the different processes that are involved in the modern business world. These processes include – recruiting, human resources,

customer relationship management, accounting, inventory, and more. ERP (Enterprise Resource Planning) is a tool that organizations would use in order to make all these repetitive processes used inside to go smoother and hand-in-hand. They bring together these previously separated business processes together with more efficiency, clarity and precision that nowadays it is almost impossible to conceive a modern fully efficient organization that runs without employing some sort of ERP system.

ERP attempts to integrate all department and functions across a company onto a single computer system that can serve all those different departments' needs. (Parthasarathy, Enterprise Resource Planning : A Managerial & Technical Perspective, 2007)

The common trait of ERP systems is a singular and central database that is shared across all platforms in the organization which aims to combat data duplication and enhance data integrity. In layman's terms, this would mean that the human resources and inventory departments of a certain company would have access to the same pool of information which would in turn mean that the decision-making process these departments would go through would be more synchronized and accurate than if they had not deployed ERP systems across their company.

Another key feature of ERP systems is access to portals that have KPIs (Key Performance Indicators) which basically are metrics that gauge how the company is performing in certain aspects and also help keep track of the actual state the company is in in relation to previously set goals.

A common misconception about ERP systems is that they are only meant for large organizations -as the "E" in the ERP is imposing- but ERPs are increasingly being employed by small and medium sized companies as the technology is being embraced more openly. Cloud-based solutions such as SaaS (Software as a Service) have helped make ERP more affordable, easier to adopt and implement. Cloud solution is a more dynamic alternative and allow real time reporting, making the system even more flexible and responsive.

3.7.1. **Benefits of Using ERP systems**

ERPs have long been known for the advantages they bring to organizations that employ them. ERP Basically have to major benefits that do not exist in non-integrated departmental systems: The first one being a unified enterprise view of the business that encompasses all functions and departments; and an enterprise database where all business transactions are entered, recorded, processed, monitored ,and reported. (Elisabeth J. Umblea, 2003) Among the benefits ERP can bring some are listed in detail down below.

-Competitiveness – ERP packages provide the firm the option to stay ahead of the curve by helping them spot gaps in the market that can be turned into the next areas of opportunity because other firms which do not use ERPs wouldn't be able to spot them. There are of course two sides to this outlook- firms using ERPs would have to spend much more initially than firms which don't; but there is bound to be a return on investment (ROI) that is going to make the initial investment worth it. Companies cannot afford to put off an ERP implementation while their competition invests in ERP and starts reaping the benefits.

- Preparedness – ERP software gives the firm the time and awareness to be able to react to any changes in the business environment. ERPs try to provide real time information thus it will be crucial for the firm's roadmap in achieving targets in time.

- Collaboration – This is one of the biggest benefits of using an ERP software. The old-fashioned way in which large firms used to operate created a lot of information gaps between the separate departments, thus allowing lapses in judgement which waste huge amounts of resources that should have been invested in iterative development for the company. Large companies are bound to have several departments that are in critical need to work hand in hand with one another, but that has not always been the case in the past. This is one of the key problems that ERPs try to solve because without solving this issue making tangible changes in the company is virtually impossible. Centralization of the data stored in ERPs allows all departments within the company to have similar insight into the company's current state. The fact that it updates in real time leaves little room for gaps in communication.

- Scalability – ERPs are not rigid/fixed systems which have to be replaced anytime there is a change in the company's size and structure. They are highly customizable and can be

tweaked to allow custom options for the company in case they go through expansion or reduction in their workforce and capabilities.

- Accessibility– ERPs have cloud options that make it even easier to collaborate from literally anywhere, on any platform (PC, mobile, tablet, ...) and at any time. This can enhance the effectiveness and reduce the time and money wasted by using traditional working methods.

3.7.2. Disadvantages of ERPs

- ERP implementations can be time-consuming – projects may take years to get completed and be fully functional.
- If examination prior to execution of ERP system is not done properly and experienced personnel and resources are not available while evaluating, ERP implementations can malfunction.
- Moving of existing data to the new ERP systems is challenging to accomplish.
- Extensive user training is needed as ERP systems are generally difficult to learn and use.
- Having an ERP system by itself does not guarantee the total success of the company.

