FIT 3138
Real-Time Enterprise Systems

Lecture 11

Technologies Supporting Real-time Enterprise

Unit Outline

Week	W/C	Topic	Deadline:
1	25/07	Introduction to FIT3138; Introduction to Enterprise Systems	
2	01/08	Systems Integration - Role of ERP in Business Functions and Processes	Assignment 1 handed out
3	08/08	The Development of ERP Systems	
4	15/08	ERP in Sales and Marketing & CRM	
5	22/08	ERP in Production and Supply Chain Management	
6	29/08	Accounting in ERP Systems	
7	05/09	Process Modelling & Improvement	Assignment 1 due Assignment 2 handed out
8	12/09	ERP Implementation – Life Cycle & Strategy	
9	19/09	ERP Implementation – Risk Management	
Mid-semester Break (26 Sep – 30 Sep 2022)			
10	03/10	ERP Implementation Issues: Managing Change	
11	10/10	Technologies supporting real-time enterprise	
12	17/10	Exam Review	Assignment 2 due

Objectives

- Discuss the power of digital transformation.

- Define RFID and its role in logistics and sales

- Define business intelligence (BI), and provide examples of its uses

- Explain how in-memory computing will change the use of BI

- Discuss the importance of mobile applications to businesses

Objectives

- Describe cloud computing and why it is becoming important for ERP providers

- Explain how the service-oriented architecture (SOA) concept has changed ERP development

- Define software as a service (SaaS)

- Identify the advantages and disadvantages of using the SaaS software delivery model

Introduction

- An Enterprise Resource Planning (ERP) system allows a company to accomplish tasks that cannot be done well, if at all, without such a system

- Traditionally:

  - ERP systems have been software applications that are run on a company's own computer systems
  - Focus of ERP has been on managing business transactions

- Technologies, such as radio frequency identification (RFID), are increasing the amount of data that is contained in ERP systems

- Business intelligence technologies are turning data in ERP systems into valuable information

- Cloud computing and mobile technologies are changing where ERP data is stored and how it is delivered

Power of Digital Transformation

What is Digital Transformation ?

Video : https://youtu.be/GjdGqf_3oSs

- The remaking and reforming of how an enterprise serves all its constituencies (customers, employees and business partners).
- It refers to entirely new, all-digital ways of doing business and making decisions
- It defines processes that support continuous operations improvement, even disrupting existing businesses and entire markets while inventing new business models
- Fully leverages digital technologies in a highly strategic, carefully planned way to effect these profound changes.

Digital Transformation

The Need for Digital Transformation

- Primary driver is meeting customer needs
- The underlying traditional or legacy infrastructures that have dominated enterprise IT for nearly 30 years simply cannot handle the workloads or power the applications that will drive business decision.
- Business and IT leaders today identify that they must transform the way the enterprise does business or risk going out of business entirely.
- In the recent 451 Research (Voice of the Enterprise Storage) survey of 500 senior IT decision makers, two thirds of respondents said their businesses will require moderate to significant transformation in the next five years.

Ref: James A. Scott (2018). A Practical Guide to Microservices and Containers

Big Data and Big Data Analytics

The Big Data World

- Biggest challenge with big data, which includes Internet of Things (IoT) data, is that it is increasingly of the semi and unstructured variety.
- Legacy RDBMS simply cannot aggregate, store and process this data efficiently or effectively, certainly not in high volumes.
- The data volumes are unprecedented and growing at high speed
- IT systems are under tremendous pressure to deal with the volume, variety, and velocity of new data, while at the same time pressured to deliver more personalization and better service to the customer base.
- Storing all the data is difficult, with many organizations looking to data lakes to collect and store huge volumes of data in native formats

Radio Frequency Identification (RFID) Technology
Video : https://youtu.be/gEQJxNDSKAE

Radio frequency identification technology

- Known commonly as RFID
- Becoming an increasingly efficient tool for tracking items through a supply chain

RFID device

- Can be attached to products
- A small package (or tag) made up of a microprocessor and an antenna

