

Electronic Commerce

Lecture 4

IT392

**Building an E-commerce Presence:
Websites, Mobile Sites, and Apps**

Prepared by
Dr. Eng. Youssef Ntefeh

Chapter 4

- In the world of e-commerce, your online presence is integral to the success of your business. Without a digital storefront, you cannot reach the wide range of customers that the internet provides.
- Throughout the lecture, we will imagine what your e-commerce presence would look like, explore ideas through the visioning process, and understand the business and revenue models. We will identify target audience demographics, and characteristics of your marketplace.
- We will delve into where your content might originate from, and use a SWOT analysis to gain a better understanding of your business.
- We will also discuss the development of an e-commerce presence map, timeline, and discuss the costs involved in setting up your e-commerce presence.

Chapter 4

- We will explore systematic approaches in building an e-commerce presence, understand the systems development life cycle.
- We will discuss alternative web development methodologies, choice of software and hardware, and other useful tools for creating your e-commerce site.
- We have also dedicated an entire section to discuss one of the most rapidly growing platforms - Mobile. We will learn about mobile website development, designing considerations for a mobile presence, cross-platform mobile app development tools, performance optimization, and cost considerations
- By the end of this lecture, you will have the knowledge and understanding to kickstart or enhance your e-commerce journey.

Learning Objectives

- Understand the questions you must ask and answer, and the steps you should take, when developing an e-commerce presence.
- Explain the process that should be followed in building an e-commerce presence.
- Identify and understand the major considerations involved in choosing web server.
- Understand the issues involved in choosing the most appropriate hardware for an e-commerce site.
- Understand the important considerations involved in developing a mobile website and building mobile applications.

Chapter 4: Building an E-commerce Presence: Websites, Mobile Sites, and Apps

Imagine Your E-commerce Presence

- What's The Idea? (The Visioning Process)
- Where's the Money: Business and Revenue Model
- Who And Where Is The Target Audience?
- What are the characteristics of the marketplace?
- Where's The Content Coming From?
- Know Yourself: Conduct a SWOT Analysis
- Develop an E-commerce Presence Map
- Develop a Timeline: Milestones
- How Much Will This Cost?

The Systems Development Life Cycle

- Systems Analysis/Planning
- System Design: Hardware and Software Platforms
- Building the System: In-House versus Outsourcing
- Host Your Own versus Outsourcing
- Testing the System
- Implementation, Maintenance, and Optimization
- Factors in Optimizing Website Performance

Choosing Software

- Simple versus Multi-tiered Website Architecture
- Web Server Software

Choosing Hardware

- Right-sizing your hardware platform: The demand side
- Right-sizing your hardware platform: The supply side

Developing a Mobile Website and Building Mobile Applications

- Understanding Mobile Websites and Applications
- Mobile Presence: Design Considerations
- Mobile Presence: Performance and Cost Considerations

Imagine Your E-commerce Presence

What's The Idea? (The Visioning Process)

- Building an e-commerce presence requires proper planning and a clear vision including a mission statement and identification of target consumers.
- Successful e-commerce companies often display their mission on their home page; examples include Amazon's mission to be highly customer-centric, Facebook's intent to foster community building and global connection, and Google's aim for creativity and innovation.
- Regardless of ambition level, a concise statement of mission, purpose, and direction is crucial in driving the development of an e-commerce project.



Imagine Your E-commerce Presence

Where's the Money: Business and Revenue Model

- The initial step after defining your vision and mission statement is to determine your potential sources of income, and formulate a preliminary business and revenue models.
- Detailed revenue and cost projections are not necessary at this stage, but a general idea of how revenue will be generated is needed.
- Some basic business models are: online retailer, content provider, transaction broker, market creator, service provider, social network, and portal.
- Options for revenue model alternatives include advertising, subscriptions, transaction fees, sales, and affiliate revenue.





 potential

Imagine Your E-commerce Presence

Who And Where Is The Target Audience?

- Know your target audience: Understand who they are and where to reach them.
- Describe your audience: Use demographics, behavior patterns, consumption patterns, digital usage habits, content creation preferences, and buyer personas.
- Use demographic info: This may include age, income, gender, and location.



What is a buyer persona?



Imagine Your E-commerce Presence

Who And Where Is The Target Audience?

- Understand different needs: Some brands like Harley-Davidson serve a wide demographic range based on their interest and lifestyle, not just their age or income
- Build detailed profiles: Create comprehensive descriptions of various "typical" customers to understand your audience better.

Imagine Your E-commerce Presence

What are the characteristics of the marketplace?

- **Market Characteristics:** Evaluate market trends - is it emerging, growing or declining? Successful ventures like Apple capitalized on untapped markets, while failures can arise from entering non-existent or over-saturated markets.
- **Marketplace Demographics:** Identify target audience based on age, income groups. Track shifting dynamics - offline to online switch, growing mobile presence.
- **Market Structure:** Investigate direct competitors, suppliers, and substitute products. Assess their market share, unique monthly website visitors, social media followers, and any special arrangements they may have.

Imagine Your E-commerce Presence

What are the characteristics of the marketplace?

- **Understand Customer Conversations:** Online platforms offer new-age methods to gauge customer sentiment. Use social listening tools to keep track of discussions about your planned products/service and competitors on various platforms.
- **Supplier Relationships & Product Substitutes:** Assess possible supplier relationships and the presence of product substitutes. A solid strategy should revolve around securing beneficial supplier deals and innovating beyond substitute offer.