3.8. SAP HANA

SAP Hana is an ERP software developed by the SAP company. SAP stands for Systems Applications and Products in Data Processing. The company was founded in Germany in 1972 by five people (Dietmar Hopp, Hasso Plattner, Hans-Werner Hector, Klaus Tschira, and Claus Wellenreuther) who were previously working in IBM. (SAP, n.d.).

It is an in-memory computing applications that combines SAP database software with server, storage, and networking hardware where the hardware is provided by partners of SAP company.

3.8.1. How SAP HANA works

It works by using data replication and uses three methods of replicating- log-based, ETL (extract, transform, load) based and trigger-based. The replicated data is then stored in memory and can be easily accessed by application that use SAP HANA in real time, thus providing real-time

analytics. (Schneider & Jandhyala, 2012) SAP HANA offers tight integration with SAP Business Intelligence tools by aggregating data from many applications into one.

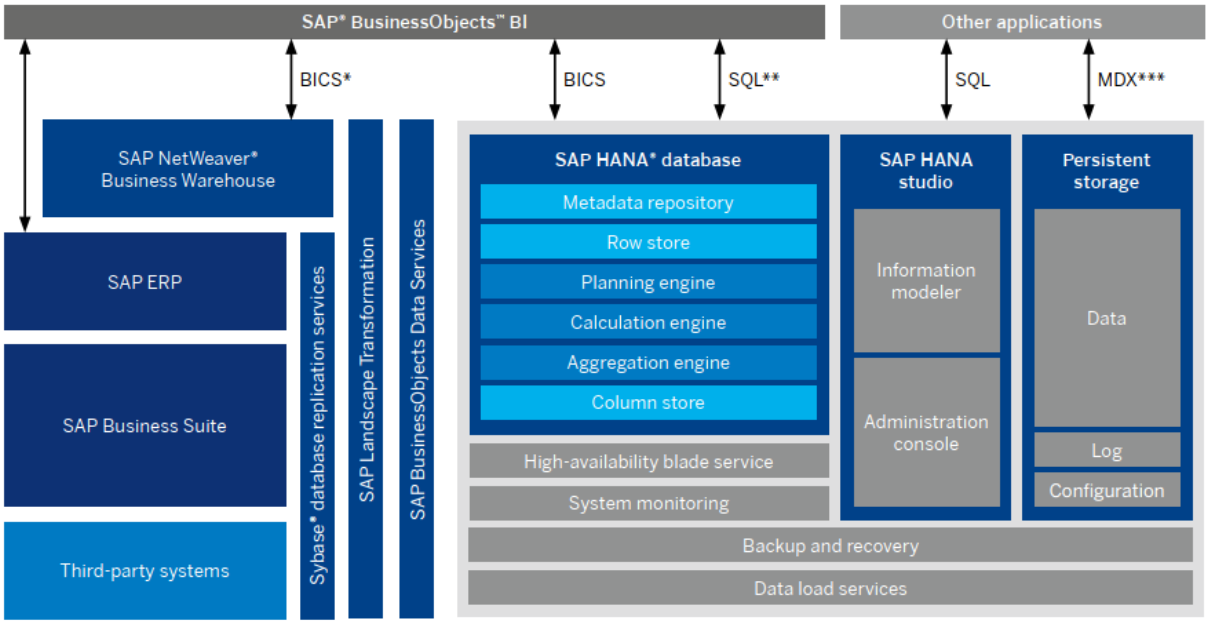

Figure 3 SAP platform overview (Schneider, et al., 2012)

Let's divide the platform into 3 groups.

3.8.2. **Major Functions**

Database Services: SAP HANA Platform is designed to leverage multi-core processing capabilities of today's processors. SAP HANA Platform's advanced compression techniques can significantly compress data so that more data can be kept and processed in the memory and processor caches.

Database Services: SAP is handles multiple data types – structured, unstructured, text, spatial and series data int its system.

Integration Services: Organizations generate and store data in multiple systems. To deliver a complete picture of an enterprise, SAP HANA platform includes integration services to handle various integration strategies from a variety of data sources.

