

Chapter 3

Technology for E-business

Learning Objectives

In this chapter, you will learn about:

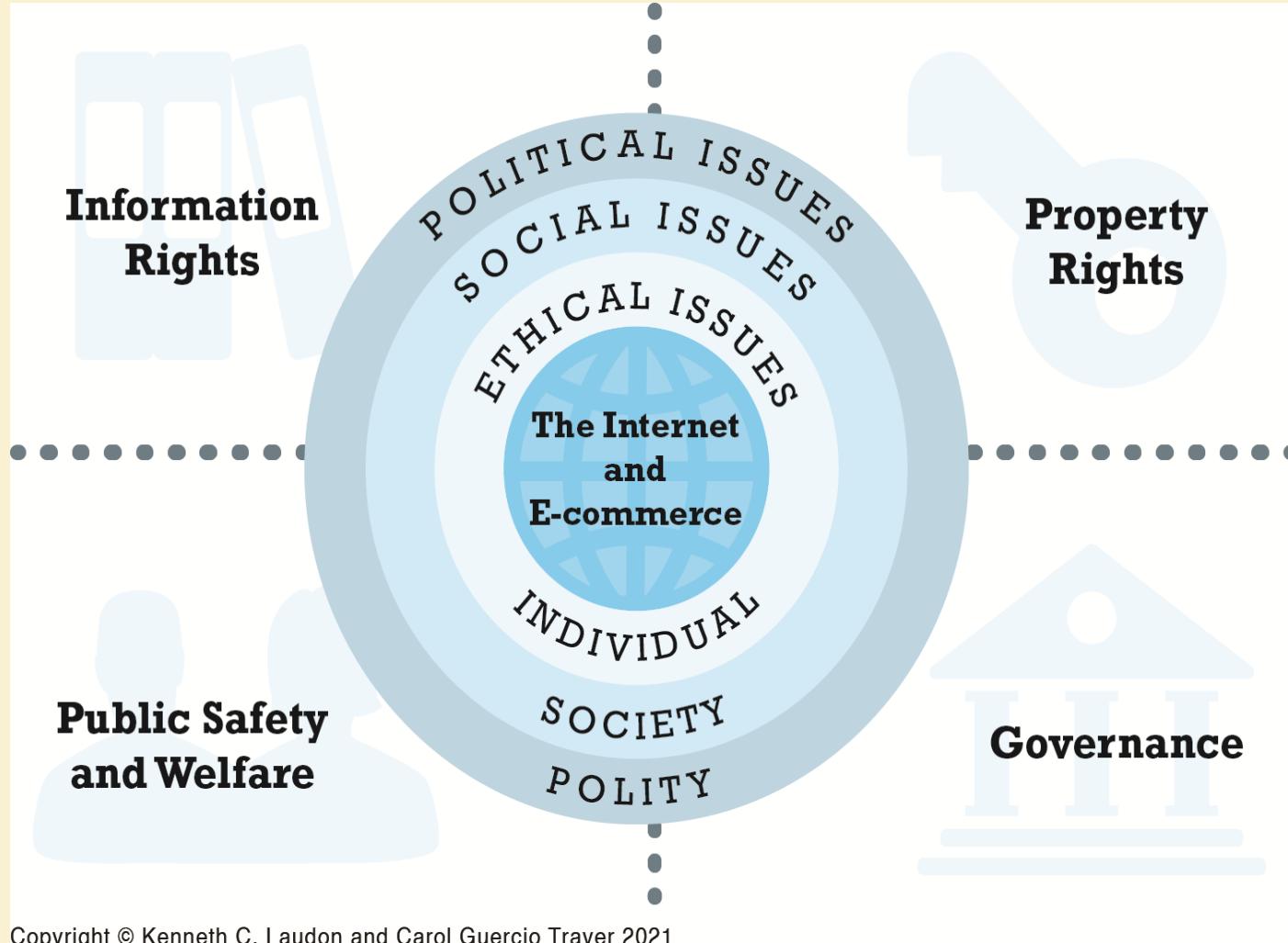
- E-business tax and Law system
- E-business software and web hosting
- Online security
- Online payment system

1. E-business Tax and Law System

A Model for Organizing the Issues

- Issues raised by the Internet and e-commerce can be viewed at individual, social, and political levels
- Four major categories of issues:
 - Information rights
 - Property rights
 - Governance
 - Public safety and welfare

The Moral Dimensions of an Internet Society



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Figure 1: The Moral Dimensions of an Internet Society

Privacy and Information Rights

- Privacy
 - The moral right of individuals to be left alone, free from surveillance or interference from other individuals, organizations, or state
- Information privacy: 4 matters
 - Right to control information collected about them
 - Right to know when information is collected and give consent
 - Right to personal information due process
 - Right to have personal information stored in a secure manner

Privacy in The Public Sector: Privacy Rights of Citizens

- Public sector privacy rights have a long history
 - First Amendment
 - Fourth Amendment
 - Fourteenth Amendment
- Constitutional, implied privacy rights did not cover the collection and use of personal information
- 1974 Privacy Act
- Federal and state law to protect individuals against unreasonable government interference

Privacy in The Private Sector: Privacy Rights of Consumers

- Piecemeal federal and state privacy legislation, applying to specific industries
- Historically, few claims to privacy in public, open markets such as in e-commerce
- Emergence of Internet has created enormous collections of personal data
 - Ideal environment for businesses and government to invade personal privacy of consumers
 - Google, Amazon, Netflix, etc.

Information Collected by Websites

- Data collected includes
 - Personally identifiable information (PII)
 - Anonymous information
- Types of data collected
 - Name, address, phone, e-mail, social security
 - Bank and credit accounts, gender, age, occupation, education
 - Preference data, transaction data, clickstream data, and browser types

Key Issues in Online Privacy of Consumers

- Top concerns
 - Profiling and ad targeting
 - Social network privacy
 - Sharing of information by marketers
 - Mobile phone privacy
 - Digital assistant privacy

Marketing: Profiling, Behavioral Targeting, and Retargeting

- Profiling
 - Creation of data images that characterize online individual and group behavior
 - Anonymous profiles
 - Personal profiles
 - Facial recognition a new dimension
- Advertising networks
 - Track consumer and browsing behavior on Web
 - Dynamically adjust what user sees on screen
 - Build and refresh profiles of consumers

Marketing: Profiling, Behavioral Targeting, and Retargeting

- Google's privacy policy
- Business perspective
 - Increases effectiveness of advertising, subsidizes content
 - Enables sensing of demand for new products
- Critics' perspective
 - Undermines expectation of anonymity and privacy
 - Enables price discrimination

Social Networks: Privacy and Self-Revelation

- Social networks
 - Encourage sharing personal details
 - Pose unique challenge to maintaining privacy
- Facebook
 - Massive database
 - Serving ads to users not on Facebook
 - Sharing information with third parties
- Personal control over personal information versus Organization's desire to monetize social network

Mobile Devices: Privacy Issues

- Mobile apps
 - Provide personal information to mobile advertisers for targeting ads
 - Track and store user locations
 - Track users' use of other apps
- Nonstop location tracking
- U.S. Supreme Court rules that police need a warrant prior to searching a cell phone for information

Privacy Protection in Europe

- European privacy protection is much stronger than in U.S
- 2016 General Data Protection Regulation (GDPR)
 - Replaces Data Protection Directive of 1998
 - Applies to all organizations that operate in EU
 - Strengthens citizens' rights to their own personal data
 - Strengthens oversight of firms to ensure compliance
- The environment has turned against U.S. firms like Facebook such as the unfettered collection and use of personal data

Technology Solutions

- Solutions include
 - Intelligent Tracking Protection (ITP)
 - Differential privacy software
 - Privacy default browsers
 - Message encryption
 - Spyware blockers
 - Pop-up blockers and ad blockers
 - Secure e-mail, anonymous remailers
 - Cookie managers
 - Public key encryption

Privacy Protection

- Privacy protection as a business
 - Personal Data Economy (PDE)
 - Life Management tools
 - Etc.
- Privacy advocacy groups

Intellectual Property Rights

- Intellectual property
 - All tangible and intangible products of human mind
- Major ethical issue
 - How should handle property that belongs to others?
- Major social issue
 - Is there continued value in protecting intellectual property in the Internet age?
- Major political issue
 - How can Internet and e-commerce be regulated or governed to protect intellectual property?

Intellectual Property Protection

- Main types of protection:
 - Copyright
 - Patent
 - Trademark
 - Trade secrets
- The goal of intellectual property law:
 - Balance two competing interests-public and private

Copyright

- Protects original forms of expression (not ideas) from being copied by others for a period of time
- Digital Millennium Copyright Act of 1998
 - First major effort to adjust copyright laws to Internet age
 - Implements WIPO Copyright treaty that makes it illegal to make, distribute, or use devices that overreach technology-based protections of copyrighted materials

Patents

- Provide owner 20-year monopoly on ideas behind an invention
- The invention must be new and novel
- Encourages inventors
- Promotes dissemination/distribution of new techniques through licensing
- Decreases competition by raising barriers to entry

E-commerce Patents

- 1998 State Street Bank & Trust v. Signature Financial Group
 - Business method patents
- 2014 Alice Corporation lawsuit
 - Supreme Court rules that software does not make a basic business method or abstract idea patentable
- E-commerce patents
 - Amazon: One-click purchasing
 - Akamai: Internet content delivery global hosting system

Trademarks

- Identify, distinguish goods, and indicate their source
- Purpose
 - Ensure the consumer gets what is paid for/expected to receive
 - Protect owner against piracy and misappropriation
- Infringement

Trade Secrets

- Business procedures, formulas, methods of manufacture and service delivery
- May not be unique or novel
- Trade secrets are
 - (a) secret
 - (b) have commercial value to owner
 - (c) owner has taken steps to protect
- 2016 Defend Trade Secrets Act

Vietnam's Legislative Document System

HỆ THỐNG VĂN BẢN QUY PHẠM PHÁP LUẬT CỦA VIỆT NAM HIỆN HÀNH										
HIẾN PHÁP của Quốc hội (1)										
BỘ LUẬT của Quốc hội (2)		LUẬT của Quốc hội (3)		NGHỊ QUYẾT của Quốc hội (4)						
PHÁP LỆNH của UBTƯ Quốc hội (5)		NGHỊ QUYẾT của UBTƯ Quốc hội (6)		NGHỊ QUYẾT LIÊN TỊCH giữa UBTV Quốc hội với Đoàn Chủ tịch UBTWMTTQ Việt Nam (7)						
LỆNH của Chủ tịch nước (8)			QUYẾT ĐỊNH của Chủ tịch nước (9)							
NGHỊ ĐỊNH của Chính phủ (10)			NGHỊ QUYẾT LIÊN TỊCH giữa Chính phủ với Đoàn Chủ tịch UBTWMTTQ Việt Nam (11)							
QUYẾT ĐỊNH của Thủ tướng Chính phủ (12)										
NGHỊ QUYẾT của Hội đồng Thẩm phán Tòa án nhân dân tối cao (13)										
THÔNG TƯ của Chánh án TANDTC (14)	THÔNG TƯ của Viện trưởng VKSNDTC (15)	THÔNG TƯ của Bộ trưởng, Thủ trưởng cơ quan ngang bộ (16)	THÔNG TƯ LIÊN TỊCH giữa Chánh án TANDTC với Viện trưởng VKSNDTC (17)	THÔNG TƯ LIÊN TỊCH giữa Bộ trưởng, Thủ trưởng cơ quan ngang bộ với Chánh án TANDTC, Viện trưởng VKSNDTC (18)	QUYẾT ĐỊNH của Tổng Kiểm toàn nhà nước (19)					
NGHỊ QUYẾT của Hội đồng nhân dân cấp tỉnh (20)										
QUYẾT ĐỊNH của Ủy ban nhân dân cấp tỉnh (21)										
VĂN BẢN QUY PHẠM PHÁP LUẬT của chính quyền địa phương ở đơn vị hành chính - kinh tế đặc biệt (22)										
NGHỊ QUYẾT của Hội đồng nhân dân cấp huyện (23)										
QUYẾT ĐỊNH của Ủy ban nhân dân cấp huyện (24)										
NGHỊ QUYẾT của Hội đồng nhân dân cấp xã (25)										
QUYẾT ĐỊNH của Ủy ban nhân dân cấp xã (26)										

Figure 2: Vietnam's Legislative Document System. Source: <https://havip.com.vn/van-ban-quy-pham-phap-luat-la-gi/>

Ghi chú: Từ 01/7/2021 TP.
Hồ Chí Minh chính thức bỏ
HĐND quận, phường và
thực hiện việc tổ chức chính
quyền đô thị.