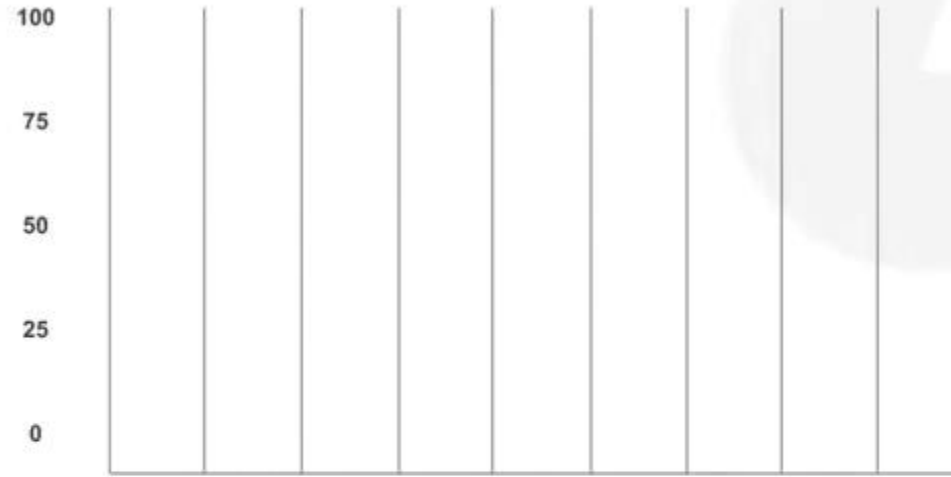
Imagine Your E-commerce Presence

Where's The Content Coming From?



- Websites are like books: They're composed of a lot of pages
- This content is what search engines catalog as they crawl through all the new and changed web pages on the Internet
- Static content is text and images that do not frequently change, such as product descriptions, photos, or text that you create to share with your visitors
- Dynamic content is content that changes regularly, say, daily or hourly.

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Business Analysis of **amazon**

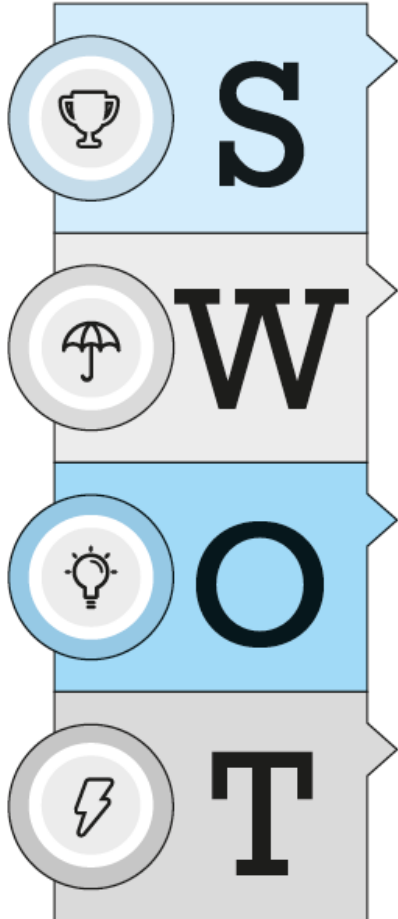


Imagine Your E-commerce Presence

Know Yourself: Conduct a SWOT Analysis

- In a **SWOT** analysis, you describe your **strengths**, **weaknesses**, **opportunities**, and **threats** (SWOT).
- There are many opportunities to address a large market with unmet needs as well as the potential to use the initial website as a home base and spin off related sites, leveraging the investment in design and technology.
- But there are also weaknesses and threats. Lack of financial and human resources are typically the biggest weakness of startup companies.
- Threats include competitors that could develop the same capabilities as you, and low market entry costs, which might encourage many more startups to enter the marketplace.

Imagine Your E-commerce Presence



STRENGTHS

Unique approach - Easy navigation - Better personalization - Customer base growing - High-value market segment - Superior social strategy

WEAKNESSES

Limited financial resources - No prior online experience - No existing user base - No media attention - No Web design expertise - No computer background

OPPORTUNITIES

Ability to address large market with unmet needs - Potential to capture significant share of this market - Potential to develop related sites

THREATS

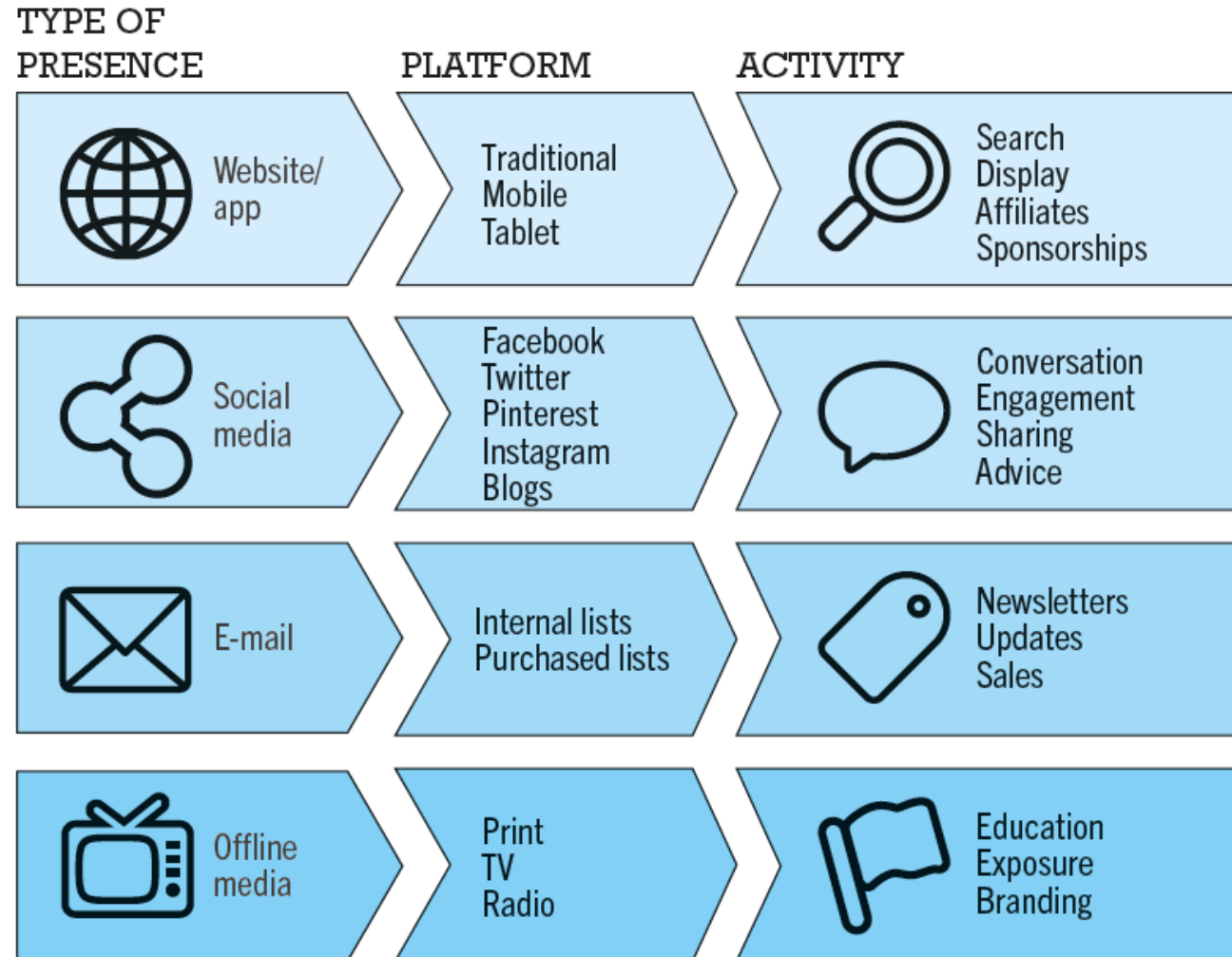
Approach could be copied by competitors - Advertisers may not want to try a new site - Rapid pace of technological development - Low market entry costs