3.8.3. **SAP in Companies**

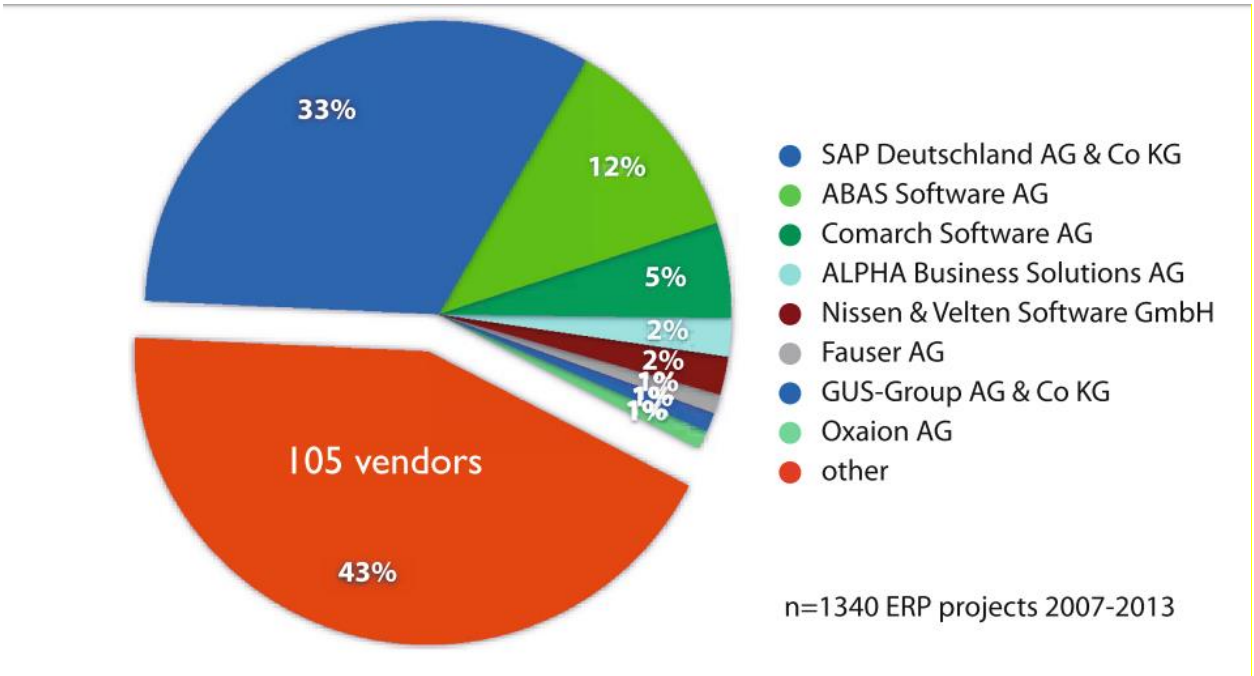

Figure 4 Top Ten ERP vendors in Germany, covering 1340 projects from 2007 to 2013 (Trends and Future Research in Enterprise Systems)

As seen from the figure, SAP took the largest share of the business with 33%, while the number six on the German market had an observed market share of less than 1 %. The market leader was "other" as of 2013. The US vendors Oracle and Microsoft are within this group. (Gronau).

3.9. Microsoft Dynamics 365

Microsoft Dynamics 365 was developed as a follow to the Microsoft Office 365 applications suite. (Bellu, 2018) It is an application that has combined the capabilities of Enterprise Resource Planning, which includes its data management and financial planning software, with its Customer Relationship Management software- which includes its customer service branch. Dynamics originally got its name because it was a graphics-based software while the 365 part of

the name was given because people tend to use the Microsoft Office and Microsoft Dynamics packages for day to day use, hence 365 days in a year.

3.9.1. **How MS Dynamics works**

MS Dynamics offers a two-tier ERP system approach. This approach comprises of two brackets, where one bracket offers administrative functions such as human resources and management while the other bracket encompasses the operating functions of the organization. The functions on the second tier are more suited for operations that do not need the use of the whole ERP software. (Shankar, Thakkar, & Bellefroid, 2014) The CRM and ERP services are subdivided into applications. Application subscriptions are called "user subscriptions" where these applications need to be purchased separately. Users who only need a single application, may purchase the suitable application for their services and users requiring multiple applications may purchase as many additional applications as needed.

These subsystem Dynamics 365 applications include hundreds of facilities across the business process such as, Sales, Marketing, Customer Service, Field Service, Project Service Automation, Finance, Supply Chain Management, Talent, Retail and Business Central.

3.9.2. **Major Functions of MS Dynamics**

Sales: Focus on build trusted relationships and take action with a solution that unifies relationship data and provides contextual AI-driven insights.