Orientations and policies of the Politburo

- **Resolution No. 57-NQ/TW** dated December 22, 2024, of the Politburo on promoting breakthrough development in science, technology, innovation, and national digital transformation.
 - ❖ **Resolution No. 03/NQ-CP** dated January 9, 2025, of the Government on promulgating the action program to implement Resolution No. 57-NQ/TW dated December 22, 2024, of the Politburo.
- **Resolution No. 59-NQ/TW** dated January 24, 2025, of the Politburo on international integration in the new context.
- **Resolution No. 66-NQ/TW** dated April 30, 2025, of the Politburo on reforming the formulation and implementation of laws to meet the requirements of national development in the new era.
- **Resolution No. 68-NQ/TW** dated May 4, 2025, of the Politburo on private sector development.

Relevant Laws of Vietnam's E-business

- Civil Code No. 91/2015/QH13 on 24th Nov 2015.
- The Law on Enterprises No. 59/2020/QH14 on 11th Jan 2020.
- The Law Trade No. 17/VBHN-VPQH on 5th July 2019.
- The Law on Tax Administration No. 38/2019/QH14 on 13th June 2019.
 - Amended by Law No. 56/2024/QH15, effective from January 1, 2025.
- The Law on Investment No. 61/2020/QH14 on 17th June 2020.
 - Amended by Law No. 57/2024/QH15, effective from January 15, 2025.
- The Law on Public Investment No. 39/2019/QH14 on 13th June 2019.
- The Law on Public – Private Partnership Investment No. 64/2020/QH14 on 18th June 2020.

Relevant Laws of Vietnam's E-business (Cont.)

- The Competition Law No. 23/2018/QH14 on 12th June 2018.
- The Law on Procurement No. 43/2013/QH13 on 26th Nov 2013.
 - Amended by Law No. 22/2023/QH15, effective from January 1, 2024.
- Other Specialized Law, such as:

➤ Intellectual Property Law	➤ Environmental Protection Law
➤ Telecommunication Law	➤ Information Technology Law
➤ Press Law	➤ Cybersecurity Law; etc.

E-commerce Legal Documents in Vietnam

No.	Name	Date of issue
01/2022/TT-BCT	<ul style="list-style-type: none">• Circular No. 01/2022/TT-BCT of the Ministry of Industry and Trade: Amending and supplementing a number of articles of Circular No. 47/2014/TT-BCT dated 05/12/2014 of the Ministry of Industry and Trade regulating the management of e-commerce websites and Circular No. 59/2015/TT-BCT dated 31/12/2015 of the Ministry of Industry and Trade regulating the management of e-commerce activities via mobile applications.	10 th Feb 2022
85/2021/ND-CP	<ul style="list-style-type: none">• Decree No. 85/2021/ND-CP of the Government : Amending and supplementing a number of articles of the Government's Decree No. 52/2013/ND-CP dated May 16, 2013 on e-commerce.	28 th Sep 2021

Table 2: E-commerce Legal Documents in Vietnam. Source: <http://online.gov.vn/Van-Ban-Phap-Luat>

E-commerce Legal Documents in Vietnam (Cont.)

No.	Name	Date of issue
98/2020 /ND-CP	<ul style="list-style-type: none">Decree No. 98/2020/NĐ-CP of the Government: Regulations on sanctioning administrative violations in commercial activities, production and trade in counterfeit and prohibited goods, and protection of consumers' interests.<ul style="list-style-type: none">➤ Amended by Decree No. 17/2022/NĐ-CP.➤ Amended by Decree No. 56/2025/NĐ-CP.	9 th Sep 2020
etc.	<ul style="list-style-type: none">etc.	

Table 2: E-commerce Legal Documents in Vietnam. Source: <http://online.gov.vn/Van-Ban-Phap-Luat>

Relevant Taxes of Vietnam's E-business

- Most business activities and investments in Vietnam will be affected by the following taxes:
 - Corporate income tax;
 - Foreign Contractor Tax;
 - Capital gains tax;
 - Value added tax;
 - Various withholding taxes;
 - Import duties;
 - Personal income tax on Vietnamese and expatriate employees;
 - Social insurance, unemployment insurance and health insurance contributions.

Relevant Taxes of Vietnam's E-business (Cont.)

- There are various other taxes that may affect certain specific activities, including:
 - Special sales tax;
 - Natural resources tax;
 - Property taxes;
 - Export duties;
 - Environment protection tax;
 - Land rental fee.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Corporate income tax (“CIT”)***
 - The standard CIT rate is 20%.
 - In the oil-gas industry, CIT rates range from 32% to 50% based on the location and specific project conditions.
 - The mineral resource industry related to prospecting, exploration, and exploitation, CIT rates of 40% or 50% depending on the project’s location.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Corporate income tax (“CIT”)***
 - Tax incentives are granted to new investment projects based on encouraged activities and locations, the size of the projects, and business expansion projects.
 - The encouraged activities include education, health care, sport/culture, high technology, environmental protection, scientific research and technology development, infrastructural development, processing of agricultural, software production, renewable energy, etc.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Corporate income tax (“CIT”)***
 - Special investment incentives are available for R&D and large investment projects specified in the Law on Investment.
 - Based on a number of criteria, e.g. the most favorable package comprises a preferential tax rate of 5% for a period of 37 years, 6 years of tax exemption, plus a 50% CIT reduction for the next 13 years.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Corporate income tax (“CIT”)***
 - The two common preferential rates of 10% and 17% are available for 15 years and 10 years respectively, starting from the commencement of generating revenue from the incentivized activities.
 - In addition, there is also an exemption/reduction from land and water rental fees, water rental fee for a period of time.
 - etc.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Foreign Contractor Tax (“FCT”)***
 - FCT is not a separate tax and normally comprises a combination of Value Added Tax (“VAT”) and CIT, or Personal income tax (“PIT”) for income of foreign individuals.
 - Payments subject to FCT include interest, royalties, service fees, lease rentals, insurance premiums, transportation fees, income from transfers of securities, and goods supplied within Vietnam or associated with services rendered in Vietnam.

Relevant Taxes of Vietnam's E-business (Cont.)

- **Value Added Tax (“VAT”)**
 - VAT applies to goods and services used for production, trading, and consumption in Vietnam.
 - A domestic business must charge VAT on the value of goods or services supplied.
 - In addition, VAT applies to the dutiable value of imported goods.
 - The importer must pay VAT to the customs authorities at the same time they pay import duties.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Taxing foreign e-commerce businesses***
 - Circular 80/2021/TT-BTC specifies a tax filing mechanism for foreign companies doing e-commerce, digital business and other business in Vietnam without a permanent establishment.
 - Foreign companies will be granted a tax code and declare tax online at the portal of the Department of Taxation on a quarterly basis and pay tax online.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Taxing foreign e-commerce businesses***
 - If such foreign companies do not directly register, declare and pay tax in Vietnam, Vietnamese organizations and parties have the following responsibilities.
 - ❖ If the Vietnamese customers are registered businesses, they have to withhold and declare tax on behalf of the foreign companies (similar to the current mechanism of foreign contractor tax).

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Taxing foreign e-commerce businesses***
 - If such foreign companies do not directly register, declare and pay tax in Vietnam (Cont.)
 - ❖ If the Vietnamese customers are individuals, then the banks or payment intermediary companies are required to withhold and declare tax on a monthly basis.
 - ❖ The Vietnamese tax authorities will provide the names and websites of such foreign companies to the banks and/or payment intermediaries for such tax withholding.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Taxing foreign e-commerce businesses***
 - If such foreign companies do not directly register, declare and pay tax in Vietnam (Cont.)
 - ❖ If the individuals use cards or other payment methods from which the banks or payment intermediary companies cannot withhold, the banks or payment intermediary companies are required to track and report payments made to the foreign companies to the Vietnamese tax authorities on a monthly basis.

Relevant Taxes of Vietnam's E-business (Cont.)

- ***Taxing foreign e-commerce businesses***
 - The department of taxation officially launched the portal for direct tax registration, declaration, and payments by e-commerce companies in Vietnam on 21 March 2022.
 - It also published the names of the foreign companies registering up to November 2022.
 - The Government also issued Decree 85/2021 setting out, inter alia, new rules on e-commerce detailing obligations of foreign traders that have e-commerce activities in Vietnam.

In conclusion

- A Model for Organizing the Issues
- Privacy and Information Rights
- Key Issues in Online Privacy of Consumers
- Privacy Protection in Europe
- Intellectual Property Rights
- Taxation in USA and Europe
- Vietnam's Legislative Document System
- Relevant Laws of Vietnam's E-business
- E-commerce Legal Documents in Vietnam
- Relevant Taxes of Vietnam's E-business



2. E-business Software and Web Hosting

Building E-commerce Presence

Imagine Your E-commerce Presence

- What's the idea? The vision includes:
 - Mission statement
 - Target audience
 - Intended market space
 - Strategic analysis
 - Marketing matrix
 - Development timeline
 - Preliminary budget

Imagine Your E-commerce Presence (Cont.)

- Where's the money?
 - Business model(s)
 - Revenue model(s)
- Who and where is the target audience?
 - Demographics, lifestyle, consumption patterns, etc.
- What does the marketplace characterize?
 - Size, growth, demographics, structure, etc.

Imagine Your E-commerce Presence (Cont.)

- Where's the content coming from?
- Know yourself (SWOT analysis)
- Develop an e-commerce presence map
- Develop a timeline: Milestones
- How much will this cost? Examples:
 - Simple website: up to \$5000
 - Small startup: \$25,000 to \$50,000
 - Large corporate website: \$100,000+ to millions

SWOT Analysis



STRENGTHS

Current sites do not address market needs • 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

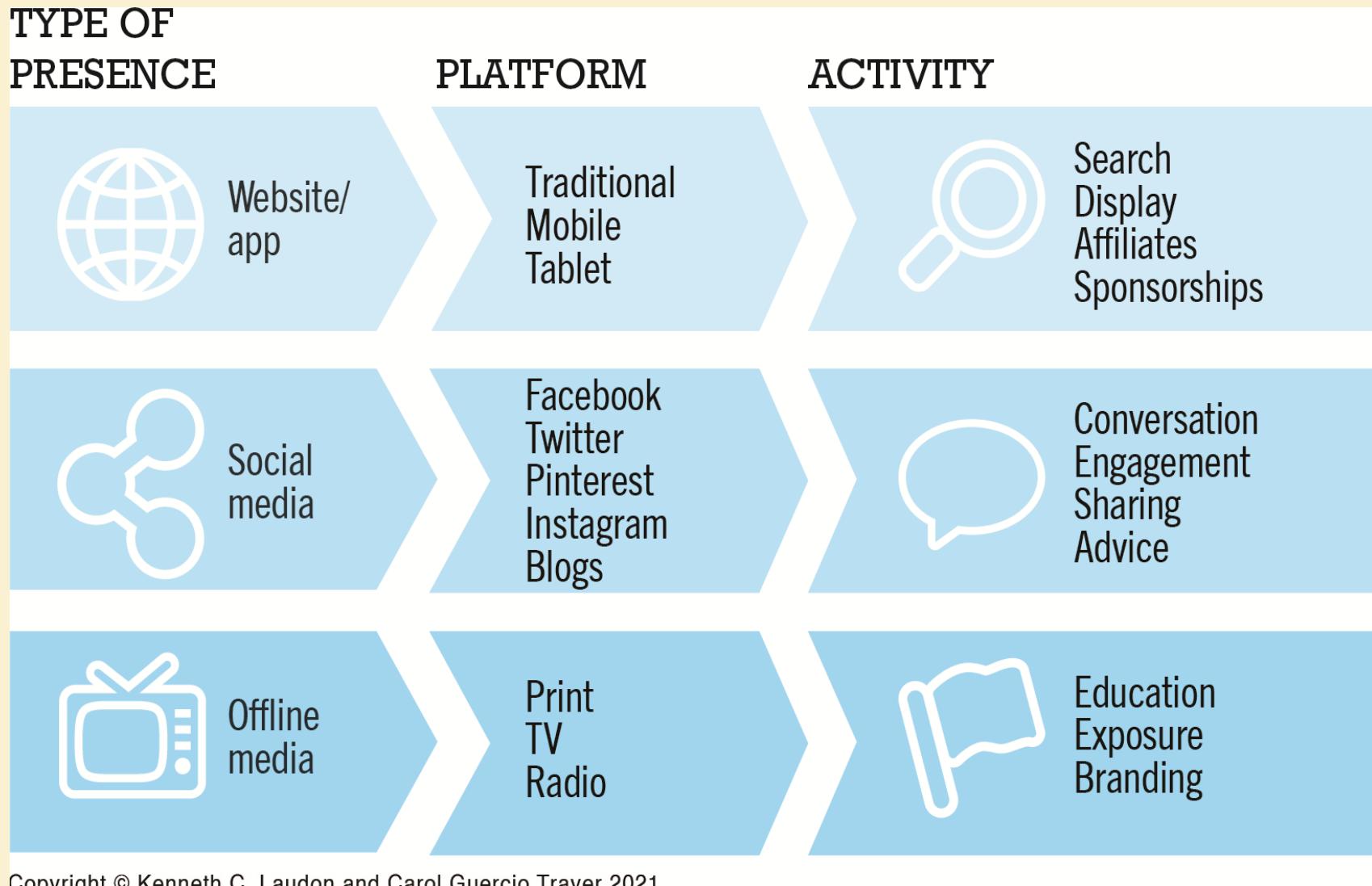
OPPORTUNITIES

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

E-commerce Presence Map



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Figure 4: E-commerce Presence Map.