RFID reader

- Can determine location of an item with an RFID tag
- Emits radio waves and receives signals back from the tag
- Sometimes called an interrogator

RFID Technology (con't)

Advantages of RFID technology

- Does not need a line-of-sight connection
- Can withstand most environmental stresses
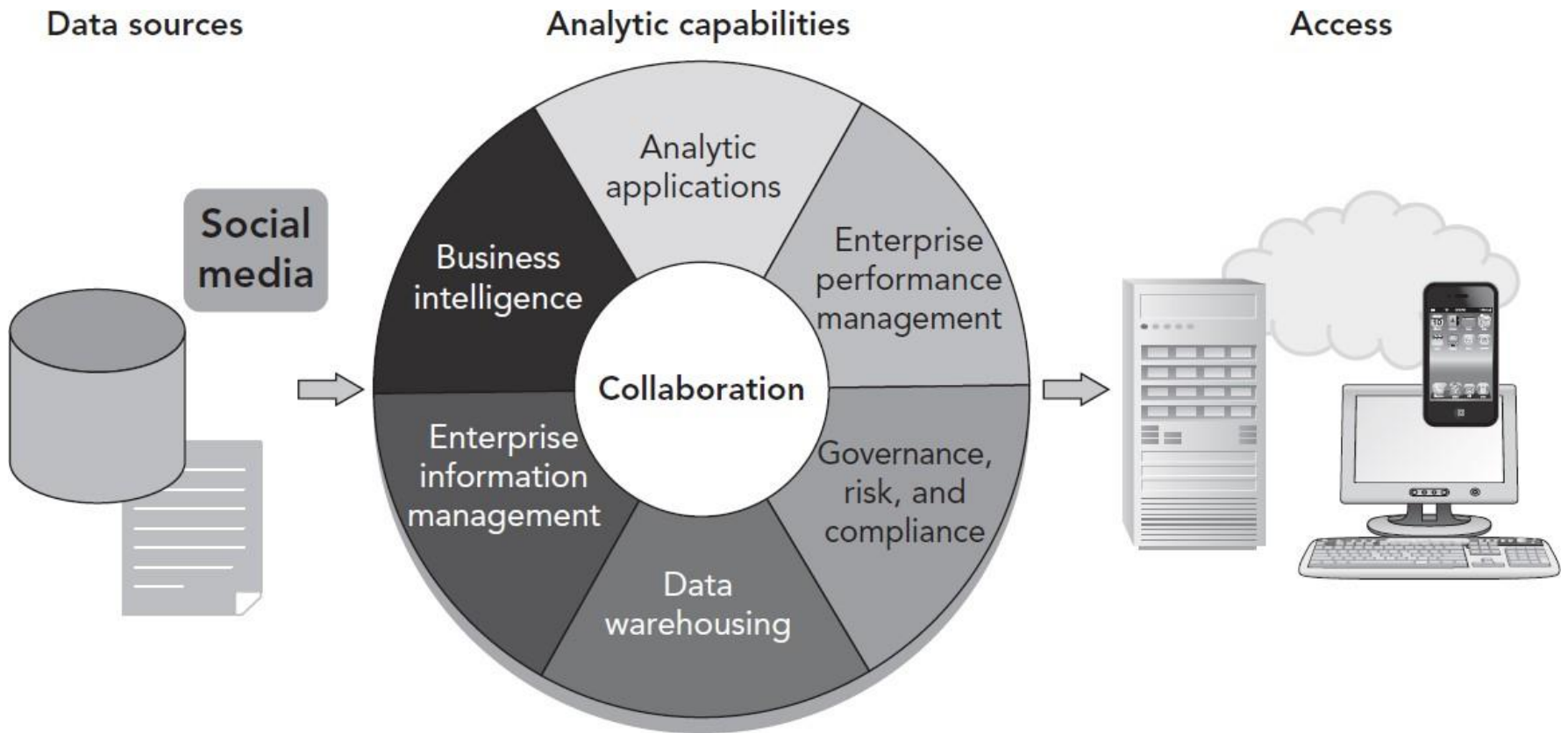
Application areas for RFID