Customer service: To Deliver the tailored service customers expect across channels with AI-enabled experiences and insights

Field service: Predict, detect, and resolve field service issues to ensure consistent and dependable operations. To dispatch technicians when they are needed while optimizing resources and costs.

Finance: improve financial controls, optimize cash flow, and make strategic decisions faster to drive growth by using real-time, unified global financial reporting, embedded analytics, and predictive insights.

Human resources: Help employees get the information they need through self-service HR tools.

Simplify and optimize benefits, compensation, leave and absence, certifications and training, and compliance programs.

Supply chain management: Drive automation and reduce downtime using IoT intelligence across of manufacturing processes and perform production planning in real time with Planning Optimization Preview.

4. Practical Part

This part of the thesis will aim to compare directly between the two ERP systems previously discussed, SAP HANA and Microsoft Dynamics 365. It will do so by providing a multi-criterial analysis by comparing the two against a set of indicators which any organization can use to choose ERP systems.

4.1. Selecting Enterprise Resource Planning systems

Selecting the ERP system that best fits a specific organization is an important part of the business process. There is no one size fits all approach when it comes to choosing ERPs so there has to be an independent assessment of the applicability of the ERP into the organization's existing IT and personnel structure. Since implementing ERPs in general is a costly endeavor there should be enough analysis made before making a decision regarding it.

4.1.1. **Factors in choosing between Enterprise Resource Planning systems**

Some of the key factors in choosing these systems are as follows (Parthasarathy, Enterprise Resource Planning : A Managerial & Technical Perspective, 2007):

- Ease of maintenance, adaptability and flexibility
- Reduced cycle time and lead time
- Multi-lingual and multi-currency features
- Increased customer satisfaction
- Higher software reliability
- Market position of vendor
- Implementation of desired business processes
- Operating system independency
- Meeting customer needs
- User friendliness

Factors considered	**Percentage of Importance**

Functionality of the ERP package	24
Vendor's reputation	26
Vendor's ability to provide a complete solution	16
Project costs	23
Future software maintenance provided by the ERP vendor	11

Table 2 Important factors influencing the ERP vendor selection (Parthasarathy, 2007)

By taking one of these factors as a test for the preference between the two ERPs, we can have a clearer picture of the situation.

4.2. Cloud Availability and costs

Cloud availability is a key factor in influencing selection of ERP systems. Cloud availability means the user can access application and databases over the internet instead of the usual on-premise (server) based approach. It offers access to shared resources such as CPU, RAM, storage and network over the internet with much lower cost and better security. (Vanstechelman, 2018)

As part of the methodology to check out the cost breakdown, we can look at how much the cost is to run a server with 16 cores and 64 GB of RAM on the Amazon Web Services (for SAP HANA) and the Microsoft Azure (for MS Dynamics 365) platforms.

The SAP HANA Cloud platform has two options, which are the SAP HANA Cloud and the SAP HANA One. SAP HANA Cloud is a service that provides infrastructure to deploy SAP HANA quickly and its licensing is purchased on a monthly subscription. (Vanstechelman, 2018) It is a privately managed cloud. SAP HANA One, on the other hand, is a service that is meant to be used by smaller and middle-sized enterprises and is an hourly subscription. It is preferred by smaller businesses because of its lower cost and is more suitable for companies looking to break into the market.

Microsoft Dynamics also offers cloud deployment as part of the Microsoft Cloud SaaS (Software as a Service) offering. (Mounla, 2017) The long-term strategy from Microsoft has been to gradually move its customer base to the cloud so as to reduce the effort and expense needed from its client's part. (Bellu, 2018) Same as SAP HANA, MS Dynamics also offers two options when it comes to cloud deployment. The first option is to connect through a private cloud.

While the second option is to connect using the Microsoft Azure cloud computing services. Microsoft Azure is the collective name for the cloud computing services that Microsoft provides. (Webber-Cross, 2014) The two main reasons that a business can prefer to use Microsoft Azure are its infrastructure capabilities and cost.

The table below shows the deployment costs for Linux servers with MS Dynamics and SAP HANA which were deployed on MS Azure and AWS platforms respectively.