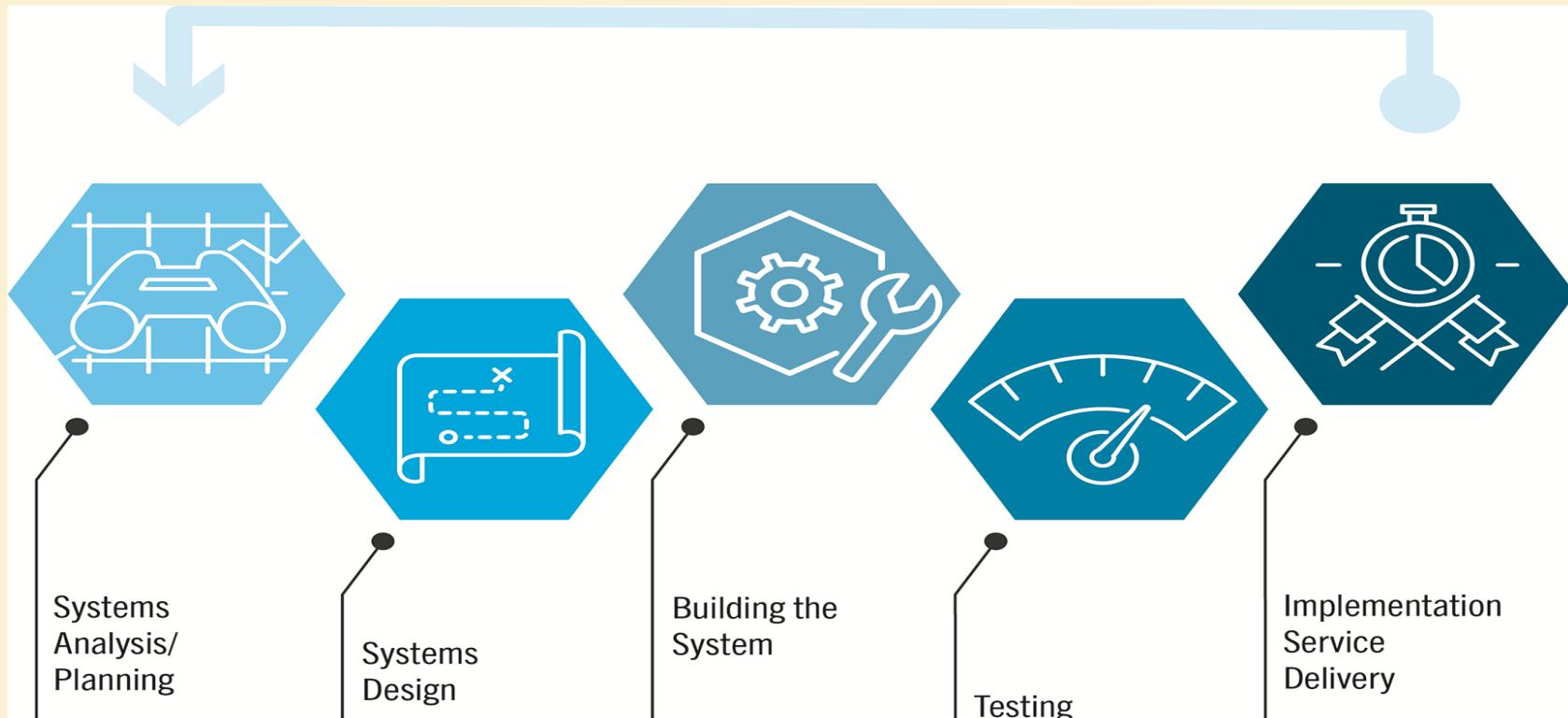
Building an E-commerce Site: A Systematic Approach

- Most important management challenges:
 - Developing a clear understanding of business objectives
 - Knowing how to choose the right technology to achieve those objectives
- Main factors to consider
 - Management
 - Hardware architecture
 - Software
 - Design
 - Telecommunications
 - Human resources; etc.

Planning: The Systems Development Life Cycle

- Methodology for understanding business objectives of a system and designing an appropriate solution
- Five major steps:
 - Systems analysis/planning
 - Systems design
 - Building the system
 - Testing
 - Implementation

Systems Development Life Cycle



Best Practices

Continuous availability 99%+ • Design for scalability • Build in management for end-to-end delivery • Plan for growth • Design system for high-speed performance • Understand and optimize workload on system

System Analysis/Planning

- Business objectives
 - List of capabilities you want your site to have
- System functionalities
 - List of information system capabilities needed to achieve business objectives
- Information requirements
 - Information elements that system must produce in order to achieve business objectives

System Analysis, Business Objectives, System Functionalities, and Information Requirements for a Typical E-commerce Site

Business Objective	System Functionality	Information Requirements
Display goods	Digital Catalog	Dynamic text and graphics catalog
Provide product information	Product database	Product description, stocking numbers, inventory levels
Personalize/customize product	Customer on-site tracking	Site log for every customer visit; data mining capability to identify common customer paths and appropriate responses
Engage customers in conversations	On-site blog; user forums	Software with blogging and community forum functionality
Execute a transaction	Shopping cart/payment system	Secure credit card clearing; multiple payment options
Accumulate customer information	Customer database	Name, address, phone, and e-mail for all customers; online customer registration

Table 3: System Analysis, Business Objectives, System Functionalities, and Information Requirements for a Typical E-commerce Site.

System Analysis, Business Objectives, System Functionalities, and Information Requirements for a Typical E-commerce Site (Cont.)

Business Objective	System Functionality	Information Requirements
Provide after-sale customer support	Sales database	Customer I D, product, date, payment, shipment date
Coordinate marketing/advertising	Ad server, e-mail server, e-mail, campaign manager, ad banner manager	Site behavior log of prospects and customers linked to e-mail and banner ad campaigns
Understand marketing effectiveness	Site tracking and reporting system	Number of unique visitors, pages visited, products purchased, identified by marketing campaign
Provide production and supplier links	Inventory management system	Product and inventory levels, supplier I D and contact, order quantity data by product

Table 3: System Analysis, Business Objectives, System Functionalities, and Information Requirements for a Typical E-commerce Site.

Systems Design: Hardware and Software Platforms

- System design specification:
 - Description of main components of a system and their relationship to one another
- Two components of system design:
 - Logical design
 - ❖ Data flow diagrams, processing functions, databases
 - Physical design
 - ❖ Specifies actual physical, software components, models, and so on

A Logical Design for a Simple Website

A. Simple Data Flow Diagram

This data flow diagram describes the flow of information requests and responses for a simple website.

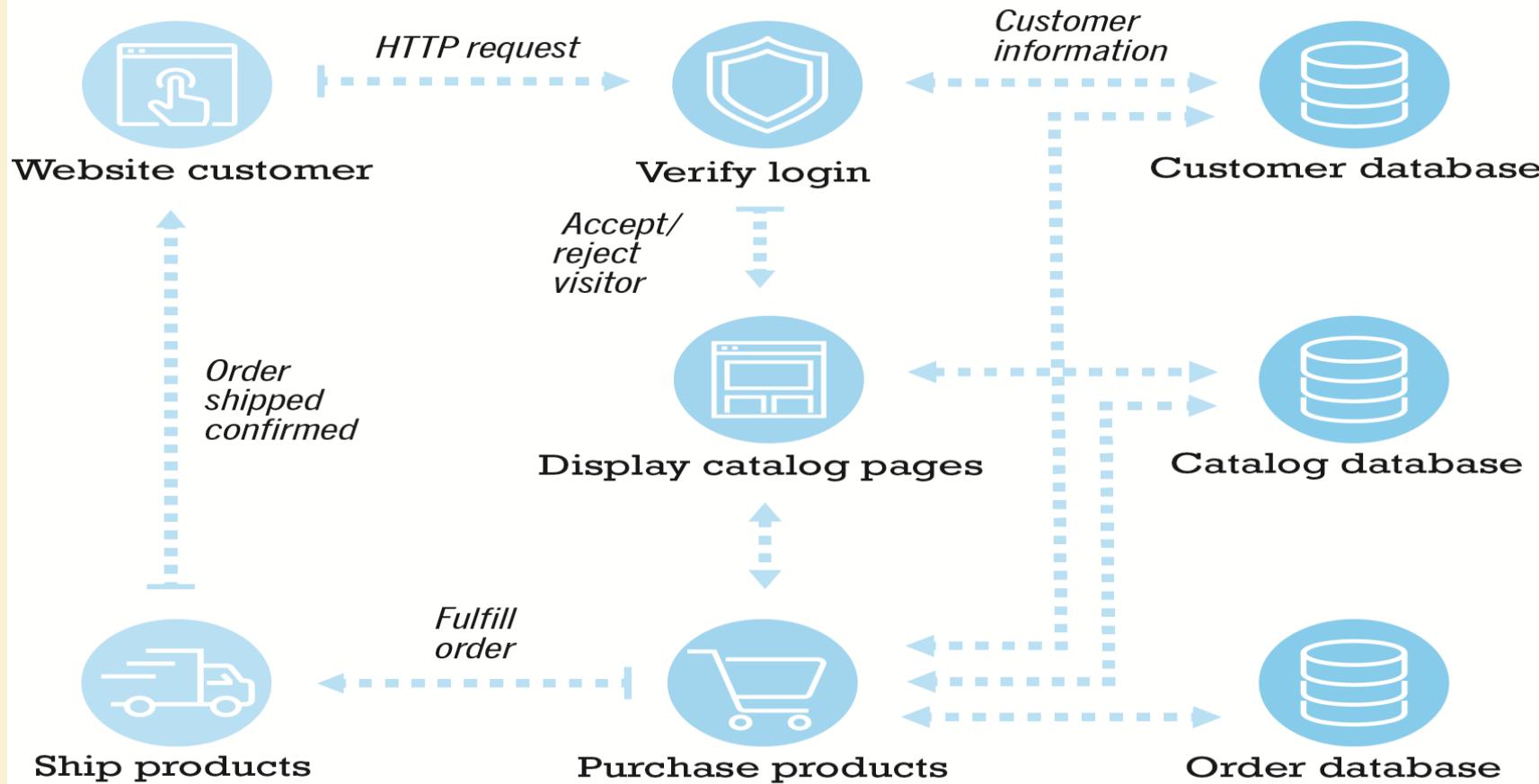
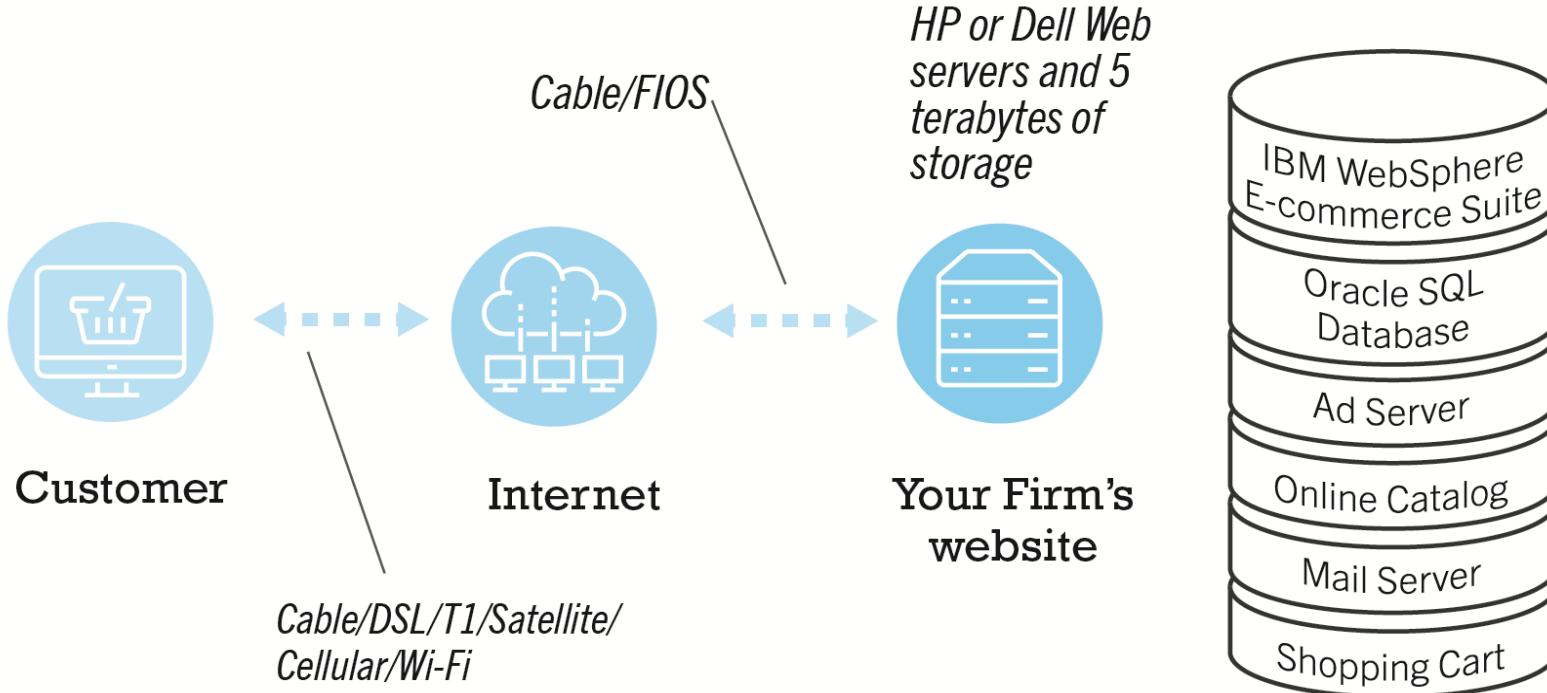


