

Business Information Systems - Part 2

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1 Web Information Systems - I Lecture

1.1 Introduction and Definition of WIS

Good morning! In this class, we will be discussing web information systems. As usual, you can find the slides on WEBEEP. Let's begin by defining what a web information system is.

- Definition of WIS as a system where:
 1. The communication among machines (servers and clients) uses the public Internet or an IP-based private VPN
 2. Users access functionalities through a browser



It represents a very broad definition including both sites and portals, as well as traditional information systems (core ERPs) redesigned to provide their functionalities through the Internet with a browser-based interface.

A web information system is a system that facilitates communication between machines using either the public internet or an IP-based private VPN. Users can access the system's functionalities through a web browser. This definition provides a broad understanding of what a web information system entails.

Defining Web Information Systems The public internet and the IP protocol, along with browsers, have brought about significant changes in information systems. Any system that meets two criteria can be considered a web information system. Firstly, it must be accessible through a browser. Secondly, it should be connected to the private VPN of the company. This means that even a traditional ERP with its core functionalities can be classified as a web information system if it meets these criteria.

1.2 Impact of Technical Innovations

These two technical innovations—internet and browsers (user interfaces)—have resulted in a transformation of the technologies utilized, even by components of web information systems that were created prior to the advent of the web. In essence, ERP providers have reimaged the interface and core technologies of their packages to align with this new paradigm.

Innovation with WIS

- The Internet is a network that has brought connectivity to individuals → companies are connected with their retail customers
- Nov. 2000 stock exchange failure (dot com bubble)
- The Web is a window on a company's processes (and their performance)
- The quality of Web sites and portals cannot be high if companies have not completed the integration of their information processes (common unified data, consistent omni-channel processes)
- The Web is the enabling technology of customer relationship management (CRM) and allows the omni-channel integration of service distribution
- As omni-channel integration is deployed, the Web becomes the single access point for both customers and internal users

1.2.1 The Internet and Its Influence

Now, let's discuss the main innovation that revolutionized web information systems: the internet. The internet connected companies to individual customers for the first time, marking a significant change in the business landscape. This not only impacted individual customers but also the employees working for these companies. The ability to connect the company's potential market, especially retail customers, through a public network was seen as a monumental shift.

During the late 90s, when the internet was introduced, there was a great deal of hope and belief in the transformative power of this new technology. There was a hype surrounding the web, with expectations that it would drastically change people's lives in a short period of time. The paradigm of exponential organization emerged, where companies without the burden of physical shops or channels to reach customers could experience rapid growth. As a result, the value of web-based companies experienced significant growth around the year 2000.

The Dot Com Bubble The dot com bubble refers to a period when the value of stocks of companies with websites ending in ".com" skyrocketed, far exceeding their actual revenues and assets. However, this rapid growth was eventually followed by a significant stock market crash, one of the largest in recent history. This sudden shift from extreme optimism to pessimism marked a turning point in the market.

Web Technology in Traditional Companies The web has undoubtedly revolutionized processes for both traditional and new companies, creating new

industries while also causing the decline of others. However, the pace at which society adapted to these changes was slower than the expectations of the stock exchange. For traditional companies to fully benefit from web innovation, they must first go through the implementation and integration of their information systems, even with traditional technologies. Without this, it is challenging for them to compete effectively on the web, unless they have a history of being highly innovative in their approach to information systems and are prepared to utilize the web as a new channel to reach customers.

For instance, companies that lack a unified data system, which is a fundamental aspect of the ERP paradigm, will struggle to provide a satisfactory web service. The web is a more objective platform compared to a physical store, as there is no personal interaction. Customers have certain expectations for service quality, which are set by industry leaders. Consequently, the web can actually make the customer relationship more challenging rather than easier. Only companies that have successfully integrated previous technologies into their operations have been able to fully exploit the potential of the web.

Extended ERP and E-Commerce When examining the functional architecture of ERP systems, it becomes clear that extended ERP is more influenced by the web than core ERP. The web has opened up new opportunities, particularly in e-commerce, which continues to evolve. Extended ERP, which is enabled by the web, encompasses various functionalities that must be supported by a well-integrated and IT-supported internal process.

One of the key enabling technologies for extended ERP is CRM, with the web playing a significant role. While companies have been using technology, such as Salesforce automation, to interact with customers for some time, the web has made it easier to showcase services, prices, and conditions, as well as compare alternative suppliers. This has created a need for integration across different channels, as any mistakes or inaccuracies on the web are visible to all. It is no longer acceptable for customers to have to visit a retail shop for information; it must be readily available and accurate on the web.

1.3 E-Commerce and Its Evolution

Companies have recognized the importance of integrating customer information into a single database, commonly known as a customer database or CRM. This integration, whether referred to as omni-channel or multi-channel, has become increasingly important as the web has become the primary access point for both customers and internal users.

Initially, the web was seen as a platform for e-commerce, allowing companies to sell their products online and reach a wider market. This was seen as a significant opportunity. E-commerce refers to the buying and selling of products

- eCommerce is the activity of buying or selling of products (goods or services) on online services (ref. Wikipedia).
- Most eCommerce services are on the Web.
- The term eCommerce usually refers to *retail* customers.
- The term eBusiness is used to refer to business customers.
- The term eGovernment is used to refer to services offered by public institutions to citizens.

and services online, primarily targeting retail customers. On the other hand, when referring to business customers, the term e-business is used. For example, if a company purchases from another company online, it is considered e-business. Similarly, if a public administration buys from a supplier online or provides services to other public institutions or citizens, it is referred to as e-government.

In summary, e-commerce focuses on reaching the market and selling products online, while e-business and e-government encompass a broader range of online transactions involving business customers and public administrations, respectively.

1.4 The Dot Com Trend and Its Aftermath

In the early days of the dot com trend, many companies initially set up their e-commerce operations as separate units or even separate companies. This was a common approach when a new technology brought about significant changes. These companies lacked the necessary expertise to effectively manage and leverage the new technology, so they sought the help of consultants and formed internal teams to handle it. Over time, these teams evolved into dedicated units focused on the new technology, such as the web.