CPU	RAM	Storage	Azure Price	AWS Price
4 cores	8 GB	40 GB	$ 764.41	$ 696.66
8 cores	64 GB	200 GB	$ 1044	$ 1018.03
16 cores	64 GB	400 GB	$ 1359.36	$ 1379.7
32 cores	128 GB	800 GB	$ 1797.36	$ 1976.76

Table 3 Costs for Linux servers with MS Dynamics and SAP HANA (source: (AWS Simple Monthly Calculator, n.d.), (Microsoft Azure Pricing Calculator, n.d.))

The table below shows the deployment costs for Windows servers (with SQL included) with MS Dynamics and SAP HANA which were deployed on MS Azure and AWS platforms respectively.

CPU	RAM	Storage	Azure Prices	AWS Prices
4 cores	8 GB	40	$ 1884.96	$ 1914.05
8 cores	64 GB	200	$ 3407.74	$ 3600.96
16 cores	64 GB	400	$ 6059.10	$ 6517.63
32 cores	128 GB	800	$ 11537.02	$ 12696.33

Table 4 Costs for Windows servers (with SQL) with MS Dynamics and SAP HANA (source: (AWS Simple Monthly Calculator, n.d.), (Microsoft Azure Pricing Calculator, n.d.))

4.3. System requirements

Microsoft had at one point planned for Dynamics to go exclusively on cloud but had since changed its position. The recommended system requirements to run MS Dynamics are 8 GB of RAM and 10 GB of available hard disk space, as well as 2 GHz CPU. At the time of writing, a base Dynamics 365 package includes 5 GB of storage. Every additional 20 licenses offer an additional 5 GB of storage for your instances. Currently, there is a technical limitation of a maximum 5 TB of total storage. (Mounla, 2017)

While for SAP HANA, the requirement for data storage is to be four times that of RAM (Random Access Memory) (Mankala & Mahadevan, 2013). A lot of RAM is needed for the system and this RAM also needs to be matched with the CPUs (Central Processing Unit). CPUs with an added number of cores of 20 would need a 256 GB RAM and this would in turn mean a data storage of 1024 GB. It is needed so that the system can perform backups.

The following is a table of the frequently used sizes that have been defined by SAP HANA as T-shirt sizes.

SAP T-shirt	XS	S/S+	M/M+	L
Memory	128 GB	256 GB	512 GB	1 TB

CPUs	2	2	4	8
SAS/SSD for data volumes	1 TB	1 TB	4 TB	4 TB
SAS/SSD for log volumes	128 GB	256 GB	512 GB	1 TB

Table 5 T-shirt sizes for SAP HANA (Vanstechelman, 2018)

4.4. Deployment Time

The table below shows the implementation period for Microsoft Dynamics in a construction company in Ethiopia. The company, Mesfine Industrial Engineering, is a metal construction and electromechanical engineering complex in Ethiopia.

Tasks	Days	Start Date	End Date
Phase 1. Project Organization & Kick off	2	17 March 2008	18 March 2008
Phase 2. System Definition & Data Preparation	31	19 March 2008	23 April 2008
Phase 3 Environment Development	27	24 April 2008	22 May 2008
Phase 4. Conference Room Pilot (CRP)	17	29 July 2008	19 August 2008
Phase 5. End-User Training	11	20 August 2008	02 September 2008
Phase 6. Go Live Preparation	10	01 September 2008	12 September 2008

Phase 7. Go Live to MS Dynamics	16	11 August 2008	30 October 2008

Table 6 Project time scale for implementing MS Dynamics at Mesfin Industrial Engineering (A Successful ERP Implementation in an Ethiopian Company: A case Study of ERP Implementation in Mesfine Industrial Engineering Pvt. Ltd, 2012)

As it can be seen in the table, the implementation or deployment of MS Dynamics in this company, took a total of 114 days. This was due to factors such as cultural problems (due to preference of the legacy systems in place at the time), business problems (the company did not have a rigid structure at the time of implementation) and technical problems (lack of accurately entered data).

The implementation of MS Dynamics at Mesfine Industrial Engineering has helped the company's ability to deliver on its promises on time. It has led to better customer reception and this in turn leads to more orders and higher revenue.

Below is the implementation time required by a model company where SAP ERP was implemented. The company is headquartered in the United States and has a total workforce of over 18000 people.