Figure 6: A Logical Design for a Simple Website.

Physical Design for a Simple Website

B. Simple Physical Design

In a multi-tier architecture, a web server is linked to a middle-tier layer that typically includes a series of application servers that perform specific tasks, as well as to a backend layer of existing corporate systems.

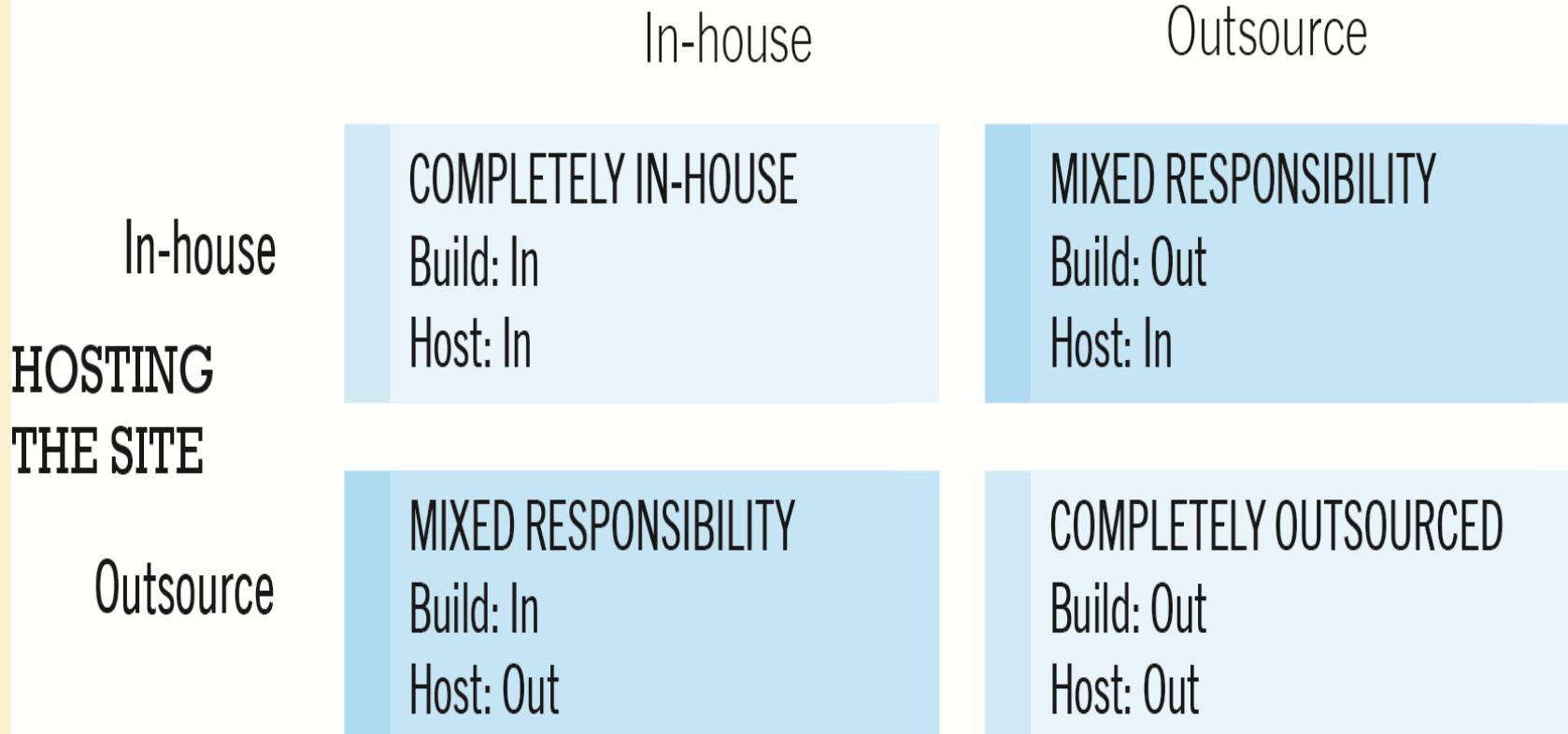


Building the System: In-House Versus Outsourcing

- Outsourcing: Hiring vendors to provide services involved in building site
- Build own versus. outsourcing:
 - Build your own requires team with diverse skill set; choice of software tools; both risks and possible benefits
- Host own versus. outsourcing
 - Hosting: Hosting company responsible for ensuring site is accessible 24/7, for monthly fee
 - Co-location: Firm purchases or leases web server (with control over its operation), but server is located at vendor's facility

Choices in Building and Hosting

BUILDING THE SITE



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Figure 8: Choices in Building and Hosting.

Testing the System

- Testing
 - Unit testing
 - System testing
 - Acceptance testing
 - A/B testing (split testing)
 - Multivariate testing

Implementation, Maintenance, and Optimization

- Systems break down unpredictably
- Maintenance is ongoing
- Maintenance costs: Similar to development costs
 - A \$40K e-commerce site may require \$40K annually to upkeep

Factors in Website Optimization

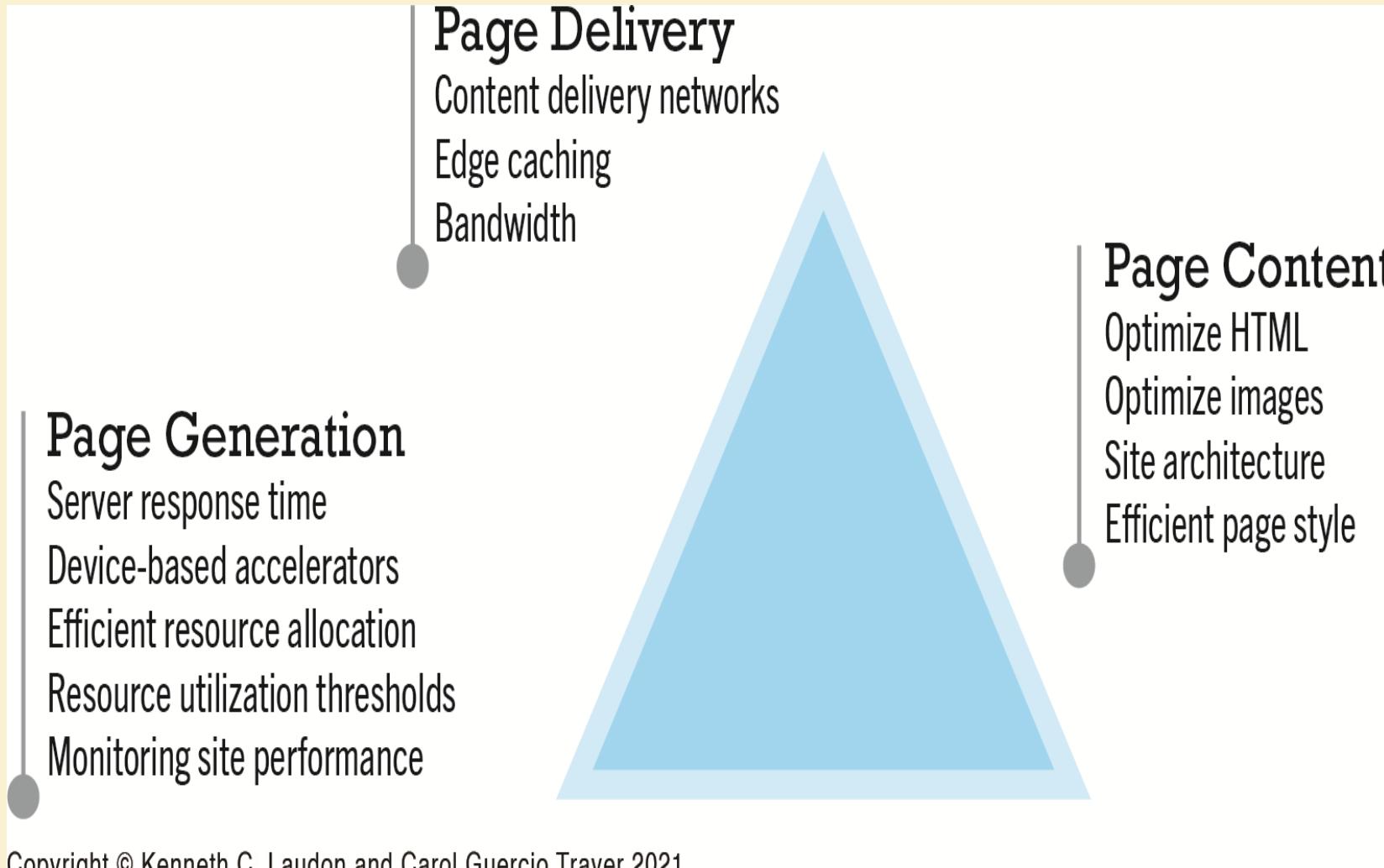


Figure 9: Choices in Building and Hosting.