- eCommerce sites have been often implemented by separate teams, often involved in rebranding initiatives (e.g. Bank24 - Deutsche Bank)
- The design of eCommerce sites involves a variety of competences (typically, IT + design + product innovation + marketing)
- The management of eCommerce sites involves new competences, in particular editors creating and updating content
- The Web is a distribution channel, a production technology, and a source of external information → it involves revolutionary change

This pattern of innovation is not unique to the web; it has been observed

in various industries. However, during the dot com era, companies that were perceived as pure dot coms, operating solely on the web without any traditional brick-and-mortar presence, were highly valued in the stock market. This led even traditional companies to establish separate units or even separate companies with their own distinct brands to tap into the potential of the web. For instance, in 2000, Deutsche Bank launched Bank 24, a web-only bank operating as a dot com.

However, this trend came to a halt after the dot com bubble burst and the subsequent stock market failure. Even Deutsche Bank eventually integrated Bank 24 back into its core services, recognizing the need to reassess their approach in light of the challenges faced by dot com companies.

1.5 Integrating Web and Traditional Channels

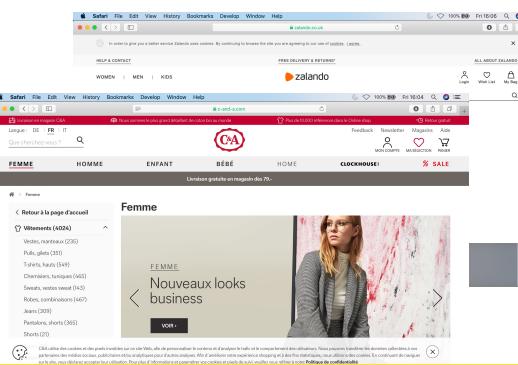
Companies have recognized the importance of integrating the web as an additional channel for their existing customers. There are a few reasons behind this realization. Firstly, companies understood that relying solely on the web for growth and stock market success was no longer feasible after the dot com bubble burst. Secondly, they realized that web-based operations still require physical processes and the management of people, offices, and complementary services. This led to the recognition of the synergies between web-based companies and traditional structures, as Deutsche Bank recognized.

To leverage these synergies, companies brought web-based operations back into their traditional structures and began integrating the web as a channel alongside other existing channels. This integration process was facilitated by customer relationship management (CRM) practices. Companies started by creating a shared customer database and analyzing it to understand the evolving habits of web customers. Based on these insights, they developed innovative services to cater to the changing needs of web customers over time.

Initially, customers were skeptical about making purchases on the web, especially for high-value or high-quality products. They preferred traditional brick-and-mortar shops. However, over time, customer behavior shifted, and e-commerce gained traction across various industries. The pace of this shift varied across industries, with some experiencing faster adoption than others. Nevertheless, e-commerce has become prevalent in almost all industries, including fashion, grocery, tourism, banking, trading, and learning. Each industry has its own specific terms and practices related to e-commerce.

eCommerce – examples

- eFashion, fashion eCommerce, digital fashion
 - eGrocery
 - eTourism/eTravel
 - eBanking
 - eTrading
 - eLearning, MOOCs
 - eBooks
 - eTicketing
 - video/music streaming
 - eGaming



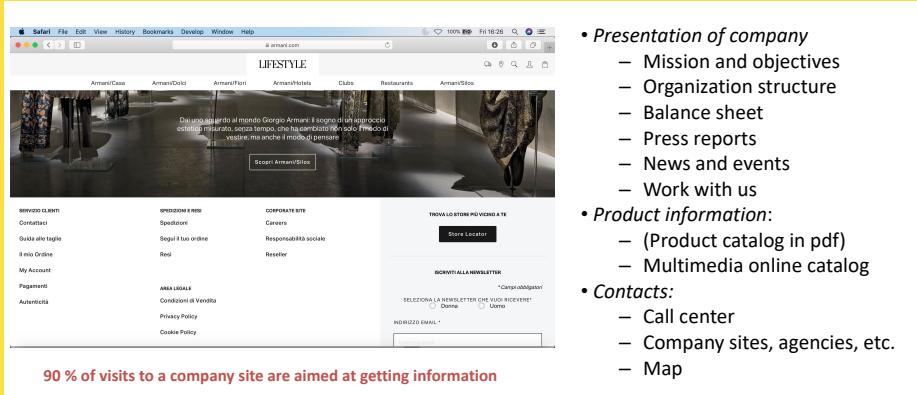
1.6 The Role of E-Commerce Post-COVID-19

When the internet was first introduced, there were predictions about which industries would be most impacted by e-commerce and how quickly it would replace traditional channels. However, it took nearly 20 years for e-commerce to become pervasive, serving only a small percentage of transactions and clients. The COVID-19 pandemic changed this dramatically, giving e-commerce a significant boost. It quickly developed and penetrated the market, reaching a larger audience. While there has been a slight decline after the initial surge, e-commerce has still experienced substantial growth and increased penetration.

1.7 Customer Journey and Online Information

To illustrate this point, let's consider the example of grocery shopping. Despite the pandemic, only a small percentage of people actually do their grocery shopping online. This indicates that the experience of shopping in a traditional store or through traditional distribution methods is still considered superior to the online experience. As a result, the current trend is to view online shopping as complementary to other channels, rather than a standalone option.

When customers engage with a company, they go through a journey that involves multiple channels at different stages of the transaction. It all begins with a need, which may arise from seeing an advertisement or simply having a requirement. The first step in this journey is typically going online to gather information. This initial step is crucial in the transaction process and is usually done through the web. When customers are unsure of where to make a purchase, they turn to the internet to find information. This helps them make decisions



- **Presentation of company**

- Mission and objectives
- Organization structure
- Balance sheet
- Press reports
- News and events
- Work with us

- **Product information:**

- (Product catalog in pdf)
- Multimedia online catalog

- **Contacts:**

- Call center
- Company sites, agencies, etc.
- Map

about the provider, the brand, and the specific product they want to buy. With the advent of social media, customers also rely on product reviews to guide their choices. This search phase of the transaction, where customers seek information, accounts for approximately 90% of visits to a company's website.

1.8 Designing Effective Web Information

The main purpose of websites is to provide information to customers who are looking for products or learning about a company for the first time. Typically, websites include a general presentation of the company, its mission, organizational structure, job opportunities, news and events, and information about its products. Some older websites may offer a downloadable product catalog in PDF format or a multimedia online catalog where customers can browse through the products. These websites often provide recommendations for related products that are commonly purchased together. Contact information, such as the call center, company size, and location, is also provided, sometimes with a map for easy navigation.