Project tasks	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**
Prep and Blueprint											
Usability study											
Functional & Technical Design											
Realization											
Development Wave I											
Integration Testing Wave I											
UAT Wave											

Deployment											
WAVE I											

Table 7 A wave-based rollout plan for SAP ERP in a company (Kalaimani, 2015)

As we can see from this table the prep/blueprint to realization stage of the implementation took from October until the end of January the following year meaning it took about 4 months to do so. There was second wave of Development done for this installation, so the additional wave took until the month of August to finish.

4.5. Quantitative factor scores

In terms of evaluating how effective the selected ERP system will be there are also other factors to look at. These have to do with the compatibility, complexity, training, empowerment, best practices and efficiency of the selected ERP system. The next figure shows the interdepend ability of these qualities.

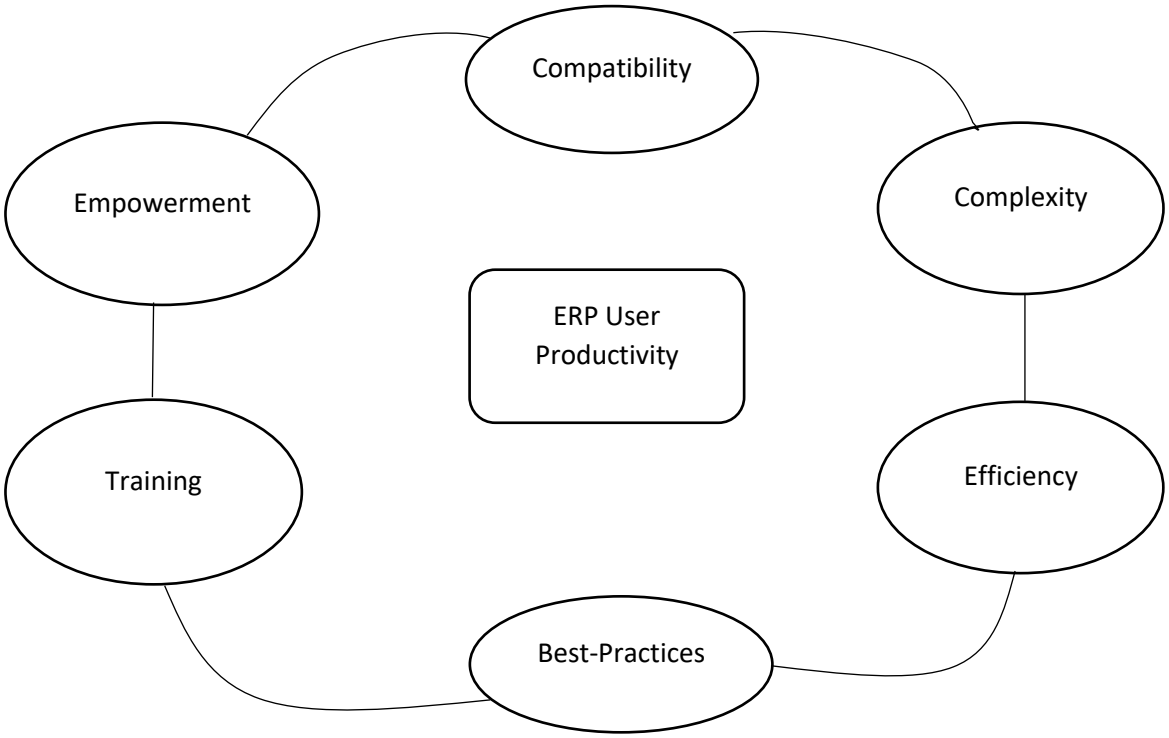

Figure 5 Research framework to assess the impact of ERP on user productivity (Pedro Ruivo, 2013)

- Best practices mean the ease of setting up the ERP package and its user friendliness and how easy it is to customize it to make it fit the business
- Efficiency is gauging the speed and ease of doing day to day tasks repeatedly
- Compatibility is how well the ERP gets along with the other components of the infrastructure- for example how well the ERP adapts with mailing services or reporting tools
- Complexity is the measure of how we can find out the user is at ease with using the system and it's a degree of measurement for how hard the ERP is to get used to
- Training is a measure of the time scale that the users take to be trained to understand and employ the system
- And Empowerment is concerned with the availability of real time data for the user to work with and the enablement of working together across the organization by using the ERP system.