Alternative Web Development Methodologies

- Prototyping
- Agile development
- DevOps
- Component-based development
- Web services

Simple versus Multi-Tiered Website Architecture

- System architecture
 - Arrangement of software, machinery, and tasks in an information system needed to achieve a specific functionality
- Two-tier
 - Web server and database server
- Multi-tier
 - Web application servers
 - Backend, legacy databases

Two-Tier E-commerce Site Architecture

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.

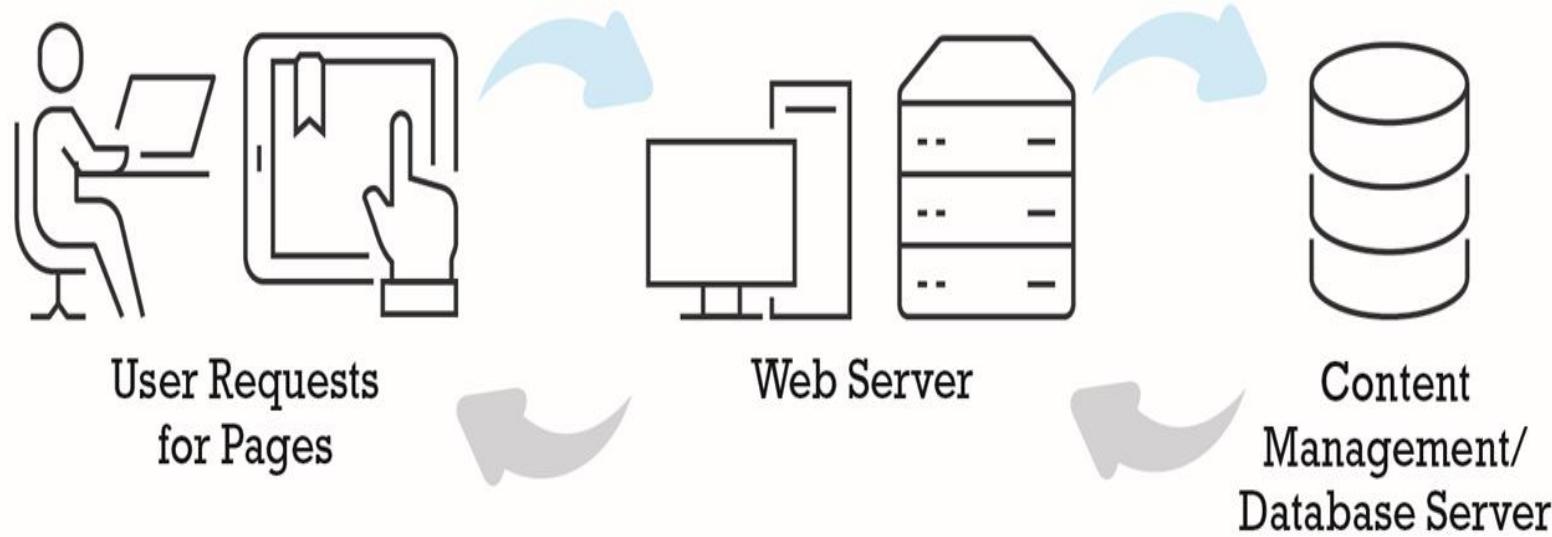


Figure 10: Two-Tier E-commerce Site Architecture..

Multi-Tier E-commerce Site Architecture

B. Multi-tier Architecture

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



Basic Functionality Provided by Web Servers

Functionality	Description
Processing of HTTP requests	Receive and respond to client requests for HTML pages
Security services (Secure Sockets Layer)/ Transport Layer Security	Verify username and password; process certificates and private/public key information required for credit card processing and other secure information
File Transfer Protocol	Permits transfer of very large files from server to server
Search engine	Indexing of site content; keyword search capability
Data capture	Log file of all visits, time, duration, and referral source
E-mail	Ability to send, receive, and store e-mail messages
Site management tools	Calculate and display key site statistics, such as unique visitors, page requests, and origin of requests; check links on pages

Table 4 : Basic Functionality Provided by Web Servers

Site Management Tools

- Basic tools included in all web servers
 - Verify that links on pages are still valid
 - Identify orphan files
- Third-party software for advanced management
 - Monitor customer purchases
 - Marketing campaign effectiveness
 - Keep track of hit counts and other statistics
 - Example: Webtrends Analytics

Dynamic Page Generation Tools

- Dynamic page generation:
 - Contents are stored in database and fetched when needed
- Common tools:
 - CGI, ASP, JSP, ODBC, JDBC, etc.
- Advantages
 - Lowers menu costs
 - Permits easy online market segmentation
 - Enables cost-free price discrimination
 - Enables content management system (CMS)

Application Servers

- Web application servers:
 - Provide specific business functionality required for a website
 - Type of middleware
 - Isolate business applications from Web servers and databases
 - Single-function applications being replaced by integrated software tools that combine all functionality needed for e-commerce site

E-commerce Merchant Server Software

- Provides basic functionality for sales
 - Online catalog
 - ❖ List of products available on website
 - Shopping cart
 - ❖ Allows shoppers to set aside, review, edit selections, and then make purchase
 - Credit card processing
 - ❖ Typically works in conjunction with shopping cart
 - ❖ Verifies card and puts through credit to company's account at checkout

Merchant Server Software Packages

- Integrated environment that includes most of functionality needed
 - Shopping cart
 - Merchandise display
 - Order management

Merchant Server Software Packages (Cont.)

- Different options for different-sized businesses
 - Small and medium-sized businesses: Yahoo Small Business; Open-source solutions
 - Mid-range: IBM WebSphere Commerce Express; Sitecore Experience Commerce
 - High-end: IBM WebSphere Professional/Enterprise; SAP Hybris, Oracle ATG Web Commerce, etc.
- Many now also available as cloud-based SaaS solutions.

Merchant Server Software Packages (Cont.)

- Key factors in selecting a package
 - Functionality
 - Support for different business models, including m-commerce
 - Business process modeling tools
 - Visual site management and reporting
 - Performance and scalability
 - Connectivity to existing business systems
 - Compliance with standards
 - Global and multicultural capability
 - Local sales tax and shipping rules

Right-Sizing Your Hardware Platform: The Demand Side

- Customer demand:
 - Most important factor affecting speed of site
- Factors in overall demand:
 - Number of simultaneous users in peak periods
 - Nature of customer requests (user profile)
 - Type of content (dynamic versus static Web pages)
 - Required security
 - Number of items in inventory
 - Number of page requests
 - Speed of inheritance applications

Right-Sizing Your Hardware Platform: The Supply Side

- Scalability
 - Ability of site to increase in size as demand warrants
- Ways to scale hardware
 - Vertically
 - ❖ Increase processing power of individual components
 - Horizontally
 - ❖ Employ multiple computers to share workload
 - Improve processing architecture
 - Outsource hosting, use content delivery network

Vertical and Horizontal Scaling Techniques

Technique	Application
Use a faster computer	Deploy edge servers, presentation servers, data servers, etc.
Create a cluster of computers	Use computers in parallel to balance loads.
Use appliance servers	Use special-purpose computers optimized for their task.
Segment workload	Segment incoming work to specialized computers.
Batch requests	Combine related requests for data into groups, process as group.
Manage connections	Reduce connections between processes and computers to a minimum.
Aggregate user data	Aggregate user data from legacy applications in single data pools.
Cache	Store frequently used data in cache rather than on the disk.

Table 5: Vertical and Horizontal Scaling Techniques.

Improving the Processing Architecture of Your Site

Architecture Improvement	Description
Separate static content from dynamic content	Use specialized servers for each type of workload.
Cache static content	Increase RAM to the gigabyte range and store static content in RAM.
Cache database lookup tables	Use cache tables used to look up database records.
Consolidate business logic on dedicated servers	Put shopping cart, credit card processing, and other CPU-intensive activity on dedicated servers.
Optimize ASP code	Examine your code to ensure it is operating efficiently.
Optimize the database schema	Examine your database search times and take steps to reduce access times.

Table 6: Improving the Processing Architecture of Your Site.

Other E-commerce Site Tools

- Website design: Basic business considerations
 - Enabling customers to find and buy what they need
- Tools for search engine optimization
 - Search engine placement
 - ❖ Metatags, titles, content
 - ❖ Identify market niches
 - ❖ Offer expertise
 - ❖ Links
 - ❖ Buy ads
 - ❖ Local e-commerce

E-commerce Website Features That Annoy Customers

- **Features**
 - Requiring user to view ad or intro page before going to website content
 - Pop-up and pop-under ads and windows
 - Too many clicks to get to the content
 - Links that don't work
 - Confusing navigation; no search function
 - Requirement to register and log in before viewing content or ordering
 - Slow loading pages
 - Content that is out of date

E-commerce Website Features That Annoy Customers (Cont.)

- Inability to use browser's Back button
- No contact information available (web form only)
- Unnecessary splash/flash screens, animation, etc.
- Music or other audio that plays automatically
- Unprofessional design elements
- Text not easily legible due to size, color, format
- Typographical errors
- No or unclear returns policy

The Eight Most Important Factors in Successful E-commerce Site Design

Factor	Description
➤ Functionality	Pages that work, load quickly, and point the customer toward your product offerings
➤ Informational	Links that customers can easily find to discover more about you and your products
➤ Ease of use	Simple foolproof navigation
➤ Redundant navigation	Alternative navigation to the same content
➤ Ease of purchase	One or two clicks to purchase
➤ Multi-browser functionality	Site works with the most popular browsers
➤ Simple graphics	Avoids distracting, obnoxious graphics and sounds that the user cannot control
➤ Legible text	Avoids backgrounds that distort text or make it illegible

Table 7: The Eight Most Important Factors in Successful E-commerce Site Design

Tools for Interactivity and Active Content

- CGI (Common Gateway Interface)
- ASP (Active Server Pages)/A S P.NET
- Java, JSP, and JavaScript (including Angular JS, D3, jQuery and Ajax)
- ActiveX and V B Script
- ColdFusion
- PHP, Ruby on Rails, Django
- Other design elements:
 - Widgets, mashups

Personalization Tools

- Personalization
 - Ability to treat people based on personal qualities and prior history with site
- Customization
 - Ability to change the product to better fit the needs of the customer
- Cookies
 - Primary method to achieve personalization

The Information Policy Set

- Privacy policy
 - Set of public statements declaring how site will treat customers' personal information that is gathered by site
- Accessibility rules
 - Set of design objectives that ensure users with disabilities can effectively access site

Developing a Mobile Website and Building Mobile Applications

- Types of m-commerce software
 - Mobile website
 - ❖ Responsive Web design
 - Mobile Web app
 - Native app
 - Hybrid app
 - ❖ Runs inside native container
 - ❖ App distribution
 - ❖ Based on HTML5, CSS, JavaScript

Planning and Building a Mobile Presence

- Identify business objectives, system functionality, and information requirements
- Choice:
 - Mobile website or mobile Web app
 - ❖ Less expensive
 - Native app
 - ❖ Can use device hardware, available offline

Unique Features That Must be Taken into Account When Designing a Mobile Presence

Feature	Implications For Mobile Platform
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.
Displays	Mobile displays are much smaller and require simplification. Some screens are not good in sunlight.
Interface	Touch-screen technology introduces new interaction routines different from the traditional mouse and keyboard. The mobile platform is not a good data entry tool but can be a good navigational tool.

Mobile Presence Design Considerations

- Platform constraints
 - Graphics, file sizes
- Mobile first design
 - Desktop website design after mobile design
- Responsive web design (RWD)
 - CSS site adjusts layout of site according to device screen resolutions
- Adaptive web design (AWD)
 - Server delivers different templates or versions of site optimized for device

Cross-Platform Mobile App Development Tools

- Low cost, open-source alternatives
 - Appery.io
 - Codiga
 - Swiftic
 - PhoneGap
 - Axway Appcelerator
- Objective C, Java

Mobile Presence: Performance and Cost Considerations

- Mobile first design
 - Most efficient
- Mobile website
 - Resizing existing website for mobile access is least expensive
- Mobile web app
 - Can utilize browser API
- Native app
 - Most expensive; requires more programming

Shopping Cart Software

What is Shopping Cart Software?

- A shopping cart is a piece of e-commerce software on a web server that allows visitors to select items on the website for online purchases.
- A shopping cart is used by E-commerce websites to track the items that are selected for purchase.
- A shopping cart allows customers to view all the items selected by them.