- Walmart is on the leading edge of the move to integrate RFID technology into the supply chain
- Pharmaceutical firms are evaluating the use of RFID technology
- RFID technology is being employed to track medical devices
  - Spectrum Health's Meijer Heart Center is using RFID technology to track stents

Business Intelligence

Business intelligence (BI)

- Also referred to as *business analytics*
- A range of different applications and technologies used to extract and analyze large amounts of data to aid in decision making
- Includes data-mining tools and querying tools
  - Often interactive and visual
- BI technologies are capable of handling large amounts of unstructured data to help identify, develop and/or create new strategic business opportunities

SAP Business Intelligence (BI) Framework

Data sources | Analytic capabilities | Access

Social media

Analytic applications

Business intelligence

Enterprise performance management

Collaboration

Enterprise information management

Governance, risk, and compliance

Data warehousing

In-Memory Computing

- Data in a data warehouse are structured as **multidimensional data cubes**

    - Allow for relationships in the data to be analyzed quickly
- Two main challenges with using a multidimensional cube structure

    - A significant level of technical expertise is needed to construct a cube
    - A multidimensional cube necessarily restricts how the data can be analyzed
- Accessing data from memory much faster than accessing data from a hard disk

In-Memory Computing (cont'd.)

- Reason why data warehouses use disk memory: storage capacity
  - Hard disks can store one thousand times more data than memory for a comparable cost
- Data compression provided by column storage
  - Makes it possible to store large volumes of data in memory without aggregation
  - Multidimensional cubes are not required
- Both SAP's and Oracle's in-memory solutions (SAP S/4 HANA and Oracle Exalytics) are designed to analyze "big data"
- Big data
  - Enormous amount of data that is now available for BI use from all the available sources, including:
    - ERP systems, Web sites, corporate databases, scientific research, Twitter, and other social networking applications

Mobile Computing

- Increasing use of smartphones, tablet computers, and other mobile computing devices

- Mobile applications need to be developed for different kinds of smartphones, with different operating systems

- Companies need to make many decisions about the use of mobile devices by employees

- Mobile devices provide users with information and can also be sources of information

Future Trends : Social Media
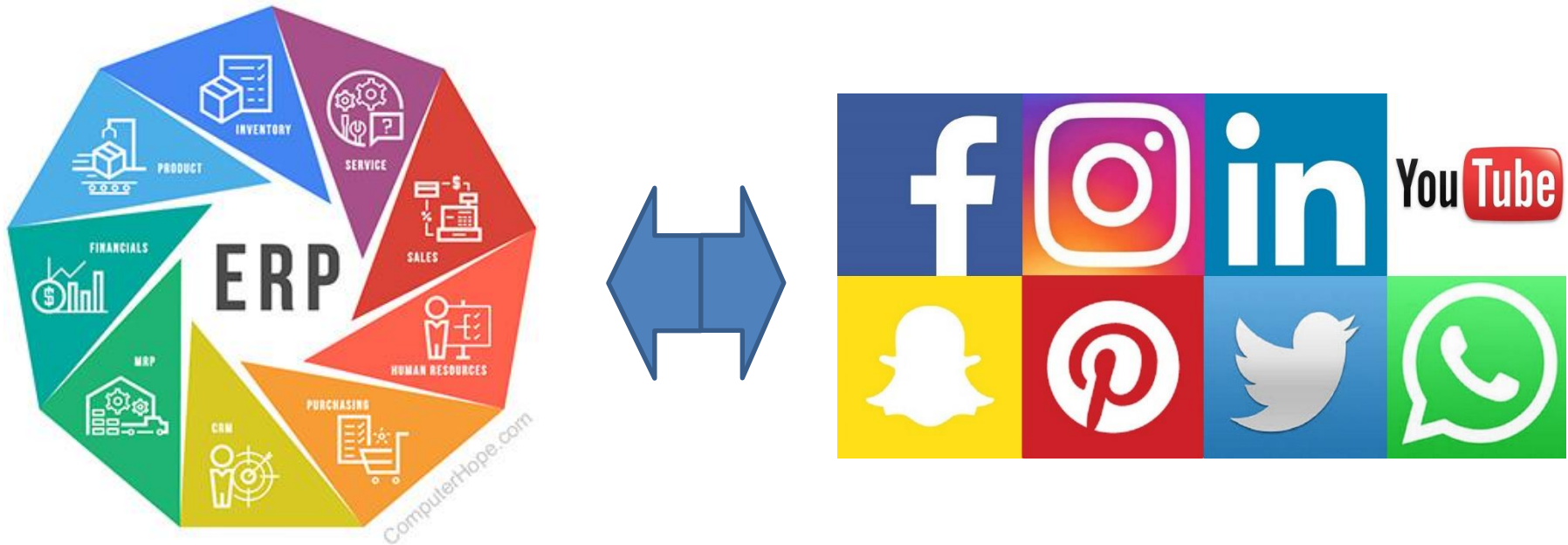
As social media has become increasingly important, it has found its way to ERP platforms.