When designing the information services of their website, companies are primarily concerned with providing a positive first impression to customers who have no prior knowledge of the company. This can be challenging for companies, as they need to carefully design the website's navigation structure. It is often best to follow a navigation structure that is similar to what competitors use, as customers have certain expectations about where to find specific information on a company's homepage. Keeping the information provided on the website standardized is a good idea, although it should be regularly updated as company information, including the mission, can change over time. To update the information on their website, companies need to gather the necessary information from various stakeholders within the organization who possess the relevant knowledge. This can be a complex task, as information is often scattered across different departments or individuals. The website serves as a central access

point for customers to find all the information they need.

1.9 Quality Criteria for E-Commerce Sites

- Issues:
 - Design a navigation structure for information and online services
 - Retrieve information
 - Constantly update information
- Solutions
 - Federation: one central site with general information and services and multiple local sites serving different organizational units that are locally managed (e.g. university/departments)
 - Editorial committee: it should be created at the beginning of the WIS project and it becomes a permanent organizational unit
 - Help desk: the call center and the Web should be tightly integrated.

In order to provide consistent information to customers on the web, information owners must cooperate. There are two approaches to collecting this information. The first approach is federated, where there is one central site with a thin layer of information and multiple local sites where individual business units can provide their own information. The landing page serves as a collection of links to the different business units' websites. While this approach allows for information retrieval to be closer to the business units, it often results in a website that lacks standardization and has lower overall quality.

The second approach is to establish an editorial committee that constantly updates the information on the website. This committee seeks information from the different business units and follows a common template for all units, ensuring standardization. Although this approach is more expensive due to the need for an editorial committee and agreement on the information to be provided, it generally leads to higher quality.

- **Content**– It represents the quality of the information and services provided by the site. It depends on:
 - Completeness
 - Dependability, i.e. user ability of assessing the correctness of information
- **Structure**– It describes the quality of the structure of content and depends on:
 - Centralized vs. federated, if federated different organizational units provide diverse information with no standard (quality is lower, but it is cheaper)
 - Understandability, i.e. users' ability to build a conceptual model of the site that supports easy retrieval of information and easy interpretation/use.
- **Presentation**– It describes the quality of the Web interface and depends on:
 - Graphics, i.e. appeal and visualization tools.
 - Coherence of graphic style
 - Page layout, i.e. position of information and links
- **Navigation**:
 - paths
 - intuitiveness
 - reference points (e.g. «home» or «back»)
 - Interaction (amount of cross-links)

When considering the quality criteria for an e-commerce site, there are several factors to consider. First, customers expect the content to be complete, dependable, and correct. They also want consistency in the information provided by the call center. Second, the structure of the website should allow customers to easily navigate and understand the information. A centralized structure is preferable in this regard. The presentation of the website should have a coherent graphic style to instill trust and confidence in the company. The layout and position of information should be intuitive and standardized. Navigation should also be intuitive, with multiple paths to reach the same information. The website should be well-connected, allowing customers to navigate between pages without having to return to the homepage. The ease of navigation, including the ability to go back multiple steps, is crucial.

In conclusion, the quality criteria for an e-commerce site include content completeness and dependability, a clear and intuitive structure, a coherent graphic style, and easy navigation with multiple paths to reach information.

2 Web Information Systems - II Lecture

2.1 Introduction to Web Information Systems - Part Two

Welcome to part two of our series on web information systems. In this installment, we will delve deeper into the fascinating world of web-based information systems and explore their various components and functionalities. So, let's jump right in and continue our exploration of this exciting topic.

In part one, we introduced the concept of web information systems and discussed their importance in today's digital age. We learned that web information systems are designed to collect, process, store, and disseminate information over the internet. They play a crucial role in facilitating communication, collaboration, and decision-making in various domains, such as business, education, healthcare, and government.

Now, let's move on to the key components of web information systems. At the heart of any web information system is the web server, which acts as the central hub for storing and serving web pages and other resources. The web server receives requests from clients, such as web browsers, and responds by sending the requested information back to the client.

Another essential component of web information systems is the database. The database stores and organizes the vast amount of data that is generated and used by the system. It allows for efficient storage, retrieval, and manipulation of data, ensuring that the system can handle large volumes of information effectively.

Web applications are another critical element of web information systems. These applications are responsible for processing user requests, generating dynamic content, and providing interactive features. They enable users to perform various tasks, such as submitting forms, conducting searches, and accessing personalized information.

To ensure the security and integrity of web information systems, authentication and authorization mechanisms are implemented. Authentication verifies the identity of users, while authorization determines what actions they are allowed to perform within the system. These mechanisms help protect sensitive information and prevent unauthorized access.

In addition to these components, web information systems often incorporate other technologies and tools, such as content management systems, search engines, and analytics platforms. These tools enhance the functionality and usability of the system, allowing for efficient content creation, search capabilities, and data analysis.

In conclusion, web information systems are complex and multifaceted systems that enable the collection, processing, storage, and dissemination of information over the internet. They consist of various components, including web servers, databases, web applications, authentication and authorization mechanisms, and additional tools and technologies. Understanding these components is crucial for building and maintaining robust and effective web information systems. Stay tuned for part three, where we will explore the design and development process of web information systems.

2.2 Gaining Online Visibility

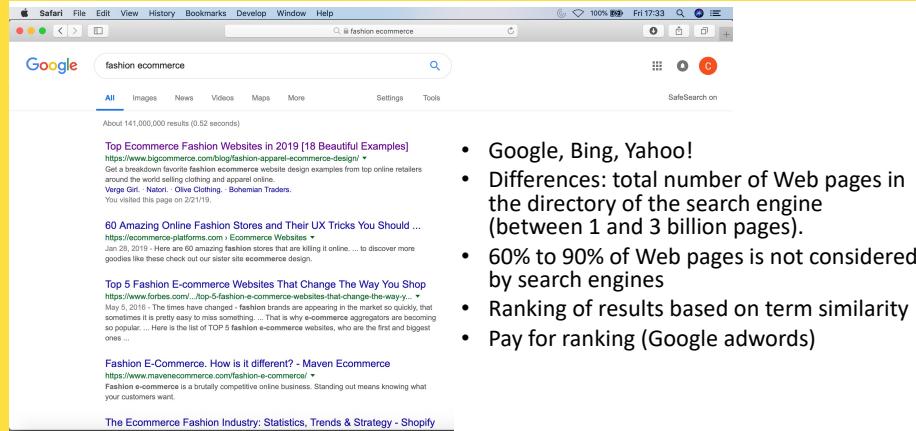
Now that we have discussed the quality criteria for websites, let's take a closer look at what makes a website truly exceptional.