Imagine Your E-commerce Presence

Develop an E-commerce Presence Map

- E-commerce has shifted significantly towards mobile-based activity, with smartphones and tablets playing a significant role in purchases.
- Internet users in the U.S. are increasingly using mobile devices to shop, compare prices, explore purchase options and interact on social networks.
- Therefore, it is crucial to strategize how to establish a presence in these diverse virtual spaces, effectively utilizing platforms like Facebook, Instagram, TikTok, and online news articles.
- The goal is to effectively reach and engage with potential customers across all platforms throughout the day.

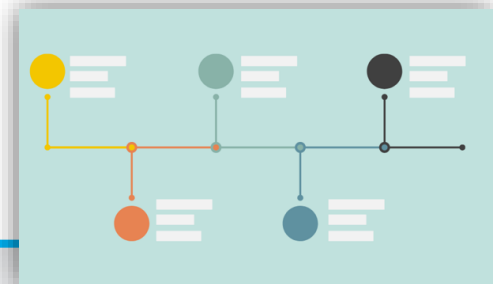
Imagine Your E-commerce Presence



Imagine Your E-commerce Presence

Develop A Timeline: Milestones

- Break down your e-commerce project into six manageable phases, each with a specified time frame.
- Develop a step-by-step timeline for website and social media plan development and implementation.
- Consider developing a mobile plan post-implementation of the website and social media plan, keeping in mind that a 'mobile-first' design approach may also be considered depending on the business requirements.
- Understand that small businesses often initiate with a social media plan prior to website development.



Imagine Your E-commerce Presence

Phase	Activity	Milestone
Phase 1: Planning	Envision e-commerce presence; determine personnel	Mission statement
Phase 2: Website development	Acquire content; develop a site design; arrange for hosting the site	Website plan
Phase 3: Web implementation	Develop keywords and metatags; focus on search engine optimization; identify potential sponsors	A functional website
Phase 4: Social media plan	Identify appropriate social platforms and content for your products and services	A social media plan
Phase 5: Social media implementation	Develop Facebook, Instagram, TikTok, Twitter, and Pinterest presence	Functioning social media presence
Phase 6: Mobile plan	Develop a mobile plan; consider options for porting your website to mobile devices	A mobile plan

Imagine Your E-commerce Presence

HOW MUCH WILL THIS COST?



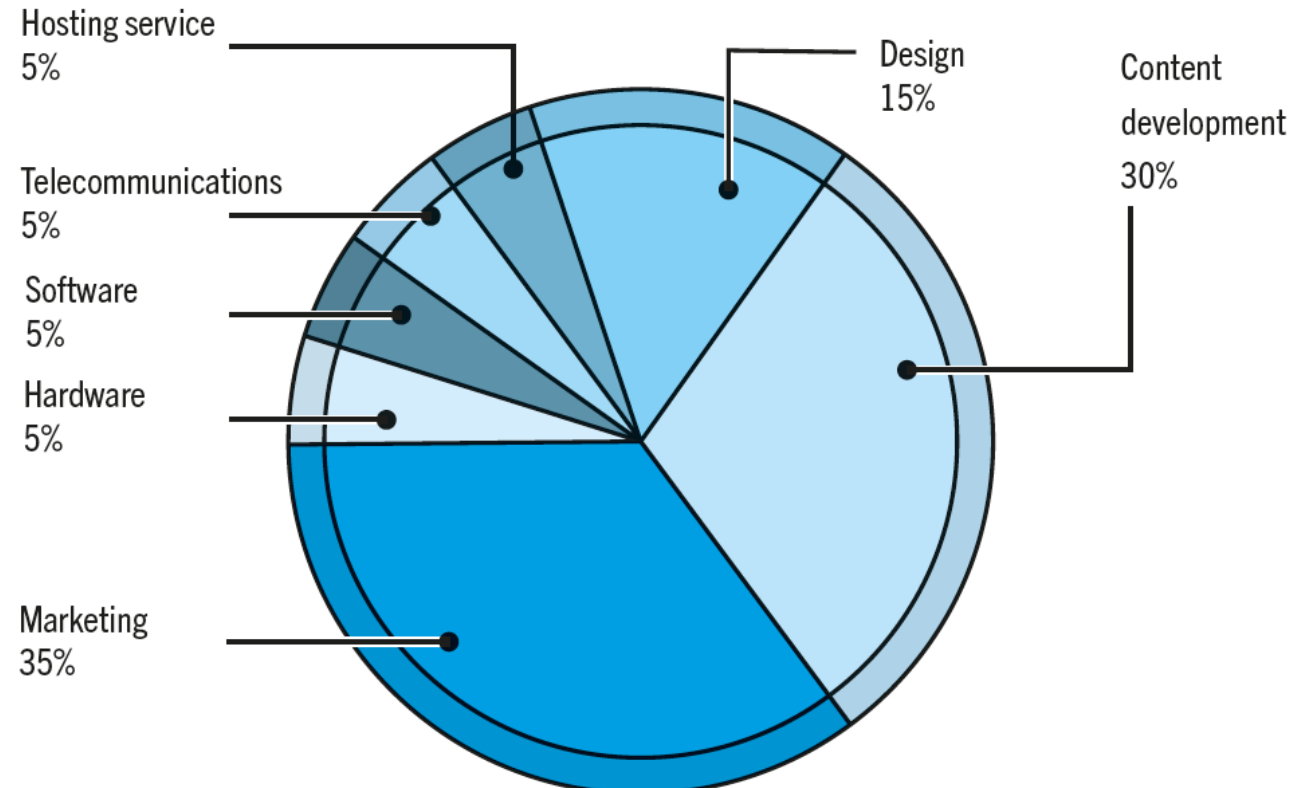
- The cost of building an e-commerce presence can vary greatly, from a few hundred dollars to millions.
- Factors include the website's function, size of the business, and whether design and hosting are outsourced or done in-house.
- Costs include not only system development, which has seen decreasing costs due to technology improvements, but also marketing, content development, and design which now make up over half the budget for a typical website.
- Maintenance costs, as well as costs for mobile site and app development, should also be considered.