SYSPRO Harmony – Social ERP Platform   https://youtu.be/VVBw46i1KjA

Future Trends : Social Media

- Many applications already integrated within the system, such as human resources and customer relationship management software, have long been connected to social media e.g., it's quite common for a recruiter in the human resources department to use LinkedIn to review potential candidates, and many salespeople reach out to prospects via Facebook.

- 84 percent of marketers view social media as crucial to their companies.

- The main ERP vendors, like Oracle and Salesforce, are working hard to perfect social media and ERP integration.

Future Trends : Internet of Things

Definition :

IoT is simply the network of interconnected things/devices which are embedded with sensors, software, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive.

Gartner states that the "**Internet of Things (IoT)** is the network of physical **objects** that contain embedded technology to communicate and sense or interact with their internal states or the external environment

IoT : How it works   https://youtu.be/LIhmzVL5bm8

Future Trends : Internet of Things

1. Smart locks
2. Smart sprinklers
3. Smart plugs
4. Smart baby monitors
5. Smart cookers

6. Smart thermostats
7. Smart mirrors (!)
8. Smart cleaners
9. Smart refrigerators
10. Connected cars

Future Trends : Artificial Intelligence

Artificial Intelligence (**AI**) is the branch of computer sciences that emphasizes the development of **intelligence** machines, thinking and working like humans. For **example**, speech recognition, problem-solving, learning and planning.

The Future of ERP.. Artificial Intelligence

https://youtu.be/yO8UxtozfwU

AI-enabled ERP (iERP) systems create an environment where a company's data is "conversational and actionable". Not only that, but ERP systems can learn from the data sources, create workflows, and reduce the time it takes to load data and reduce errors in the data. Since AI technology learns the different ways in which an organisation and individual users interact with the ERP software on a daily basis. AI-enabled ERP systems can suggest different ways to optimize the system for individual users.

Future Trends : Artificial Intelligence

What AI Looks Like in an ERP System

Gartner defines AI as "*technology that appears to emulate human performance*".
AI ERP systems can recognize patterns and automate routine tasks, and they do all of it in the blink of an eye, giving businesses an unprecedented level of efficiency, functionality and insight into their data.

A good example of an AI-driven ERP solution is SAP Leonardo, which includes a number of microservices* integrated with a cloud platform.

*A software development technique —a variant of the service-oriented architecture (SOA) structural style— that arranges an application as a collection of loosely coupled services.

Future Trends : Automation

Developments in enterprise resource planning software open possibilities to address potential pitfalls with automation features. Functions preprogrammed
through ERP solutions can ensure more repetitious tasks do not suffer from user error, as well as allow human input to be transferred to monitoring the system.
With more resources devoted to oversight, and processes delegated well ahead of execution, potential glitches can be identified and solved more easily.

SAP Connected Manufacturing :
https://youtu.be/z_Auifovjcc

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Future Trends : ADDITIVE MANUFACTURING

Additive manufacturing (AM) is the industrial production name for 3D printing, a computer-controlled process that creates three dimensional objects by depositing materials, usually in layers.