2.2.1 Search Engines and User Behavior

Despite having a high-quality website, companies still need to ensure that their online presence is visible. So, how do companies initiate the search phase of a transaction? Well, they start by going online and conducting a search on popular search engines like Google or Bing. It's worth noting that Google is the most widely used search engine, with a near monopoly in certain countries, particularly when it comes to web searches. When conducting a search, people usually look for a specific product or service.

2.2.2 Google's Dominance and Search Patterns

In many cases, when you're searching online, you may not know the specific brand or company name for the product you need. Instead, you have a general idea of the type of product you're looking for. For instance, if you're in need of a pair of running shoes, you might simply search for "running shoes".



- Google, Bing, Yahoo!
- Differences: total number of Web pages in the directory of the search engine (between 1 and 3 billion pages).
- 60% to 90% of Web pages is not considered by search engines
- Ranking of results based on term similarity
- Pay for ranking (Google adwords)

When you enter a search term into Google, it aims to provide you with a wide range of relevant results. Google takes pride in displaying a large number of potential websites and useful links that address your search query. For example, in the figure provided, the search term was "fashion e-commerce", and Google informs us that there are nearly 150 million possible sites that could meet this need.

2.2.3 Importance of Top Rankings

When users perform a search, they typically use common and direct terms. As a company, it is crucial that your website's landing page appears in the search results and that users click on the provided URL to visit your site. However, it's important to understand that Google displays search results in a text format, and users often need to click on the links to determine if they are interested in the content. Simply reading the brief description provided by Google is often not enough.

So, how patient are users when it comes to clicking through search results? Studies have shown that if your company's website is ranked below the 10th position on Google, only 10% of users will click on the link. This percentage decreases even further for results ranked between 10 and 20. In fact, only one in 100 users will click on these results. This highlights the importance of achieving a high ranking in the search results.

It's crucial to note that very few users venture beyond the first page of search results. While it is possible to navigate to the second page, the majority of users do not go that far. Therefore, it is essential to aim for a top ranking to maximize online visibility and attract potential clients.

2.2.4 User Search Habits and Implications

It has been shown that Google is generally effective in providing search results. However, for niche searches, the best fit result is often found within the top 100 results rather than the top 10. This means that it is important to be patient and take the time to go through the first 100 results, clicking on various landing pages to find the best one. This level of thoroughness is typically expected from someone conducting accurate market analysis. However, for the average user, especially a potential retail customer, the priority is to find what they are looking for quickly. If a result is not found within Google's top 10, there is a tendency to assume that it does not exist. This is the conclusion that most people draw when they cannot find a result within Google's top 10.

2.2.5 Google's Role in Visibility and Monetization

It is a common belief among retail customers that if a search result is not within the top 10, it may not exist or be relevant. This behavior can be conscious or unconscious, leading customers to give up on their search after the first page of results. As a result, companies strive to appear in Google's top 10 search results, as this is where most visibility and traffic come from. Google capitalizes on this demand for visibility by selling advertising space through its Google Ads platform. Companies can pay to have their websites appear in the top results for specific keywords.

However, this does not mean that the web provides perfect market conditions for companies. In reality, companies must navigate through a funnel controlled by Google, the dominant player in the search engine market. Google profits from other companies' desire to rank high in its search results. Whether this arrangement is fair or not is not for us to judge in this course. Nevertheless, this system has been in place and functioning for the past 20 years.

2.3 Digital Divide and Marketing Strategies

2.3.1 Challenges for Small Companies

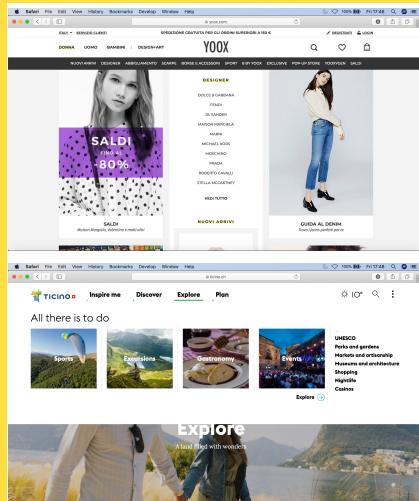
The digital divide poses a significant challenge for small companies, especially when it comes to marketing. Limited financial resources make it difficult for

these companies to appear in search results. However, even with a small budget, there are still ways to optimize Google campaigns and gain visibility in a niche market. This niche can be geographical or specific to less mainstream keywords, such as niche issues or fashion e-commerce.

2.3.2 Optimizing Google Campaigns and Niche Visibility

In the realm of digital marketing, optimizing Google campaigns and targeting niche audiences can help overcome the challenges of the digital divide. While the concept may seem less mainstream, it is still a viable strategy for businesses operating within a limited budget. By focusing on a specific niche, companies can achieve visibility and make an impact, even with limited resources.

2.3.3 Marketplaces as a Solution



- They sell products and services from multiple companies, e.g.:
 - Geographical brands (e.g. «Franciacorta» or «Ticino»)
 - Users' needs (aggregators, e.g. Yoox).
- Companies should share order management and delivery processes.
- Common within districts for SMEs.
- Standard in mobile app market (App store, Play store).

Companies have responded to the opportunities and limitations of the digital landscape in various ways, particularly when it comes to budget constraints. One effective strategy they have employed is the creation of marketplaces. Instead of solely focusing on establishing their own online presence, companies choose to participate in existing marketplaces. These marketplaces can gain significant popularity, such as in the fashion industry where they may be associated with well-known brands like Franciacorta or Ticino. The main concept behind marketplaces is that multiple companies pool their resources to cover the costs of online visibility. This approach offers clear advantages, as companies can share the financial burden of establishing a strong online presence, which can be quite substantial.