Imagine Your E-commerce Presence

- HOW MUCH WILL THIS COST?

FIGURE 4.3

COMPONENTS OF A WEBSITE BUDGET



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Building an E-commerce Presence

- E-commerce presence is an integration of business, technology and social aspects.
- The key challenges are understanding your business objectives and choosing the right technology to meet them.
- It's important to let business drive the technology decision. This approach applies even when outsourcing development and operation tasks, as a clear plan and basic understanding of e-commerce infrastructure is essential for making sound decisions.
- One cannot simply rely solely on IT specialists and programmers; e-commerce strategy involves a broader perspective.

Building an E-commerce Presence

- Building a successful e-commerce presence involves assembling a team with the right skills to define business objectives, strategy, technology, design, and social policies.
- Key decisions revolve around hardware, software and telecommunication infrastructure based on customer demands.
- Customers prefer technology that allows simple product discovery, viewing, purchasing and quick delivery.
- Design decisions should also reflect customer preferences. Following a systematic approach, like the systems development life cycle, helps in effectively developing the project.

The Systems Development Life Cycle

- The **SDLC** is a beneficial methodology for comprehending business goals and curating pertinent solutions. This method revolves around a 5-step process:
- 1. **Systems Analysis/Planning:** Understanding the company's objectives.
- 2. **Systems Design:** Crafting an effective solution based on the analysis.
- 3. **Building the System:** Transforming the design into a functional system.
- 4. **Testing:** Checking the system's functionality and troubleshooting any issues.
- 5. **Implementation and Maintenance:** Deploying the system while ensuring its long-term efficacy and performance.

SDLC aids in creating strategic documents which clearly outline objectives, milestones, and resource use for effective management. The approach doesn't guarantee success, but it is more advantageous than proceeding without any strategic plan.

The Systems Development Life Cycle



Systems Analysis/Planning

- The goal in Systems Analysis/Planning is to allow business decisions to steer technology, aligning technology with business strategies.
- The **first step** is to identify your site's business objectives, defined as the capabilities you want your site to possess.
- **Next**, define system functionalities, which are the information system capabilities needed to realize your business objectives
- **Finally**, determine the information requirements, the specific information elements that the system needs to meet the objectives.
- These objectives, functions, and requirements should be well defined and detailed.
- The key difference in e-commerce is that these objectives must be delivered entirely digitally, 24/7, without the need for physical structures or salespeople.

The Systems Development Life Cycle

System Design: Hardware and Software Platforms

- System design is a crucial step in the e-commerce process that involves outlining both logical and physical designs.
- The **logical design** refers to the data flow diagram showcasing the information flow within your e-commerce site, processing functions, databases used, backup procedures, system controls, and security measures.
- In contrast, the **physical design** translates the logical systems into tangible, physical components such as the specific server model, software used, size of telecommunications link needed and measures for system protection.



The Systems Development Life Cycle

Building the System: In-House versus Outsourcing

- Options for building a website range from outsourcing to in-house creation, each with its own advantages and potential pitfalls.
- A variety of vendors, such as WordPress, Wix, Squarespace, Shopify, Square, and Weebly offer website-building tools with built-in e-commerce functionality.
- These pre-built templates restrict the level of customization but simplify the construction process.
- More elaborate options include building a site from scratch using HTML/HTML5, CSS, and JavaScript, or using premium web development tools like Adobe Dreamweaver CC, Microsoft Visual Studio, Sitecore Commerce, or HCL Commerce.
- Constructing a website on your own can be risky and costly due to the complexity of features, but it provides greater control and adaptability.



The Systems Development Life Cycle

Building the System: In-House versus Outsourcing

- Prepackaged site-building tools can speed up the site creation process, however, choosing the right package requires detailed consideration and potential modifications can increase the cost rapidly.
- While large retailers rely heavily on vendors for complex website capabilities, they also maintain a substantial internal staff for site maintenance and modifications.
- Medium-sized startups often purchase website design and programming expertise from vendors.
- Small businesses seeking simple e-commerce storefronts typically utilize templates from WordPress, Squarespace, and Weebly.

The Systems Development Life Cycle

Host Your Own versus Outsourcing

Small to medium-sized businesses tend to outsource website hosting, leaving the technicalities to the hosting company for a monthly fee.

- Larger firms may opt for co-location; they maintain control over web servers but house them in a vendor's facility.
- With virtualization, firms can rent server capabilities monthly, often for less than the cost of owning a server.
- Cloud services, offering standardized infrastructure and a pay-as-you-go billing system, are becoming more popular due to reduced costs and high reliability.