ERP package/factor	Dynamics	SAP
Compatibility factor score	4.17	3.63
Complexity factor score	3.29	3.30
Efficiency factor score	4.01	3.96
Best practices factor score	3.71	3.47
Training factor score	3.30	3.21
Empowerment factor score	3.95	4.03

Table 8 ERP Packages and each respective factor influencing user productivity (Pedro Ruivo, 2013)

As we can see from the table, the total score for the MS Dynamics ERP is 22.43 while the total score for the SAP ERP is 21.6. MS Dynamics is rated higher in terms of Training, Compatibility, Complexity, Efficiency and Best Practices. SAP only took the upper hand in the Empowerment section as it was deemed to be a better tool to encourage employee engagement and productivity.

4.6. Comparison made by Multi Criterial Analysis

Taking all the results above into consideration, we can build a table showing a simple Multi Criterial Analysis (MCA) performance matrix. In this matrix, the factors discussed above will come into play to make an informed decision in comparing between the two ERPs. We can give "ticks" indicating where a dominant "winner" has been found in each of the four categories discussed above. By counting the number of ticks corresponding to each ERP we can try to make a better judgement of which ERP can be preferred by companies looking for the same qualities as the ones we are comparing from.

The "Cost" column is one where the dominant option would ideally be the cheaper option. The "System Requirements" column would have the option with the lower system infrastructure demand as the winner, while the "Deployment Time" would obviously see a shorter time span needed to implement the ERP as a virtue. The final column, "Quantitative Factor Scores", is an aggregate of the scores that were taken from the study quotes above and considers the higher sum to be preferable.

	Cost	**System Requirements**	**Deployment Time**	**Quantitative Factor Scores**
SAP ERP	-			
Microsoft Dynamics	-	✔	✔	✔

Table 9 Comparison of the two ERPs made with Standard Level Multi Criteria Analysis (Source: Own)

As we can see from the table MS Dynamics has the clear dominance in three of the categories, while the "Cost" category is designated as a tie and is not awarded to neither one of the ERPs because there wasn't a clear winner in that area.

Additionally, from this table we can gather that potential gains that a company would get from choosing to use the dominant option in this scenario (MS Dynamics) would be lower costs to achieve the minimum system requirement (in terms of hardware costs), and less time needed for deployment of the ERP system. The company would also have an ERP with better overall usability index as we saw in the Quantitative Factor Scores- therefore, making it more generally favorable to achieve the goals set out by the company.

5. Conclusion

As was mentioned on the methodology, on this bachelor thesis the two systems are weighed against each other by their performance in areas such as cost, system requirement, deployment time and such.

The deployment time observed in the SAP table shows a Preparation/Blueprint to Realization time scale of 4 months or 120 days while the second or final wave of the implementation took about 11 months or 330 days. In the Windows Dynamics case, we can observe a Project Organization to Go Live implementation time scale of 114 days. It must be taken into consideration that the cultural acceptance of ERP systems plays a big factor in the time taken to implement the systems in a specific enterprise.

When we come to the system requirements SAP ERP systems are more demanding in terms of the minimum required hardware capability. MS Dynamics can be run on a minimum of 2 CPU, 8 GB RAM and 10 GB of hard disk space, while SAP requires at least 4 times the size of its RAM when it comes to hard disk space.

As we can see from the tables made from the calculations for deploying Microsoft Dynamics and SAP HANA on the cloud platforms Microsoft Azure and Amazon Web Services respectively, there are cost differences between using the two systems. The observation was split into two parts, which were based on the two operating systems used which were Linux and Windows OS. The Windows OS estimation was done by using a SQL server in the East United States region and was estimated using a sample of four different sizes with regards to the CPU, RAM and Storage of each server. As the table indicates, the estimates on the Azure platform for the MS Dynamics system are always cheaper than the estimates on the AWS servers for the SAP HANA system.

The second table contains an estimation for Linux servers for MS Dynamics and SAP HANA systems on MS Azure and AWS platforms respectively. On this estimation there were also four sample sizes up for consideration. However, on this estimation it was not possible to

find a “pure winner” since in half of the instances the AWS option was cheaper while on the other half the MS Azure option was cheaper.

The table showing the scores for Quantitative Factor Scores shows that the aggregate for the scores of Microsoft Dynamics is 22.43 while the sum for SAP scores is 21.6. This score was itself a cumulative for the scores of each ERP on the basis of compatibility, complexity, training, empowerment, best practices and efficiency of the systems; so, by itself it is a very good indicator of their usability.