The Case of Yoox and Fashion Brands E-commerce has brought both advantages and disadvantages to fashion brands. Take the case of Yoox, an e-commerce platform that sells products from established fashion brands. Initially, these brands overlooked the potential of online sales, believing that fashion products were not suitable for e-commerce. However, over time, consumer habits have changed, especially among younger demographics. It has become common for people to visit physical stores to try on products and then make their purchases online, seeking better deals or unique offerings.

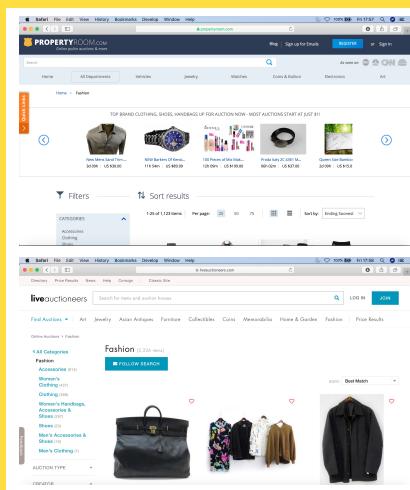
While this shift in consumer behavior presents opportunities for fashion brands, there are also risks involved in not embracing technology and the online market. Many fashion companies now aspire to establish their own brand presence instead of relying on platforms like Yoox, as these platforms take a percentage of sales. By building their own online presence, brands can maintain greater control over their image and profit margins.

2.4 Online Auctions and Dynamic Pricing

2.4.1 Concept of Online Auctions

There are various ways to share the costs of visibility as a small provider or seller. One effective method is to utilize online auction services such as CDE. These platforms offer a range of online auction options, some of which cater to specific product niches. These auctions operate based on the concept of dynamic pricing, also known as options.

2.4.2 Types of Auctions



- **Ascending (or English) auction.** The vendor sets a minimum price. The product is sold to the last highest offer (with timeout).
- **Descending (or Dutch) auction:** The vendor sets a maximum price that is decreased by a fixed amount at regular time intervals down to a minimum price. The product is sold to the first client offering to buy at the current price.
- **Vickrey auction:** all customers make an undisclosed offer within a given time frame. The product is sold to the second highest offer.

Ascending Auctions In the realm of dynamic pricing, there is a type known as ascending auctions. These auctions are particularly suitable for goods or services that are scarce. For example, if you have a piece of furniture with historical value, it can be sold online through an ascending auction. Since there are not many similar items available on the market, the price for such a unique piece can vary greatly depending on its condition.

In ascending auctions, the seller sets a base price and a minimum price. Potential buyers then make offers, and the product is ultimately sold to the highest bidder. It's important to act quickly in these auctions, as there is a time limit for making offers. If you don't make a timely bid, you risk losing the opportunity to purchase the item.

Descending or Dutch Auctions The rush to make offers in dynamic pricing is a key aspect of the mechanism, especially when dealing with limited goods or services like cars. In perfect market conditions, there would be an abundant and unlimited supply of the good. However, in reality, this is not always the case. To ensure you get the best price in such conditions, an environment is created where people are inclined to make instinctive, rather than entirely rational, offers. This leads to the price being raised accordingly.

One type of auction that employs this strategy is the descending or Dutch auction. In this type of auction, the vendor sets a very high maximum price, which is then gradually decreased at regular time intervals. The item is sold to the first client who stops the offer and is willing to buy at the current price.

The sense of urgency remains, but the mechanism changes. The choice between ascending and descending options depends on whether you, as a vendor, are unwilling to sell below a certain base price or if the market is unlikely to purchase above a specific amount.

Vickrey Auctions Another option is the Vickrey auction, where customers submit undisclosed offers within a set timeframe, and the product is sold to the second highest bidder. This type of auction is commonly used for tenders in the public administration and by companies.

When companies need to purchase goods or services from a supplier, they often use a document called a request for proposal (RFP). This document is published and a selected number of suppliers are invited to participate in an auction. The suppliers are required to submit another document that explains how they will meet the requirements outlined in the RFP. Additionally, they must include a separate envelope with a price for the goods or services they are offering.

The reason why the product is sold to the second highest offer is to prevent dumping. Dumping occurs when larger companies enter the market by offering

extremely low prices to gain market share. This can create a monopoly and limit competition. By selling to the second highest offer, companies can avoid dumping and promote a diverse market.

In some cases, auctions may prioritize the quality of the document that explains the product or service being offered by the supplier. This emphasizes the technical quality and ensures that the client receives the best possible solution.

2.5 E-Commerce Functionalities and Customer Profiling

2.5.1 Advanced Functionalities

- Product configuration
- Pricing
- Online orders (digital signature vs. login)
- Payment
 - Credit based (credit cards)
 - Debit based (Paypal)
 - Token based (Bitcoins)
- Order status
- Transaction log
- Online services
- Post sale services
- Customer profiling

E-commerce offers a range of advanced functionalities to meet the needs of customers, whether it's through a marketplace or the commerce side of a company. These functionalities are designed to enhance the customer experience and provide efficient and effective solutions.

In e-commerce, there are several advanced functionalities that enhance the customer experience. These include product configuration, pricing, and the ability to place orders online. Customers have the convenience of ordering and paying for their purchases on the website using various payment methods such as credit, debit, or token-based payments. They can also track the status of their orders online and access post-sale services if they encounter any issues.

2.5.2 Recommendation Systems and Personalization

As customers shop online, companies collect information about their purchases to create customer profiles. This process, known as customer profiling, helps

- **Collaborative filtering**
 - Recommendations are based on each customer's past purchasing behaviour
 - Recommendations are based on past purchasing behaviour of customer segments (that is subsets of customers similar by either static characteristics from catalog information, such as age, location, etc., or dynamic behavioural characteristics)
- **Content based**
 - Recommendations are based on the similarity of products or product categories (up-selling)
 - Recommendations are based on the complementarity of products or product categories (cross-selling)
- **Hybrid: a combination of collaborative filtering and content based**

Recommendation strategies should be consistent with business objectives:

- Increasing sales for low-turnover or high-stock products
- Promote new products
- Prevent churn
- ...