The Systems Development Life Cycle

Host Your Own versus Outsourcing

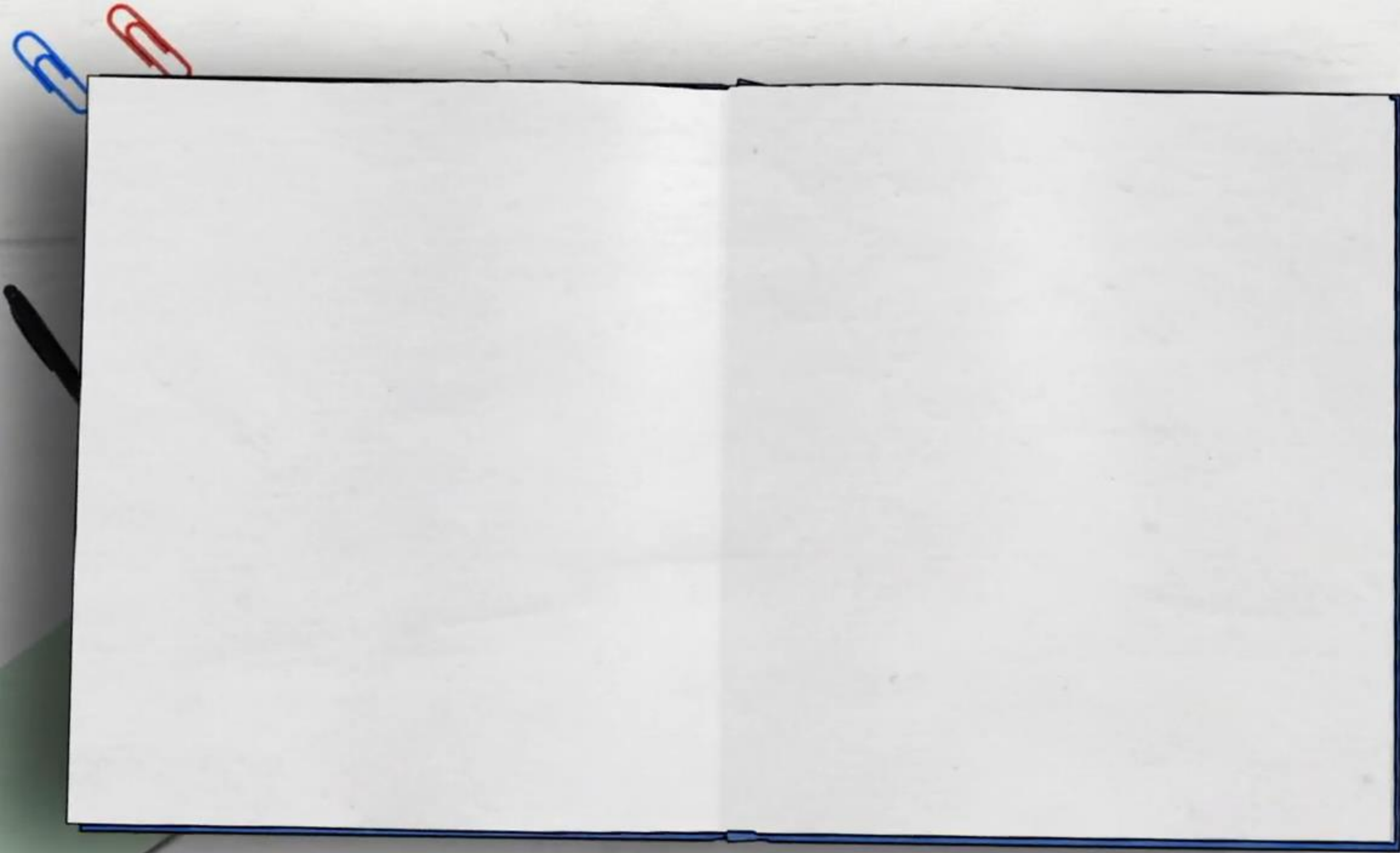
- When outsourcing hosting, it's crucial to select a vendor that can scale with your business and has robust security measures in place.
- In-house hosting presents a higher cost risk as businesses must fund all the necessities, including hardware, software, physical facilities, communication lines, staff, and security provisions.
- Regardless of the option chosen, companies must differentiate themselves from the commodity-hosting business by offering extensive site design, marketing, optimization, and other services.

The Systems Development Life Cycle

Testing the System



- Implementation of a new system requires a thorough testing process which can be a complex and time-consuming task.
- **Unit testing** involves examining each program module separately, while **system testing** simulates a user's interaction with the whole site, covering as many possible pathways as possible.
- **Final acceptance testing** involves key personnel using the system to confirm it meets the originally intended business objectives.



The Systems Development Life Cycle

Testing the System

- **A/B testing** involves comparing two versions of a webpage or site to determine which performs better. It could take forms such as
 - ❖ *template test* compares the same general page content using two different layouts and/or design treatments.
 - ❖ *new concept test* compares a control page with one that is very different.
 - ❖ *funnel test* compares the flow through a series of pages (such as a product page, to a registration page, to a shopping cart page, versus skipping the registration page) to see which one results in a higher percentage of conversions.
- **Multivariate testing:** a more advanced form of A/B testing, involves testing specific elements on a web page in different versions and combinations to determine the most optimal design.
- if a webpage has three elements (headline, image, button) and two versions of each, eight different combinations ($2 \times 2 \times 2 = 8$) would be tested.

The Systems Development Life Cycle

Implementation, Maintenance, and Optimization

- Post-implementation phase in an information system marks the beginning of the system's operational life, requiring continuous checking, testing, and repair.
- Systems maintenance is integral yet often not budgeted for; it roughly parallels development cost. For instance, an e-commerce site developed for \$40,000 may need a similar cost for annual maintenance.
- E-commerce sites, due to continual change and improvement needs, spend 20% of their time in debugging and responding to emergencies while another 20% is used for report changes, data file updates, and backend database links.
- The remaining 60% of the maintenance phase includes product and price updates in the catalog, along with system enhancements.

The Systems Development Life Cycle

Implementation, Maintenance, and Optimization

- The long-term success of an e-commerce site typically depends on a multi-skilled web team who monitor and adapt the site according to changing market conditions.
- Initial tasks for the web team include responding to customer feedback and developing a systematic monitoring and testing plan ensuring proper link operation, correct pricing, and updated pages.
- Another responsibility involves benchmarking, where site features like response speed, layout quality, and design are compared with competitor sites.
- Keeping the site updated on pricing and promotions is essential in the highly competitive web environment, where customers could be easily frustrated and lost with a dysfunctional site.