Introduction to Additive Manufacturing
https://youtu.be/Ev-MM9cGKiQ

Additive Manufacturing : Benefits

AM has the ability to execute a wider variety of design. The design of an object that cannot be manufactured in one entire piece with traditional manufacture is not impossible in additive manufacturing.

The process is also quick. Any change in the design can be done by clicking the mouse. With this flexibility, companies can cut budgets effectively.
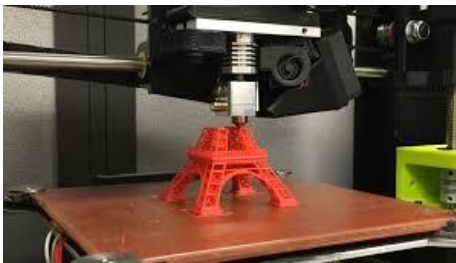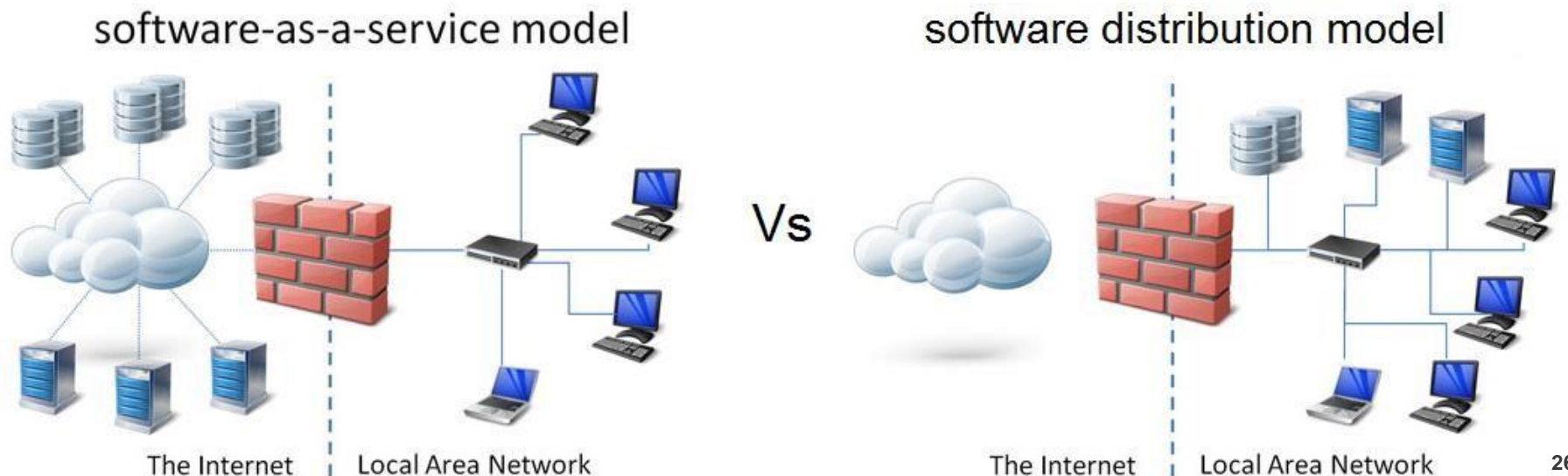
From Internet-Enabled to Cloud Computing

- Cloud computing

  - Delivery of a software product to a user via the Internet

  - The user typically accesses the cloud product through a Web browser or a lightweight (meaning small and simple) application for a computer or mobile device

- Cloud computing is not a completely new concept

  - It represents the latest stage of the development of computing and the Internet

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SaaS: Software As A Service

- A software delivery model

- A software product is hosted by a company—such as SAP—on its servers and is accessed by customers via a Web browser

- Sometimes described as a utility

- A subset of cloud computing

software-as-a-service model

Vs

software distribution model

The Internet | Local Area Network

The Internet | Local Area Network

SAP Business ByDesign

- An example of SaaS for the ERP market

- First released in 2007

- A full ERP system delivered to customers via the cloud

- For small to medium-sized companies:

  - Lowers the total cost of ownership of the software
 - Enables a rapid and implementation

Extending the Portfolio to Address an Untapped Market

SAP

LARGE	SAP Business Suite including SAP ERP 6.0	> 2,500 employees	~ $30 billion market
MIDSIZE	SAP Business All-in-One	< 2,500 employees	~ $15 billion market
	SAP Business ByDesign	100-500 employees	NEW BUSINESS ~ $15 billion market
SMALL	SAP Business One	< 100 employees	~ $15 billion market

SAP Business ByDesign (cont'd.)