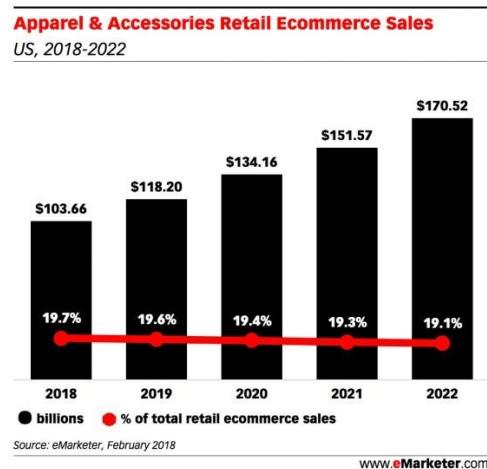
companies understand their customers' preferences. For example, if a customer clicks on a pastel-colored item, the recommendation system will show them related products, such as sauces for pasta. The recommendation system typically uses a combination of collaborative filtering and content-based filtering, depending on the company's business objectives.

When it comes to recommendation systems in e-commerce, personalization is crucial, especially for companies that cater to different market segments, such as the mid-market, low-end, and up-market. However, if a company serving the up-market purchases an off-the-shelf recommendation system that operates like Amazon's, there can be some challenges.

Typically, these off-the-shelf recommendation systems tend to suggest mass-market products. This poses a risk for companies serving the up-market because they may end up consistently recommending mid-market products to customers who prefer up-market products. As a result, instead of upselling and offering higher-priced products to increase revenue, the company may unintentionally downsell and offer lower-priced products.

In the best-case scenario, customers who are looking for up-market products may simply ignore these recommendations because they are not aligned with their preferences. However, in the worst-case scenario, customers may find some interest in the mid-market recommendations and choose those instead of the higher-priced up-market products. This can lead to lower revenues and margins for the company.

- eFashion is growing fast
- eFashion is growing comparatively less than other types of eCommerce
- The percentage of eCommerce sales varies markedly by product segment, from around 2% for grocery to more than 20% for apparel to the overwhelming majority of sales in categories where products can be digitally delivered, like music, books and games (source: Forbes).



2.5.3 Growth Trends and Market Penetration

The extent to which e-commerce technologies are adopted depends on the industry. In the case of e-fashion, it currently holds a market penetration of approximately 20%. This means that 80% of sales still take place in physical stores or through other channels. This is an important observation because it highlights that e-commerce is just one channel among many. Traditional companies must utilize multiple channels if they wish to maintain their current revenue levels.

2.6 Innovative E-Commerce Technologies

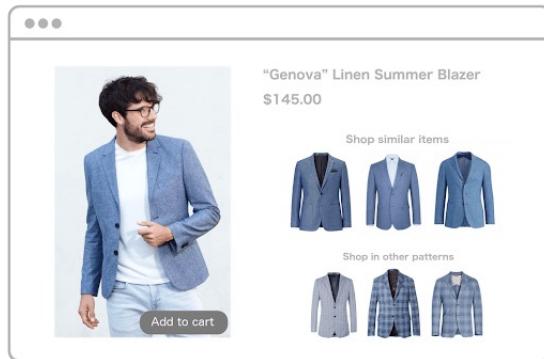
2.6.1 Product Recommendations

To illustrate this point, let's consider advanced product recommendation systems that leverage visual similarity. These systems are particularly relevant in the fashion industry.

2.6.2 Chatbots and Virtual Assistants

Another way to enhance personalization in e-commerce is by utilizing innovative technologies such as chatbots and virtual assistants. These tools can serve as shopping assistants, providing personalized recommendations based on the products you are interested in. For example, when you are browsing a specific product, the chatbot or virtual assistant can show you other similar products with different customization options, allowing you to personalize your purchase.

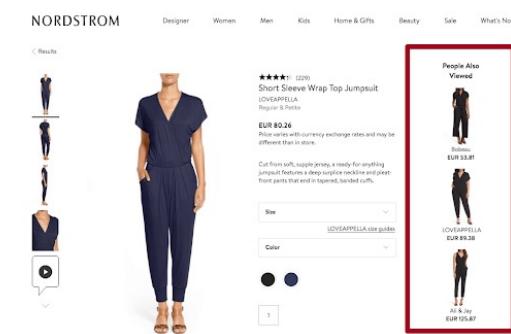
Similar product recommendations



Source: catchoom.com

Webshop visitors often abandon the site when an item is **out of stock, not in their size or it is not exactly what they were looking for.** Through **computer vision** it is possible to automatically suggest similar items when a customer is taking a look at a specific garment or accessory, **reducing the chances of abandonment.**

Recommendation engines (based on customer segmentation)



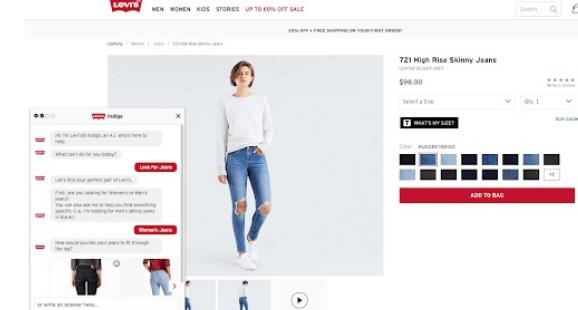
Source: catchoom.com

Retailers' goal has become to **personalize merchandising**, depending on their customers' taste. This is the main reason why AI-powered recommendation engines are quickly gaining ground in the eCommerce field. They provide personalized product recommendations based on user behavioral data and are often presented in the form of "**You may also**"

This visual representation can help you make informed decisions and find the perfect product that suits your preferences. Additionally, chatbots and virtual assistants can provide real-time assistance, answering any questions you may have and guiding you through the shopping process. These technologies not only enhance the customer experience but also streamline the purchasing journey, making it more efficient and enjoyable.

To excel in the e-commerce industry, it is crucial to have a deep understanding of customer preferences and be able to recommend suitable products. This is where the application of AI can be highly beneficial. By working tirelessly and becoming skilled at interpreting and learning a customer's style, you can effectively propose products that align with their preferences. This personalized

Virtual assistants, chatbots



The screenshot shows a Levi's website page for women's jeans. A chatbot window is open on the left, asking for input about finding the perfect pair of jeans. On the right, a product page for "721 High-Rise Skinny Jeans" is displayed, showing a price of \$98.00 and an "ADD TO BAG" button.