The Systems Development Life Cycle

Factors in Optimizing Website Performance

- Website performance optimization is vital to ensure quick, reliable content delivery and transaction completion. This potentially improves commerce effectiveness.
- Key factors in optimization include **page content**, **page generation**, and **page delivery**. Efficient styling and techniques in **page content**, such as reducing unnecessary HTML and using efficient graphics, can reduce response time.
- **Page generation** speed can be enhanced by segregating servers for dedicated functions, and **delivery** can be sped up with specialized content delivery networks or enhanced local bandwidth.
- These principles apply whether you're a small firm relying on a vendor like Wordpress, or crafting a custom site.

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Choosing Software

Simple versus Multi-tiered Website Architecture

- Traditional websites used **single-tier** architecture, which consisted of a server computer running basic web server software to deliver HTML pages to users.
- This changed with the development of e-commerce, as more interactive functionality was required, such as processing customer orders and integrating with corporate databases.
- **Multi-tiered** system architecture was developed, which includes specialized web application servers for the variety of transaction processing required in e-commerce.

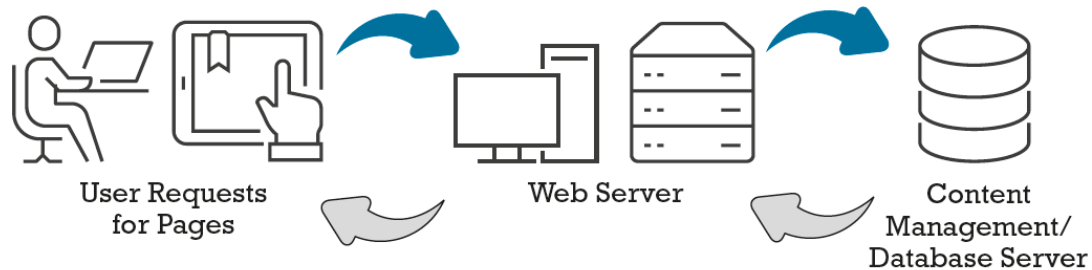
Simple versus Multi-tiered Website Architecture

- **Two-tier** architecture includes a web server for web page requests and a database server for backend data storage.
- **Multi-tier** architecture links the web server to a middle-tier layer of application servers and a backend layer of existing corporate systems containing product, customer, and pricing information.
- A multi-tiered site often uses several physical computers, each running some of the software applications and sharing the workload across many physical computers.
- Web application servers and their various types are central to multi-tiered website architecture.

Choosing Software

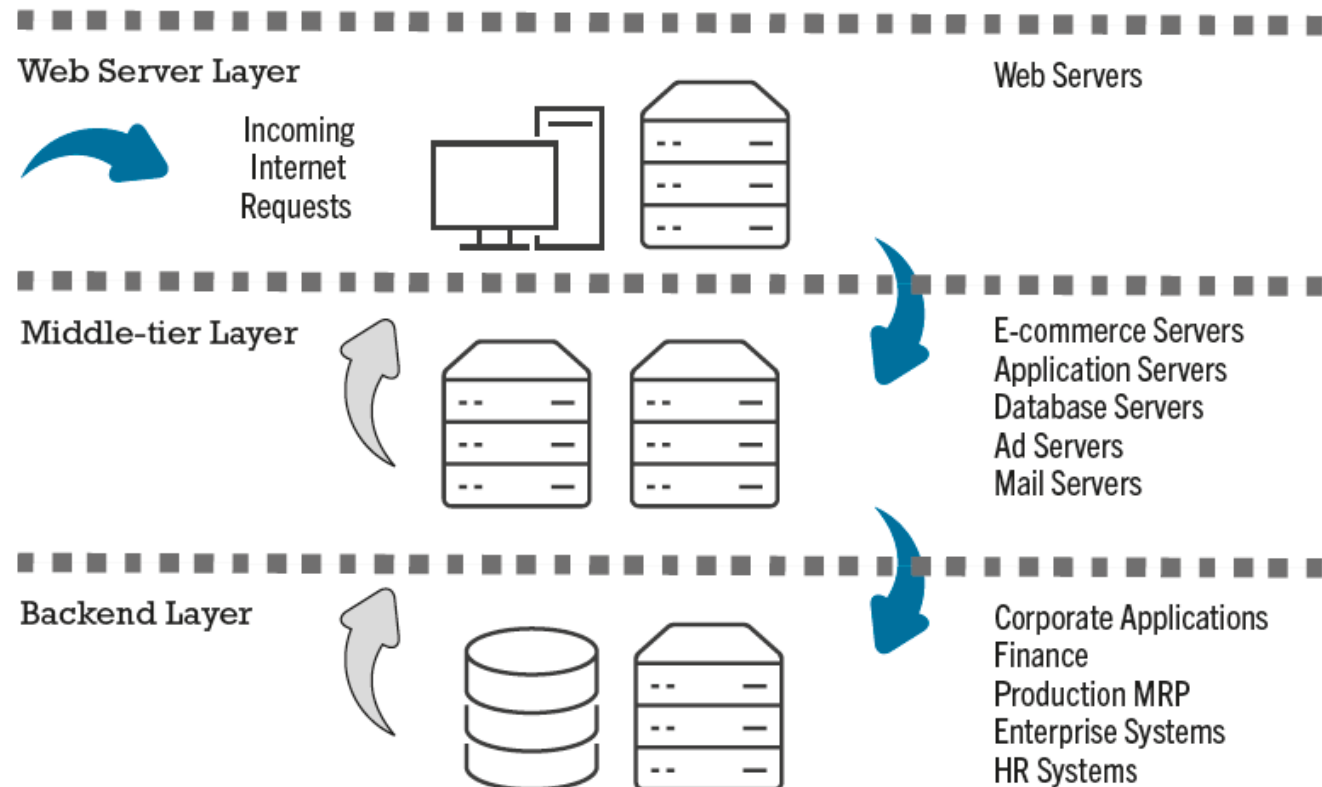
A. Two-tier Architecture

In a two-tier architecture, a web server responds to requests for web pages and a database server provides backend data storage.



B. Multi-tier Architecture

A physical design describes the hardware and software needed to realize the logical design.