- PlaNet Finance

  – A small organization that offers microloans to customers in 30 international offices
  – Finds Business ByDesign is a good fit for its needs
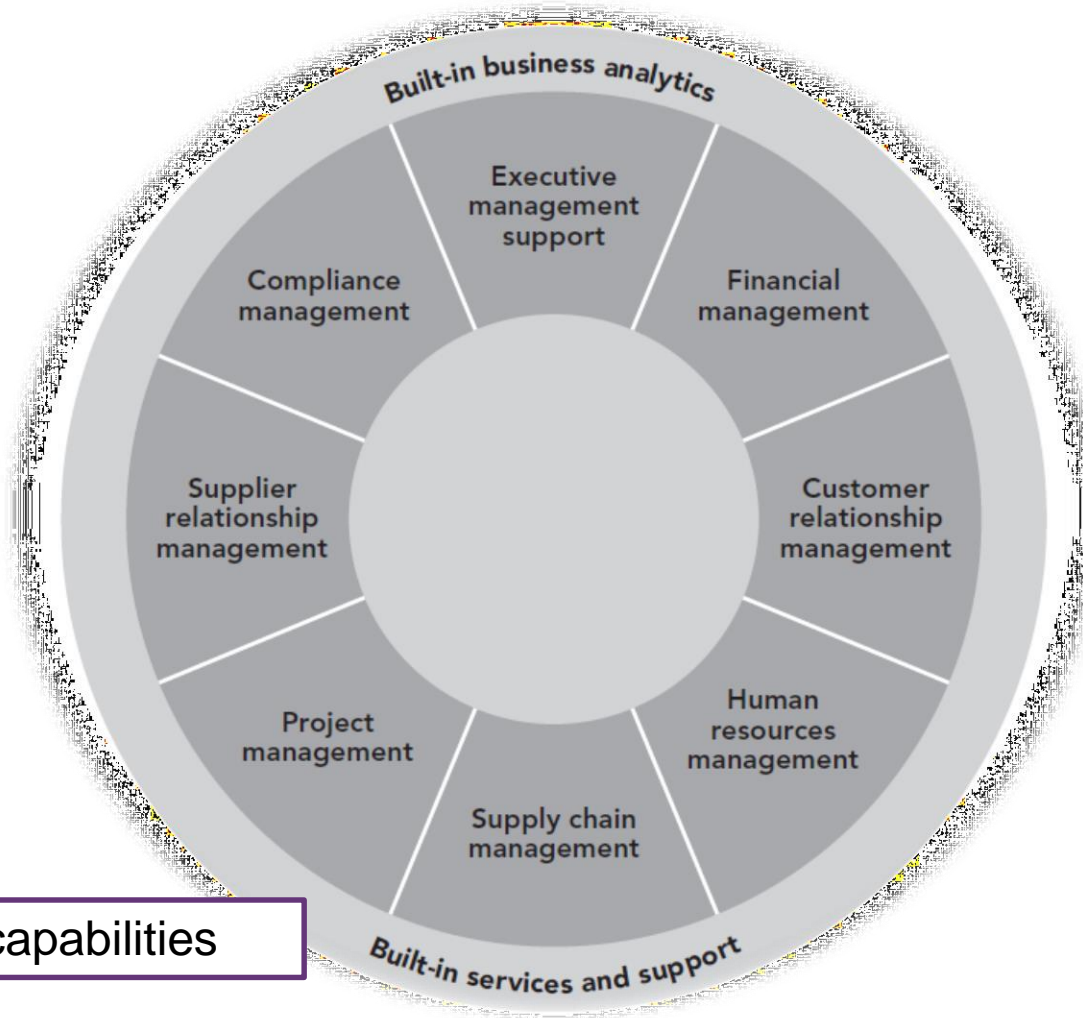
SAP Business ByDesign's key capabilities