Important Features of Shopping Cart Software

- Payment Alternatives
- Searching and Browsing Website
- Product Ratings and Reviews
- Gift Registry Options
- Inventory Management
- Faster Checkout
- Tracking Orders
- Special Offers
- Security for E-commerce Sites

The procedure for online purchase using shopping cart software

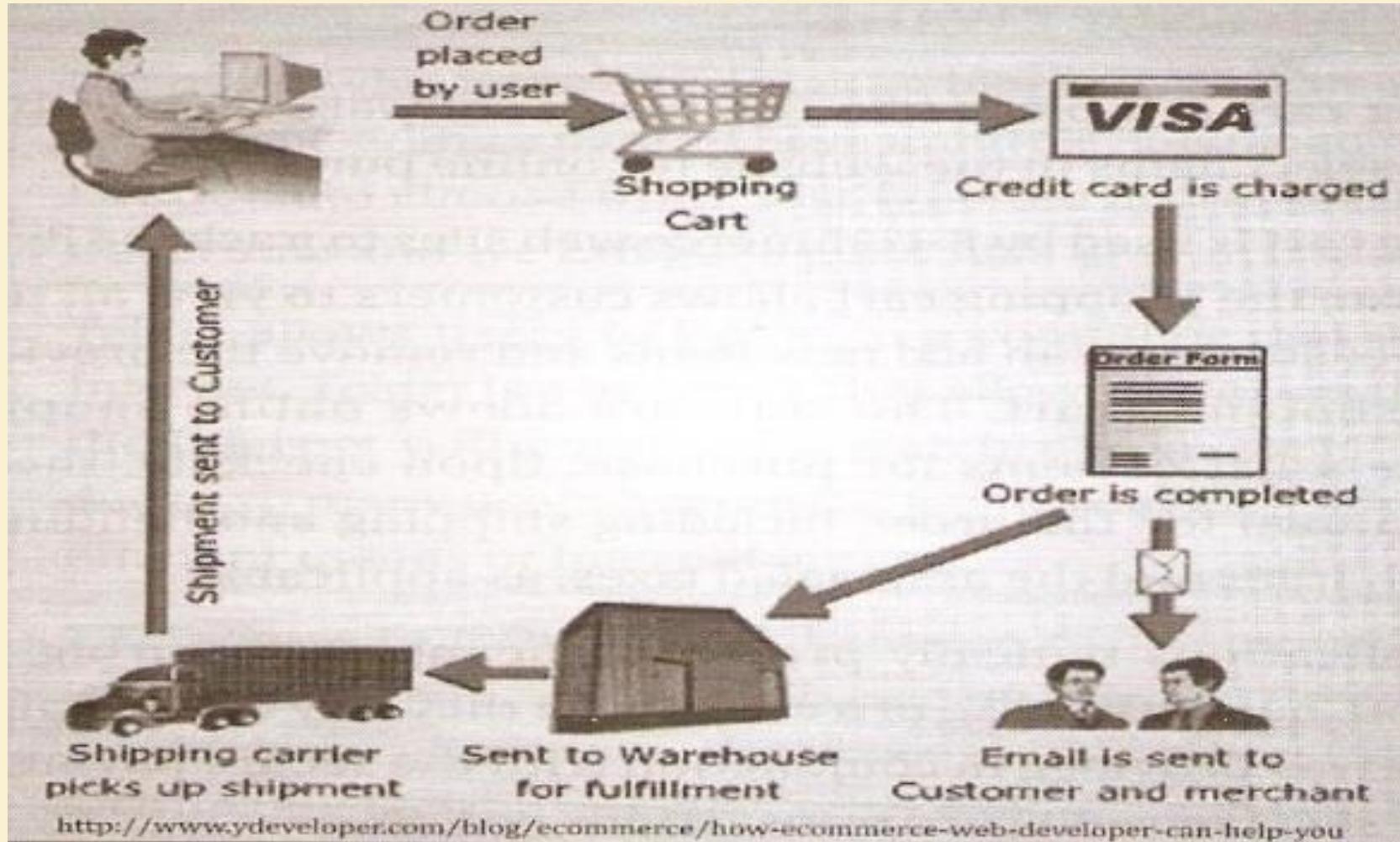


Figure 13: The procedure for online purchase using shopping cart software

The procedure for online purchase using shopping cart software (Cont.)

- The customers can add new items and remove the previously selected items from the shopping cart.
- The software allows online shopping customers to store a list of items for purchase.
- Upon checkout, the software typically calculates a total for the order, including shipping and handling (i.e. postage and packing) charges and the associated taxes, as applicable.

The procedure for online purchase using shopping cart software (Cont.)

- Most shopping cart software provides additional features that an Internet merchant uses to fully manage an online store.
- Data regarding the products, categories, discounts, orders, and customers are normally stored in a database and accessed in real-time by the software.
- These applications typically provide a means of capturing a client's payment information.
- Shopping Cart Software is also known as e-commerce software, e-store software, etc.

Types of Shopping Cart Software

- **Licensed software**
 - In the "licensed" shopping cart model a merchant pays a license fee (often a one-time fee), and then takes possession of the software.
 - Within reason, the merchant may place the software on any web server and, in most cases, may modify or customize the shopping cart software.
 - The main advantages of this option are that the merchant owns a license and therefore can host it on any Web server that meets the server requirements.

Types of Shopping Cart Software (Cont.)

- ***Hosted service***
 - In the "hosted" shopping cart model, the merchant pays a recurring monthly / yearly fee for access to the software.
 - The merchant does not choose the web server's configuration or location, and the merchant may in no way modify or customize the shopping cart software.

Types of Shopping Cart Software (Cont.)

- ***Free licensed shopping cart software***
 - Free licensed shopping cart software is available in the market.
 - With these carts, one will still need to either own or maintain a web server or rent a web server, but the software itself is free.

Customer Relationship Management

What is CRM?

- Technology-enabled relationship management occurs when a firm obtains detailed information about a customer's behavior, preferences, needs, and buying patterns.
- Using information set prices, negotiate terms, modify promotions, add product features, and otherwise customize its entire relationship with that customer.
- Technology-enabled relationship management is often called customer relationship management (CRM) or electronic customer relationship management (eCRM).

The goal of CRM

- The goal of CRM is to understand each customer's specific needs and then customize a product or service to meet those needs.
- The idea is that a customer whose needs are being met exactly is willing to pay more for the goods or services that they need.
- Although companies of all sizes can practice CRM techniques, large companies can afford to buy and implement software products that automate many CRM functions.

CRM as a Source of Value

Dimensions	Technology-Enabled Customer Relationship Management	Traditional Relationships with Customers
Advertising	Provide information in response to specific customer inquiries	“Push and sell” a uniform message to all customers
Targeting	Identify and respond to specific customer behaviors and preferences	Market segmentation
Promotions and discounts offered	Individually tailor to customer	Same for all customers
Distribution channels	Direct or through intermediaries; customer's choice	Through intermediaries chosen by the seller
Pricing of products or services	Negotiated with each customer	Set by the seller for all customers
New product features	Created in response to customer demands	Determined by the seller based on research and development
Measurements used to manage the customer relationship	Customer retention; total value of the individual customer relationship	Market share; profit

Figure 14: CRM as a Source of Value. Source: Gary P. Schneider, *Electronic Commerce 12th*, Cengage Learning, 2017.

Elements of typical CRM System

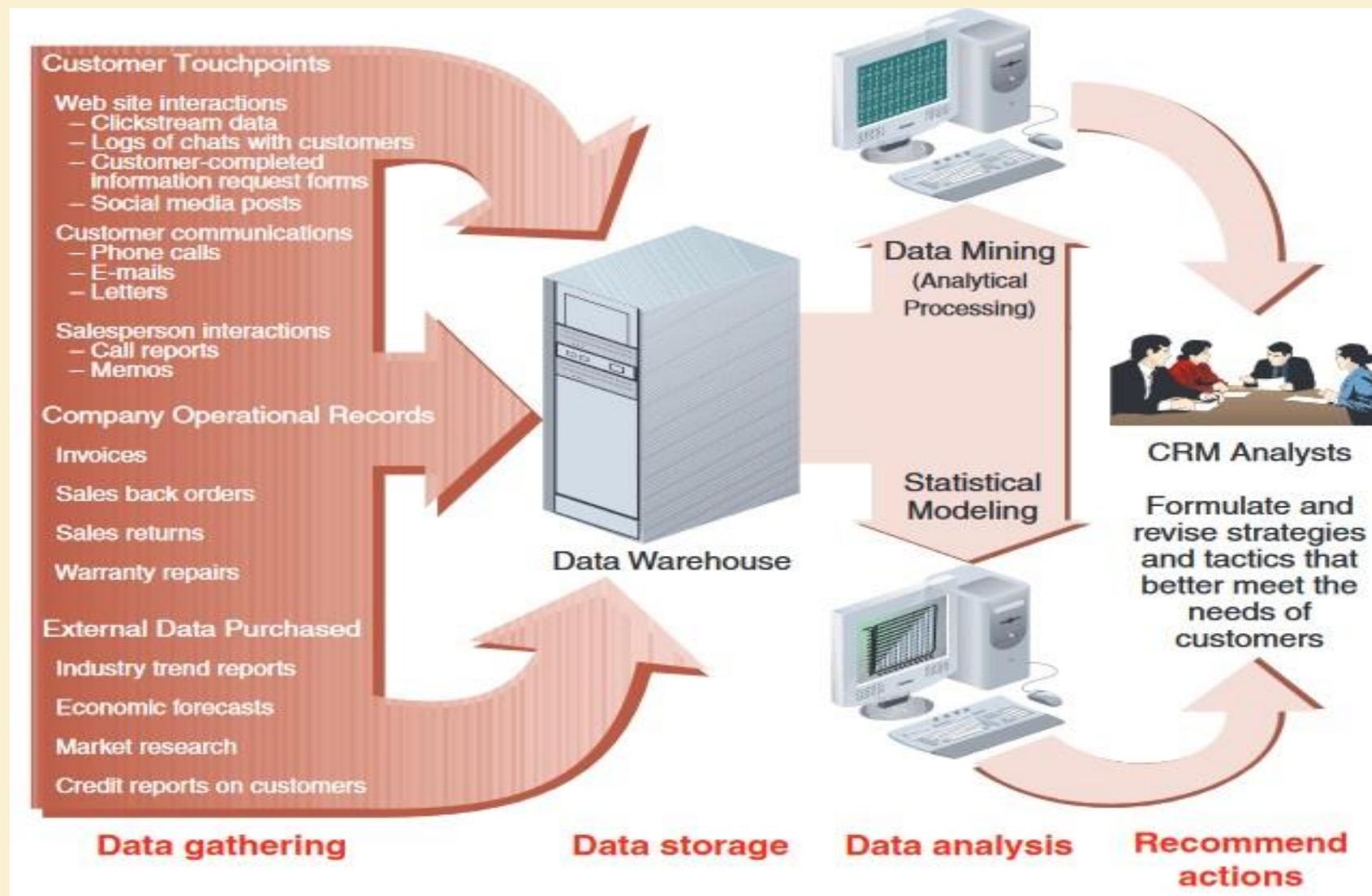


Figure 15: Elements of typical CRM System. Source: Gary P. Schneider, *Electronic Commerce 12th*, Cengage Learning, 2017.