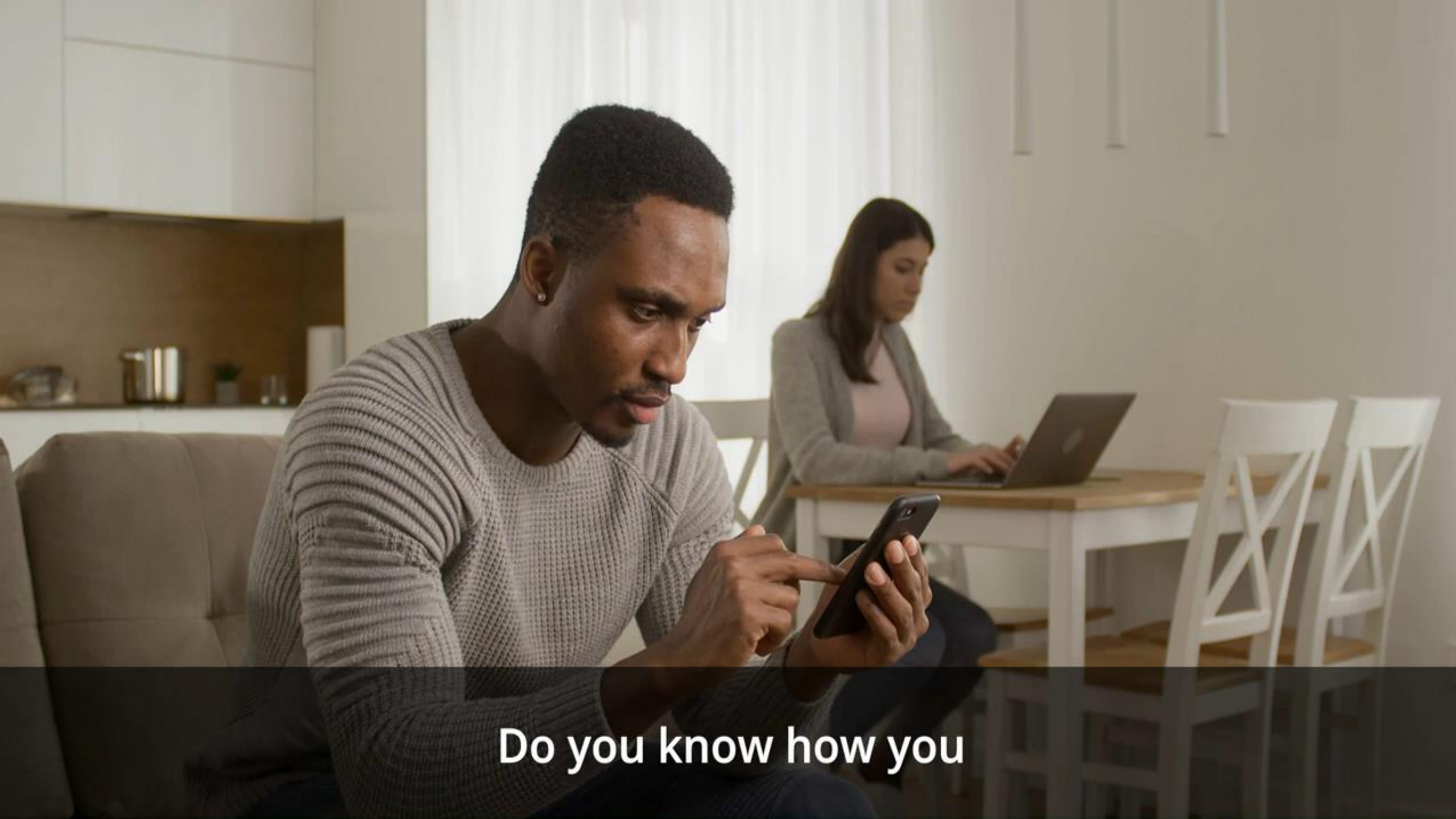


Choosing Software

Web Server Software

- E-commerce sites require web server software to provide services like security, file transfer, and data capture.
- Apache is a leading web server software, compatible with Linux and Unix operating systems, renowned for its stability and large support from the programming community.
- Microsoft Internet Information Services (IIS) is another popular choice, based on Windows and compatible with many Microsoft utility programs.
- The choice of web server doesn't impact user experience, as web pages will look the same regardless. While Microsoft's development tools are integrated and user-friendly, Linux offers exceptional reliability and is widely supported by the global programming community.





Do you know how you

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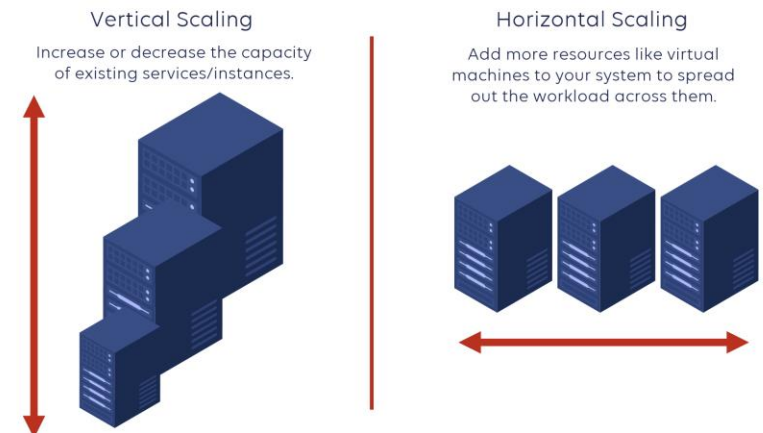
- **Key elements affecting website speed:** number of simultaneous users during peak periods, nature of customer requests, content type, required security, inventory volume, rate of page requests.
- User sessions are typically short-lived and stateless, resulting in a limited load on a server for each user.
- System performance decreases as simultaneous user demands increase, but degradation remains manageable until peak load is met.
- Static web pages demands are I/O intensive, hence website performance is constrained mainly by server's I/O limitations and telecoms connection rather than processor speed.
- Increased processor demands occur with user requests like searches, registration forms, and shopping carts.