Advantages & Disadvantages of Using SaaS

Advantages:

- *Initial affordability*
  - Lower cost to implement software provided through SaaS
- *Shorter implementation time*
  - Implementation time usually shorter as the user does not have to worry about technical issues
- *Lower support costs and complexity*
  - Do not need to hire additional IT personnel to implement new systems and applications

Disadvantages:

- *Security*
- *Bandwidth/response time*
- *Flexibility*
- *No frills*
- *Technical, not business focus*

An Example

Case Study

- Fitter has made the decision to acquire an ERP system
- Arguments for purchasing ERP system and software versus using SaaS

Options

- *Option 1*: Buying Computers and Software Rights for an ERP System
- *Option 2*: Using an SaaS Provider to Deliver ERP Software

Option 1: Buying Computers and Software Rights for an ERP System

- Estimated costs to set up its own ERP system:

    - Database server
    - Application server
    - PCs
    - Computer maintenance
    - Licensing rights
    - Installation
    - User training
    - Ongoing consulting
    - Network and database administrator

Option 2: Using an SaaS Provider to Deliver ERP Software

■ Estimated costs for using an SaaS provider to deliver ERP software:

- – PCs
- – Computer maintenance
- – Software through the SaaS provider
- – User training

Making a Recommendation

Calculate the NPV :

- You will set up a spreadsheet to total all the costs of each option
- Calculate the net present value (NPV) of money for each scenario

NPV

- A way to figure out whether an investment is profitable
- Can be used to compare outlay of funds from one method to another
- Addresses the time value of money

Why use NPV

- When calculating two different investment options, NPV calculation allows different future expenses or earnings to be calculated as an equivalent amount in the present time
- NPV can be calculated over a number of years
  - In example: we need a five-year outlay of funds for the ERP project

Calculate the NPV and Make a Recommendation

- In an Excel spreadsheet, the syntax of NPV calculation:

  =*NPV* (*hurdle rate percentage*, *range of values*)

  – Values in range can be positive or negative numbers

  – Hurdle rate

    • Rate of discount over the period

    • Minimum acceptable rate of return on a project that a company will accept

ERP Purchasing Options

Option 1 - Buying computers and software outright

Items	2013	2014	2015	2016	2017
Database server	70000				
Application server	40000				
10 PCs	15000				
Software	500000				
Consultants - initial (6 months)	486000				
Training (2 weeks)	23000				
Consultants - maintenance (1 day per month)		36000	36000	36000	36000
PC maintenance		12000	12000	12000	12000
Network administrator	200000	200000	200000	200000	200000
Total	1334000	248000	248000	248000	248000
NPV	$1,646,671.81				

Option 2 - Using SaaS

	2013	2014	2015	2016	2017
PCs	15000				
PC maintenance		7200	7200	7200	7200
ASP cost	400000	400000	400000	400000	400000
Total	415000	407200	407200	407200	407200
NPV	$1,224,277.26				
Hurdle rate	20%				

Cost comparisons: Buying versus SaaS

Summary

- Technologies such as radio frequency identification (RFID) and smartphones are fueling explosive growth in the amount of data available for businesses to process

- Business intelligence (BI) tools are growing in sophistication and power

  - Technologies such as in-memory computing will provide greater speed and flexibility to BI users

- Mobile computing technology is increasing the use of ERP and BI data

- Cloud computing is the delivery of a software product to a user via the Internet

Summary (cont'd.)

- Software as a service (SaaS) is a software delivery model in which a software product is hosted by a company—such as SAP—on its servers and is accessed by customers via a Web browser

    - SaaS model allows companies to use ERP without a large initial investment
    - SaaS solutions allow for more rapid improvements in the software through user communities
    - There are some risks associated with us provider

That's all folks!!

End of Lecture 11

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