Elements of a CRM System

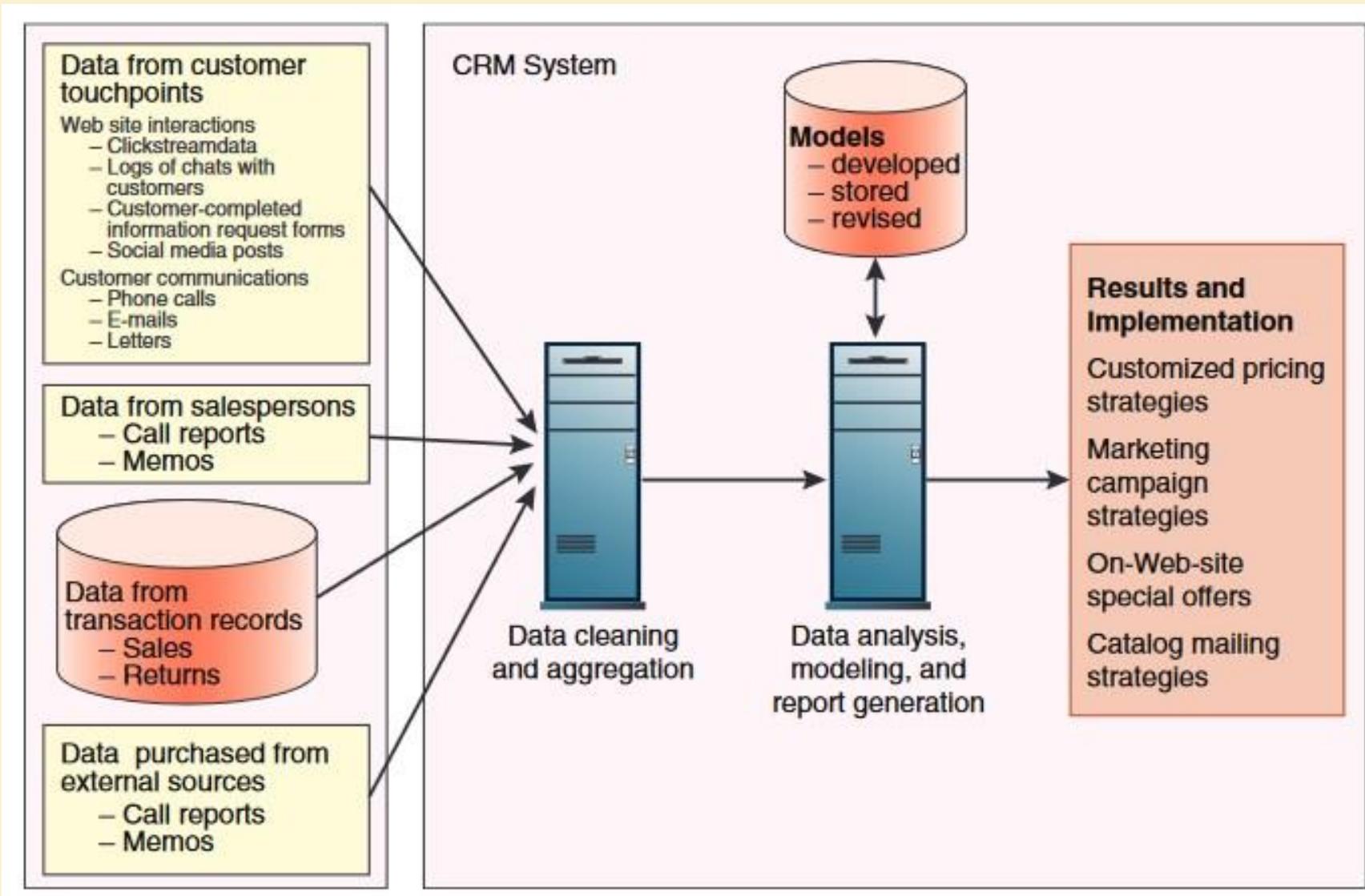


Figure 16: Elements of a CRM System. Source: Gary P. Schneider, *Electronic Commerce 12th*, Cengage Learning, 2017.

CRM Software

- CRM software must obtain data from operations software that conducts activities such as sales automation, customer service center operations, and marketing campaigns.
- The software must also gather data about customer activities on the company's Web site and any other points of contact the company has with its existing and potential customers.
- CRM software uses this data to help managers conduct analytical activities, such as gathering business intelligence, planning marketing strategies, customer behavior modeling, etc.

Supply Chain Management

What is Supply Chain Management (SCM)?

- **Supply chain management**
 - The coordination of all supply activities of an organization from its suppliers and partners to its customers.
- **Upstream supply chain**
 - Transactions between an organization and its suppliers and intermediaries, equivalent to buy-side e-commerce.
- **Downstream supply chain**
 - Transactions between an organization and its customers and intermediaries, equivalent to sell-side e-commerce.

Members of the supply chain

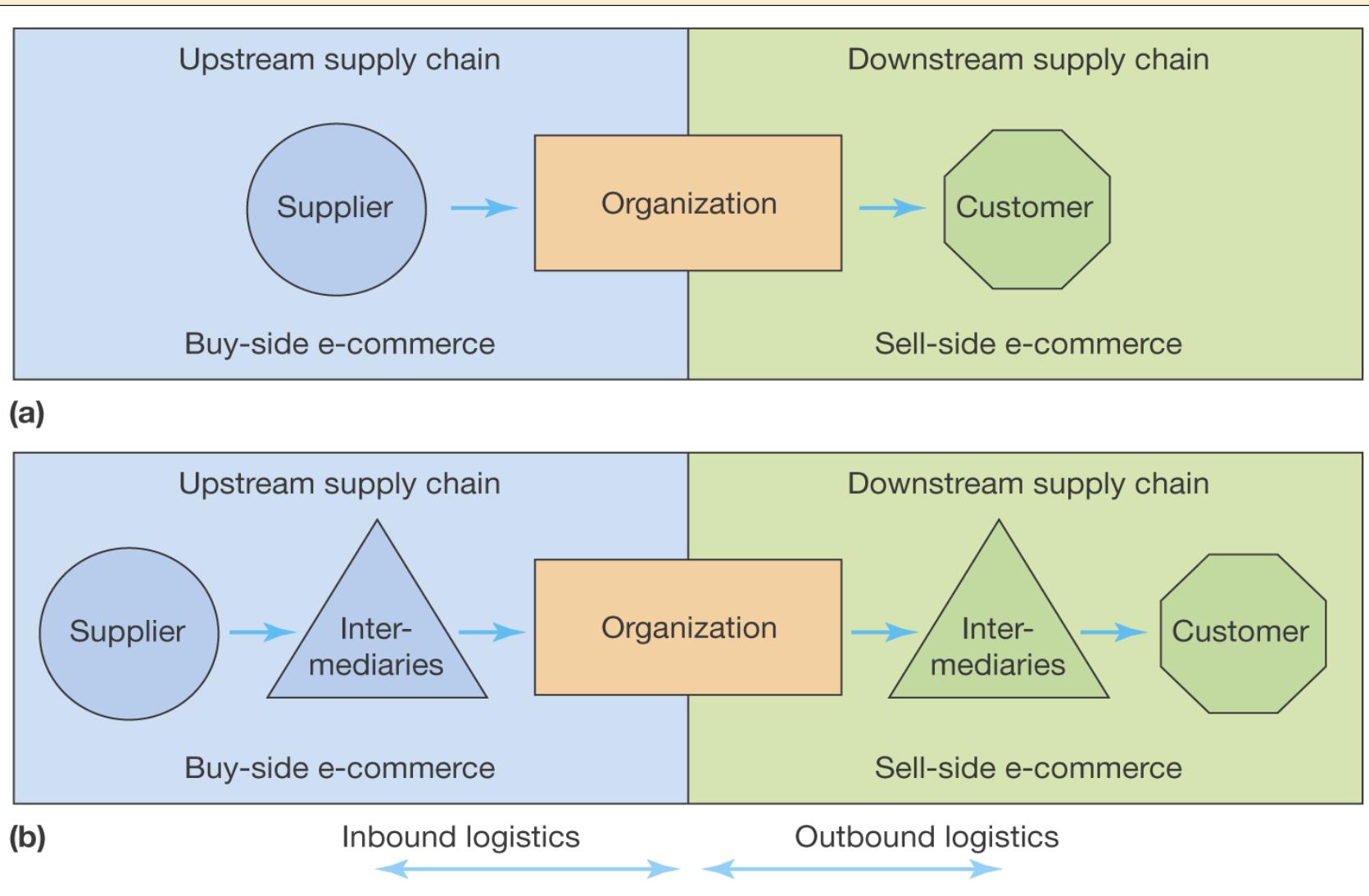


Figure 17: Members of the supply chain: (a) simplified view, (b) including intermediaries

A typical supply chain

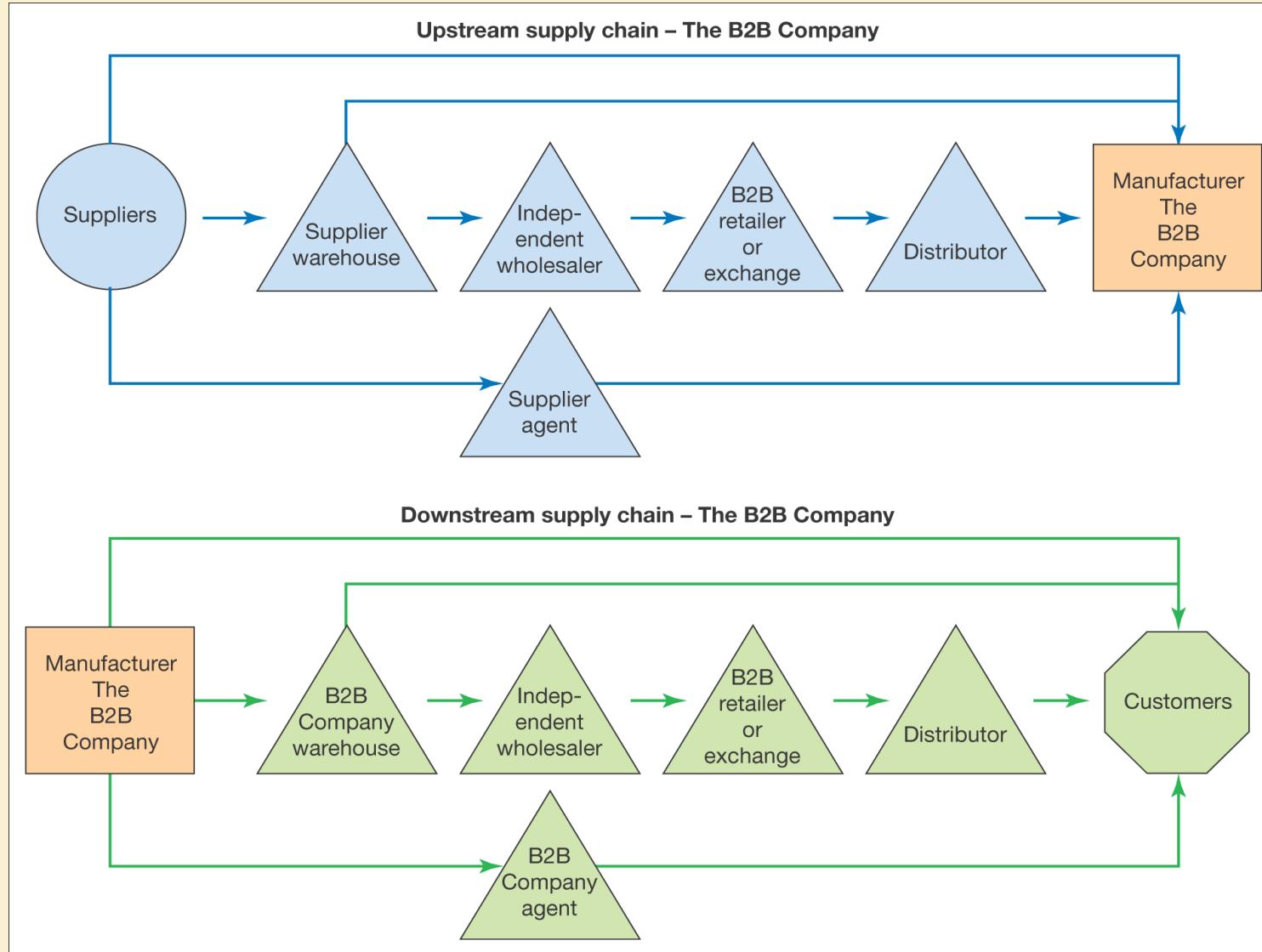


Figure 18: A typical supply chain (an example from The B2B Company)