Choosing Hardware

Right-sizing your hardware platform: The supply side

Website scalability, crucial for increasing site size per demand, can be achieved by:

- 1) **Vertical Scaling:** enhancing individual components' processing power e.g. by adding more processors or upgrading to faster speeds. However, it's expensive and makes the site reliant on a few top-notch computers.
- 2) **Horizontal Scaling:** distributing workload over multiple servers which could handle different tasks. This cheaper, recyclable method provides redundancy, but requires more space and complex management.
- 3) **Improving Processing Architecture:** a mix of vertical and horizontal scaling along with strategic design decisions, involving workload separation into I/O-intensive and CPU-intensive activities.
 - ❖ Adding more RAM, for instance, reduces load time dramatically.
 - ❖ For CPU-intensive tasks, a dedicated multiprocessor server can provide optimal performance.
 - ❖ Outsourcing to cloud-based services may also be alternatives.



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Developing a Mobile Website and Building Mobile Applications

Understanding Mobile Websites and Applications

- With over 90% of Internet users accessing the web via mobile devices, businesses need to develop mobile websites, web apps, native apps or hybrid apps.
- **Mobile website** is a streamlined version of a regular website, tailored for usage on a mobile device.
- **Native app** is designed for a specific mobile device's hardware and operating system, offering more advanced features and better performance.
- **Mobile web app** runs on the mobile web browser, designed for mobile interface and can support complex interactions.
- **Hybrid apps** combine elements of native and web apps, using the device's browser engine to process locally.

Developing a Mobile Website and Building Mobile Applications

What are t

A hand holding a black pen, pointing at the text 'What are t'. The hand is positioned on the right side of the frame, with the pen tip touching the text. The background is a light blue gradient with faint, stylized text and graphics.

Developing a Mobile Website and Building Mobile Applications

Mobile Presence: Design Considerations

- **Hardware:** Mobile hardware is smaller, and there are more resource constraints in data storage and processing power.
- **Connectivity:** The mobile platform is constrained by slower connection speeds than desktop websites have.
- **Displays:** Mobile displays are much smaller and require simplification. Some screens are not good in sunlight.
- **Interface:** Touch-screen technology introduces new interaction routines that are different from the traditional mouse and keyboard. The mobile platform is not a good data entry tool but can be a good navigational tool.

Developing a Mobile Website and Building Mobile Applications

Mobile Presence: Performance and Cost Considerations

- The costs for **mobile website** development can vary greatly depending on the business size and the approach taken.
- Building a **mobile web app** provides high interactivity but comes with more developmental costs and limitations like browser-based applications.
- **Native apps**, though most expensive, provide the ability to offer an unique and intense customer-brand interaction.
- This lack of standardization may demand more simplification and focus, but opens up opportunities for a unique customer experience.

REVIEW

Understand the questions you must ask and answer, and the steps you should take, when developing an e-commerce presence. include:

What is your vision and how do you hope to accomplish it?	Conduct a SWOT analysis.
What are your business and revenue models?	Develop an e-commerce presence map.
Who and where is the target audience?	Develop a timeline.
What are the characteristics of the marketplace?	Develop a detailed budget.
Where is the content coming from?	

REVIEW

Explain the process that should be followed in building an e-commerce presence.

- Factors you must consider when building an e-commerce site include hardware, software, telecommunications capacity, website and mobile platform design, human resources, and organizational capabilities.
- The systems development life cycle (a methodology for understanding the business objectives of a system and designing an appropriate solution) for building an e-commerce website involves five major steps:
 - Identify the specific business objectives for the site, and then develop a list of system functionalities and information requirements. Basic business and system functionalities for an e-commerce site include a digital catalog, a product database, customer tracking, a shopping cart/payment system, an on-site blog, a customer database, an ad server, a site tracking and reporting system, and an inventory management system.

REVIEW

- Develop a system design specification (both logical design and physical design).
- Build the site, either by in-house personnel or by outsourcing all or part of the responsibility to outside contractors. Advantages of building in-house include the ability to change and adapt the site quickly as the market demands and the ability to build a site that does exactly what the company needs. Disadvantages include higher costs, greater risks of failure, a more time-consuming process, and a longer staff learning curve that delays time to market. Using design templates cuts development time, but preset templates can also limit functionality. A similar decision is also necessary regarding outsourcing the hosting of the site versus keeping it in-house
- Test the system (unit testing, system testing, acceptance testing, A/B testing, and multivariate testing).
- Implement and maintain the site.

REVIEW

Identify and understand the major considerations involved in choosing web server and e-commerce merchant server software.

- Early websites used single-tier system architecture and consisted of a single server computer that delivered static web pages to users making requests through their browsers. The extended functionality of more complex websites requires a multi-tiered systems architecture, which utilizes a variety of specialized web servers as well as links to pre-existing backend or legacy corporate databases.
- All e-commerce sites require basic web server software. Apache, which works with Linux and Unix operating systems, is the most commonly used.
- Web server software provides a host of services, including processing user requests for HTML and XML pages, security services, file transfer, search services, data capture, e-mail, and site management tools.
- Dynamic page generation tools allow sites to deliver dynamic content rather than static.

REVIEW

Understand the issues involved in choosing the most appropriate hardware for an e-commerce site.

- Speed, capacity, and scalability are three of the most important considerations in choosing the most appropriate hardware for an e-commerce site.
- To evaluate how fast the site needs to be, companies need to assess the number of simultaneous users the site expects to see, the nature of their requests, the types of information requested, and the bandwidth available to the site. The answers to these questions will provide guidance regarding the hardware necessary to meet customer demand. In some cases, additional processing power can increase capacity, thereby improving system speed.
- Scalability is also an important issue. Scaling up to meet demand can be done through vertical or horizontal scaling or by improving processing architecture.

REVIEW

Understand the important considerations involved in developing a mobile website and building mobile applications.

- It is important to understand the difference between a mobile website, native apps, mobile web apps, and hybrid apps when you are developing a mobile presence.
- The first step is to identify business objectives because they help determine which type of mobile presence is best.
- Design should take into account mobile platform constraints. Recent trends include mobile first design, responsive web design, and adaptive web design.
- Developing a mobile website is likely to be the least expensive option; mobile web apps require more effort and cost; native apps are likely to be the most expensive to develop.

Reference