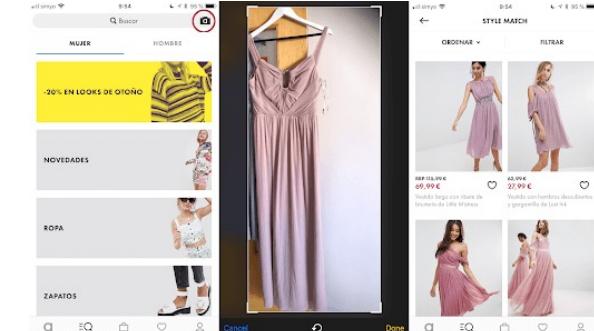
Source: catchoom.com

Chatbots or virtual assistants are virtual machines that **recommend** garments and accessories that best suit a specific customer **via chat** as if they were actual **shopping assistants working around-the-clock**. These services are fed with data and learn from each customer interaction to **increase**

approach can greatly enhance the customer experience and increase satisfaction.

2.6.3 Visual Search and Style Building

Visual search



The screenshot shows a visual search interface. A pink dress is uploaded, and the system displays a "STYLE MATCH" section with similar products, including a long purple dress and a pink jumpsuit.

Source: catchoom.com

Visual search aims at enabling consumers to take a picture of a product in order to search for it online. With the use of computer vision and image recognition, visual search solutions match the image uploaded by the consumer and with the retailer's closest image in their catalog.

Another innovative e-commerce technology that is worth exploring is visual search. With visual search, customers can simply take a picture of an item, such as a dress, and the recommendation system will search for similar dresses and suggest them. This feature allows customers to easily find products that match their desired style, making the shopping experience more convenient and efficient. By incorporating visual search into your e-commerce platform, you can provide a seamless and enjoyable shopping experience for your customers.

2.7 Conclusion and Transition to Part Three

Lastly, it is important to mention that your recommendation system can also incorporate AI to personalize the style of recommendations based on a specific client's purchases. This concludes part two of the lecture, and in part three, we will delve into web information systems, with a specific focus on supply chain management.

3 Web Information Systems - III Lecture

3.1 Introduction to Supply Chain Management

Welcome to part three of our discussion on web information systems, where we will be focusing on supply chain management. In the previous sections, we explored the impact of e-commerce on retail customers and how web information systems have revolutionized the way businesses interact with their customers. However, it's important to note that the web is not only used for e-commerce but also for e-business, specifically in the context of coordinating exchanges and transactions along the supply chain.

Supply chain management is a crucial aspect of e-business, where the web serves as a platform for businesses to collaborate and execute transactions with their partners along the supply chain. This innovative application of web information systems has transformed the way businesses operate and has led to significant improvements in efficiency and effectiveness throughout the supply chain.

In the context of supply chain management in retail, the focus is on the product that is ready to be sold to the end user. For example, when a customer searches for "rammy shoes" and clicks on an e-fashion shop that sells those shoes, they become the end user of the product. However, in the realm of supply chain management, the interactions and exchanges do not directly involve the end user.

3.2 Understanding Supply Chains

3.2.1 Definition and Components

Supply chains consist of multiple businesses that work together to produce and distribute a specific product. It's not just one company involved, but rather a chain of companies that each handle different aspects of production and distribution. These companies collaborate to ensure that the product moves from

Supply chain management: definition

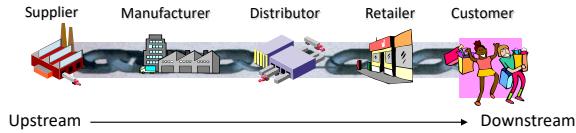
- Software supporting SCM coordinate and integrate all activites along a value chain involving multiple companies, from the downstream company that receives orders to the upstream suppliers working on base resources and materials.
- Fundamental benefits: cost reductions, service level improvement, flexibility.

raw materials to the final product and reaches the end customer. In essence, a supply chain is a network of companies that produce and sell the same product, with a shared focus on serving the end users of that product.

3.2.2 Complexity and Management

SCM: objectives

The supply chain is composed by:



Goal: adapt supply to demand



In supply chain management, companies closer to the end customer are referred to as downstream companies, while those closer to raw materials are known as upstream companies. The management of a supply chain is facilitated by web information systems and tailored to the specific needs of the product involved. Generally, a supply chain consists of a cascade of companies operating in the same industry, from upstream to downstream. These companies include suppliers, manufacturers, distributors, retailers, and customers.

However, supply chains can be much more complex than this basic structure. They can involve multiple levels of suppliers and customers before reaching the

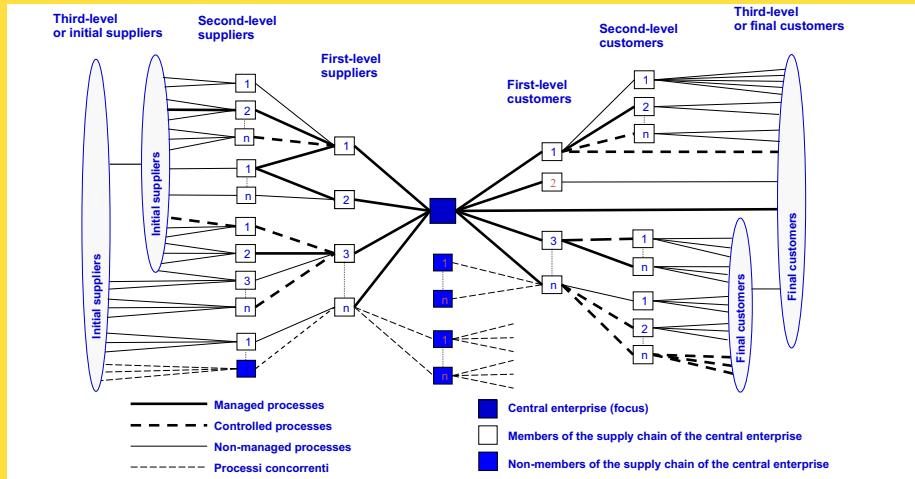
final customers. Effective supply chain management involves coordinating with suppliers and customers to achieve a common goal: delivering the right product, at the right price, through the right intermediary, in the right quantity, to the right customers, at the right time.

3.2.3 Financial Impact and Positioning

Supply chain management plays a crucial role in driving revenues and profits for companies. The amount of money that companies can make along the supply chain is directly influenced by effective supply chain management. However, the financial impact and positioning of a company within the supply chain can vary depending on its position and the nature of the product.