Websites

(n.d.). Retrieved 1 25, 2020, from SAP: https://www.sap.com/corporate/en/company/history.html

AWS Simple Monthly Calculator. (n.d.). Retrieved from AWS: https://calculator.s3.amazonaws.com/index.html

Microsoft Azure Pricing Calculator. (n.d.). Retrieved from Microsoft Azure: https://azure.microsoft.com/en-us/pricing/calculator/#virtual-machines7a847980-3039-4949-ac0d-cd8b91bfa112

Bibliography

Bellu, R. (2018). *Microsoft Dynamics 365 for Dummies.* New Jersey: John Wiley & Sons, Inc.

Boltena, A. S., & Gomez, M. J. (2012). A Successful ERP Implementation in an Ethiopian Company: A case Study of ERP Implementation in Mesfine Industrial Engineering Pvt. Ltd. *5*.

Boschker, C. (2010). *Explanation capabilities and User Acceptance of a Business Intelligence Decision Support System.* Utrecht University .

Cooper, D. M. (2000). Issues in Supply Chain. *Elsevier Science Inc. All rights reserved*.

Douglas J. Thomas *, P. M. (1996). Coordinated supply chain management. *European Journal of Operational Research*.

Elisabeth J. Umblea, R. R. (2003). Enterprise resource planning: Implementation proceduresand critical success factors. *European Journal of Operational Research*, 1-2.

Gronau, N. (n.d.). Trends and Future Research in Enterprise Systems.

Iriana, R., & Buttle, F. (2008). Strategic, Operational, and Analytical Customer Relationship Management.

Ivana Nižetić, K. F. (n.d.). An Overview of Decision Support System Concepts .

Joachim Baumeister, A. S. (2015). Knowledge-driven systems for episodic decision support.

Kalaimani, J. (2015). *SAP Project Management Pitfalls : How to Avoid the Most Common Pitfalls of an SAP Solution.* Apress L. P.

King, W. R. (2009). Planning for Information Systems. *14*.

Lucey, T. (2004). *Management Information Systems.* Cengage Learning EMEA.

Mankala, C., & Mahadevan, G. V. (2013). *SAP HANA Cookbook.* Birmingham: Packt.

Mounla, R. (2017). *Microsoft Dynamics 365 Extensions Cookbook.* Birmingham: Packt.

Novotný, O., Pour, J., & Slánský, D. (2005). *Business Intelligence: Jak využit bohatství ve vašich datech.* Prague: Grada Publishing.

Parthasarathy, S. (2007). *Enterprise Resource Planning : A Managerial & Technical Perspective.* New Age International.

Parthasarathy, S. (2007). *Enterprise Resource Planning : A Managerial & Technical Perspective.* New Age International Ltd.

Payne, A. (2005). HANDBOOK OF CRM: Achieving Excellence in Customer Management. Massachusetts: Newgen Imaging Systems (P) Ltd.

Pedro Ruivo, B. J. (2013). *Commercial ERP Systems and User Productivity: A Study Across European SMEs.* ISEGI, Universidade Nova de Lisboa, Campus de Campolide, 1070-312 Lisbon, Portugal and Department of Informatics, School of Economics and Management, Lund University, SE-223 63 Lund, Sweden.

Power, D. J. (07 Apr 2008). Understanding Data-Driven Decision Support Systems.

Rainer, R. K., & Cegielski, C. G. (2012). *Introduction to Information Systems: Enabling and Transforming Business.* New Jersey: Wiley Global Education.

Schneider, E., & Jandhyala, R. (2012). *SAP HANA PLATFORM - TECHNICAL OVERVIEW.* SAP AG.

Shankar, C., Thakkar, N., & Bellefroid, V. (2014). *Customer Success with Microsoft Dynamics Sure Step.* Birmingham: Packt Publishing.

Sprague, B. M. (2002). Information Systems Management in Practice.

Tyrychtr, J., & Vasilenko, A. (2015). *Business Intelligence in Agribusiness: Fundamental Concepts and Research.* Brno: Konvoj.

Vanstechelman, B. (2018). *SAP HANA - Implementation Guide.* Gleichen: Espresso Tutorials GmbH.

Webber-Cross, G. (2014). *Learing Microsoft Azure.* Birmingham: Packt Publishing.