While it is generally believed that companies closer to the customer, downstream in the supply chain, tend to make more money, this is not always the case. The profitability of a company depends on its strength within the supply chain. This strength is determined by factors such as bargaining power and the level of competition at that particular point in the supply chain.

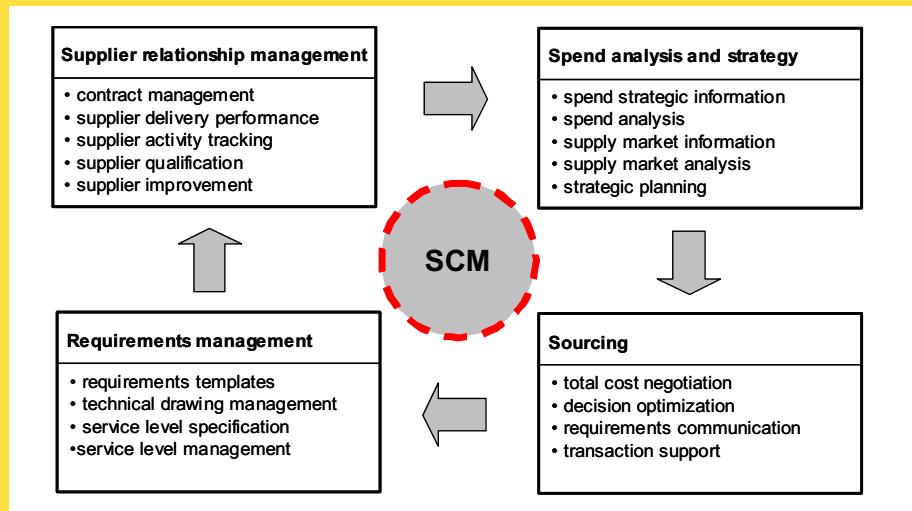
3.2.4 Realistic View of Supply Chains



A realistic view of a supply chain involves multiple companies operating along the same chain. In this diagram, the blue squares represent these companies. For example, manufacturers within the supply chain may compete against each other while also sharing suppliers and customers. They compete to attract the attention of customers and suppliers, ensuring they receive products at the right time to serve their customers effectively.

3.3 Supply Chain Management Process

3.3.1 Continuous Learning Cycle



Managing the supply chain is an ongoing process that requires continuous learning. Companies must constantly strive to improve their ability to manage the supply chain, as the world is constantly changing. This continuous learning cycle allows companies to adapt and stay ahead. The learning cycle is a repetitive process that ends at a certain point, but then starts again when something changes and new knowledge needs to be acquired.

Spend Analysis and Strategy To gain a better understanding of their supply chain, companies need to go through a learning process when introducing a new product. The first step in this process is spend analysis and strategy. This involves examining how money is being spent and determining if it is being allocated in the most effective way. Typically, the Pareto law is applied at this stage. Companies evaluate their suppliers and the materials they purchase, ranking them based on the amount of money spent. Ideally, this ranking follows the Pareto principle, where 20% of the materials or goods account for 80% of the spending. By focusing on optimizing this 20% of purchases, companies can achieve 80% of the benefits, as it covers the majority of their spending. This is the essence of spend analysis.

Supplier Assessment and Sourcing In the supply chain management process, the first step is to assess the supply market and determine if the company is purchasing from the best suppliers. This involves creating a list of suppliers and evaluating their position in the market. Strategic planning is then done to

determine if any suppliers should be replaced with better options. The company may also consider experimenting with new suppliers who are market leaders.

Once the best suppliers have been identified, the next step is sourcing. This involves negotiating the total cost with potential suppliers. The company approaches the supplier and discusses the amount they currently spend on the type of goods or materials provided by the supplier.

Requirements Management In our supply chain management process, one of the key steps is spend analysis and strategy. Each year, we analyze our spending and develop a strategy based on that information. As a supplier, if you can offer us a discount or integrate our information systems, it would make it more convenient for us to work with you. For example, if we have access to your stock levels, we can place orders with confidence, knowing that you can meet our requirements in a timely manner. We also prioritize electronic transactions to ensure accuracy and efficiency.

In some cases, we may even reach a point where we have automated processes, such as automatic order placement through MRP (Material Requirements Planning). Of course, this would only be possible if the supplier has the capacity to fulfill the orders.

Another important aspect of our relationship with suppliers is managing new requirements. The market is constantly changing, and we need to adapt to the evolving needs of our end customers. We work closely with our suppliers to address these requirements together. We value flexibility and the ability to respond to emerging needs, rather than rigid standardization. This collaborative approach allows both parties to continuously grow and stay competitive in the market.

In fact, our relationship with suppliers can be so strong that we even collaborate on designing new products or services together. This level of partnership and cooperation is what we aim for in our requirements management process.

Supplier Relationship Management In order to effectively manage supplier relationships, it is important to focus on step number three: requirements management. This step should be reserved for suppliers who have proven their loyalty and ability to support your business. By concentrating your purchases with these dependable suppliers, you can establish a strong working relationship over time.

However, it is crucial to recognize that suppliers may close, be sold, or acquired by other companies, regardless of their loyalty. In such cases, it becomes necessary to find new suppliers who can meet your requirements. To ensure a smooth transition, it is essential to engage in supplier relationship management.

Supplier relationship management is similar to a CRM package, but specifically designed for suppliers. It provides a platform where suppliers can access a workspace, download contracts and RFPs, participate in tenders, and receive notifications about upcoming opportunities. They can also manage their contracts, payments, and undergo continuous evaluation and qualification processes.

By actively managing supplier relationships through this system, suppliers have the opportunity to grow and improve their performance. Positive evaluations can give them a competitive edge in future tenders, ensuring a mutually beneficial partnership.

3.4 Technology in Supply Chain Management

In addition to attending courses online, companies can also provide training programs for their suppliers. Through e-learning platforms, suppliers can access courses and gain knowledge about the company's needs before being approached for new projects. This allows suppliers to grow and improve their capabilities, making them more suitable for collaboration with the company. Certification and qualification processes further ensure that suppliers meet the company's standards.

All of these processes are managed through technology, which includes analytics, spend analysis, and strategy. The negotiation phase involves sourcing, and requirements management is done collaboratively. Transaction support is provided through e-commerce, and as the relationship with suppliers develops, the platform evolves to include CRM-like features for managing supplier relationships. This comprehensive technology platform enables efficient and effective collaboration between companies and their suppliers.