Push and Pull approaches to Supply Chain Management

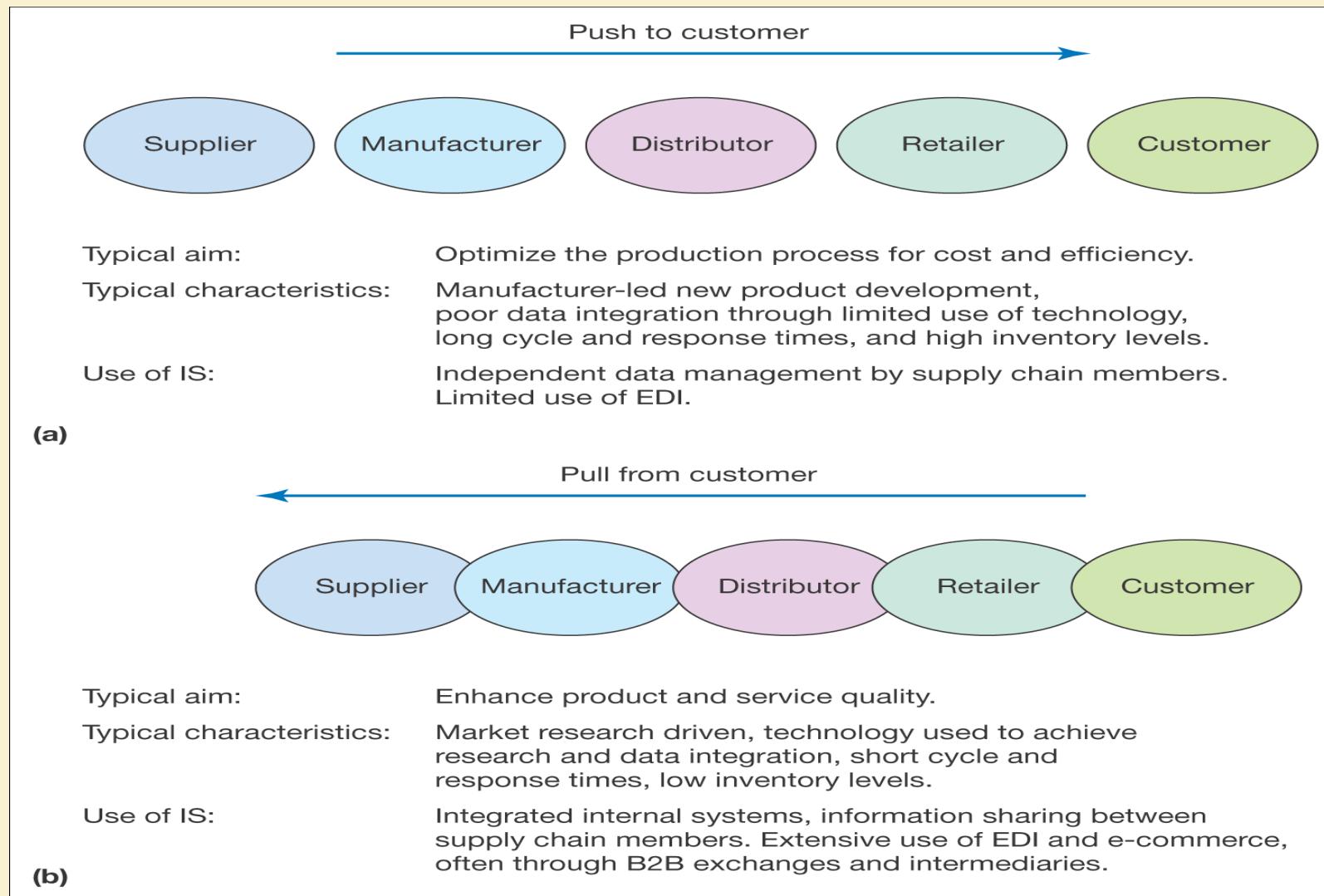


Figure 19: Push and pull approaches to supply chain management

Two alternative models of the value chain

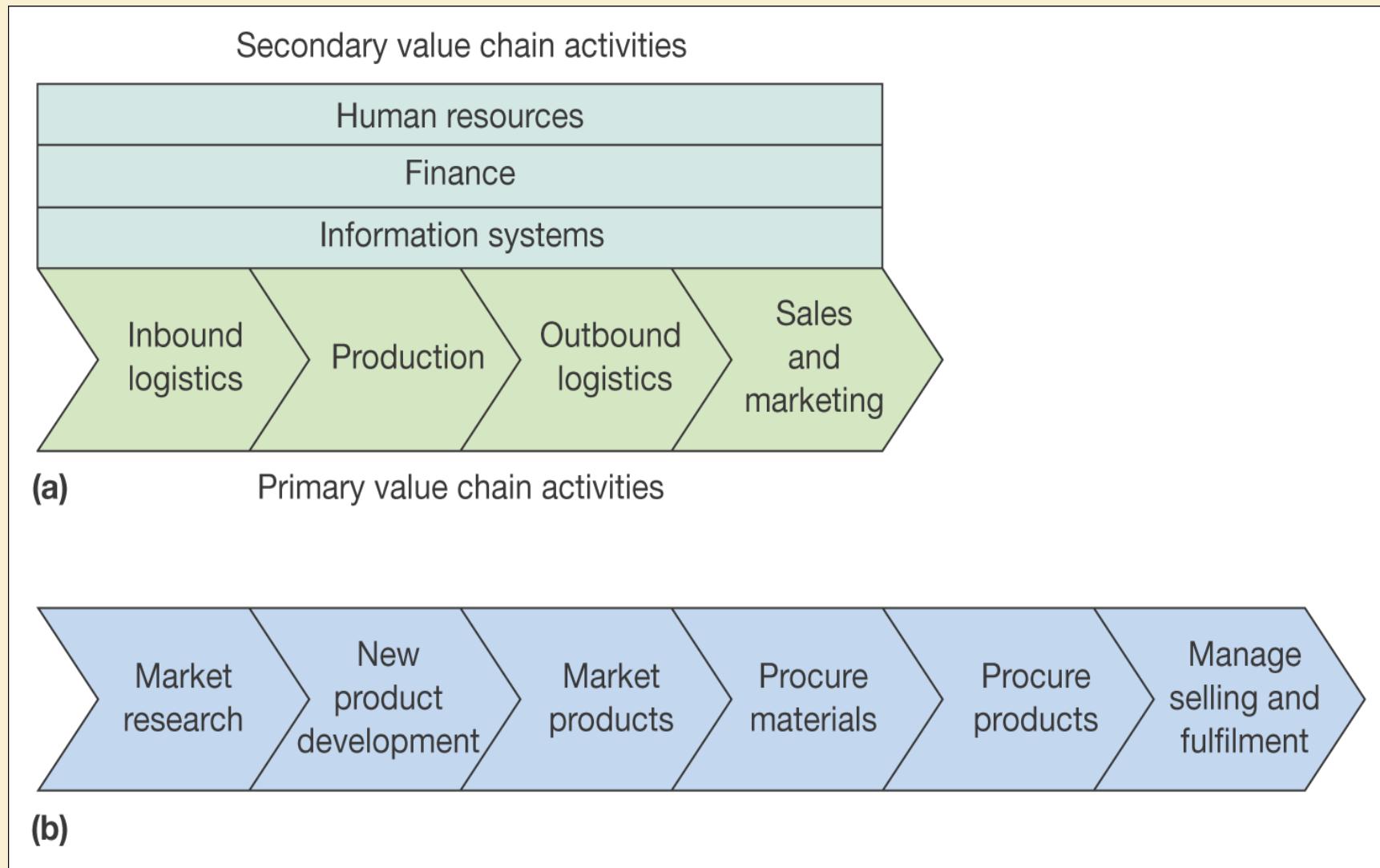


Figure 20: Two alternative models of the value chain: (a) traditional value chain model, (b) revised value chain model

Source: Figure 6.4(b) adapted from Deise et al. (2000)

A typical IS infrastructure for Supply Chain Management

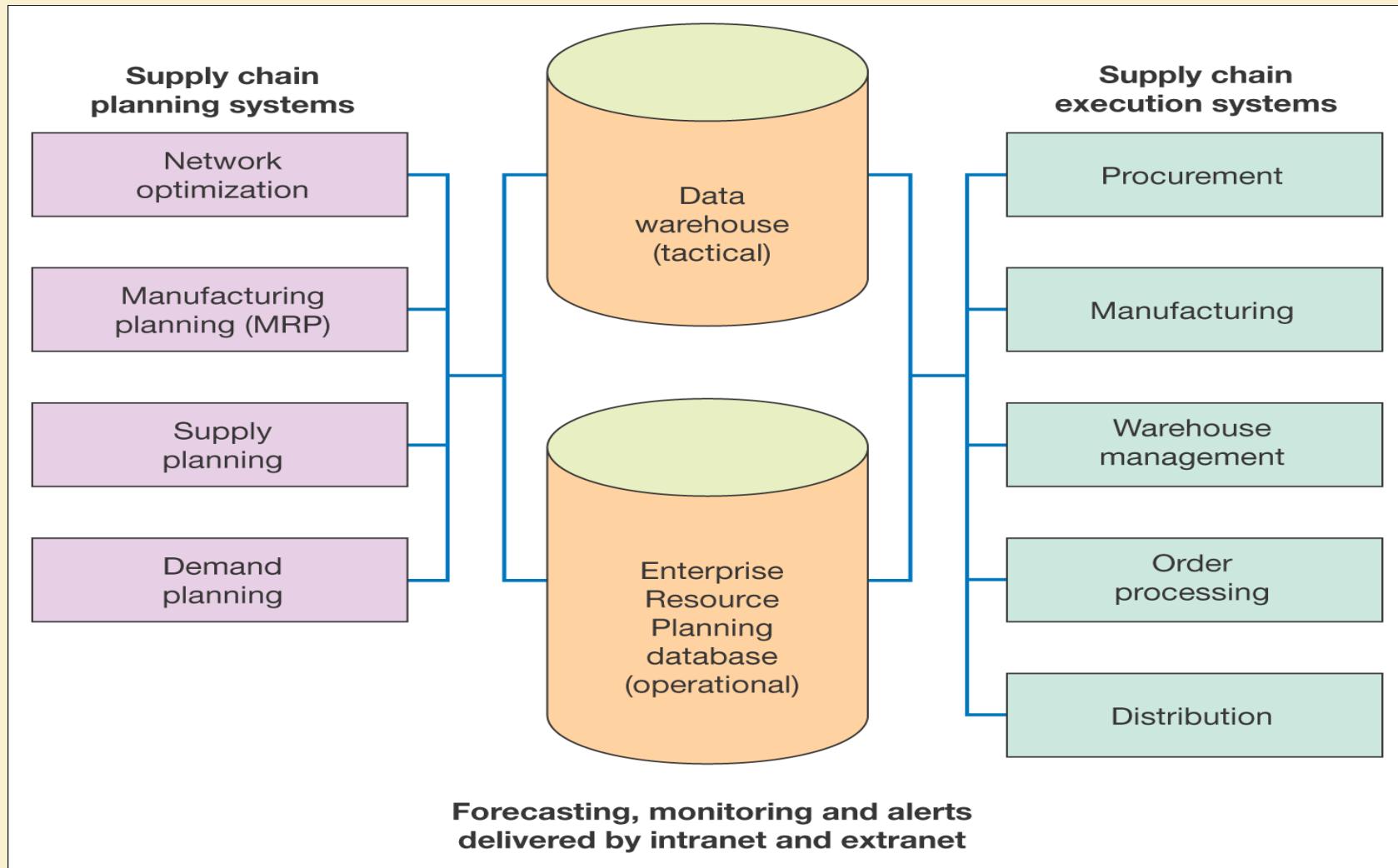


Figure 21: A typical IS infrastructure for supply chain management

Benefits of applying IS to SCM

- Increased efficiency of individual processes
 - Reduced cycle time and cost per order
- *Reduced complexity of the supply chain*
 - Reduced cost of channel distribution and sale
- Improved data integration between elements of the supply chain
 - Reduced cost of paper processing
- Reduced cost through outsourcing
 - Lower costs through price competition
- Innovation
 - Better customer responsiveness.

E-procurement

What is E-procurement?

- Procurement refers to all activities of obtaining items from a supplier, include purchasing as well as inbound logistics, warehousing, etc.
- E-Procurement
 - The integration and management of all procurement activities including purchase request, authorization, ordering, delivery, and payment.

The 5 rights of E-procurement

- at the right price
- delivered at the right time
- are of the right quality
- of the right quantity
- from the right source.

Key procurement activities within an organization

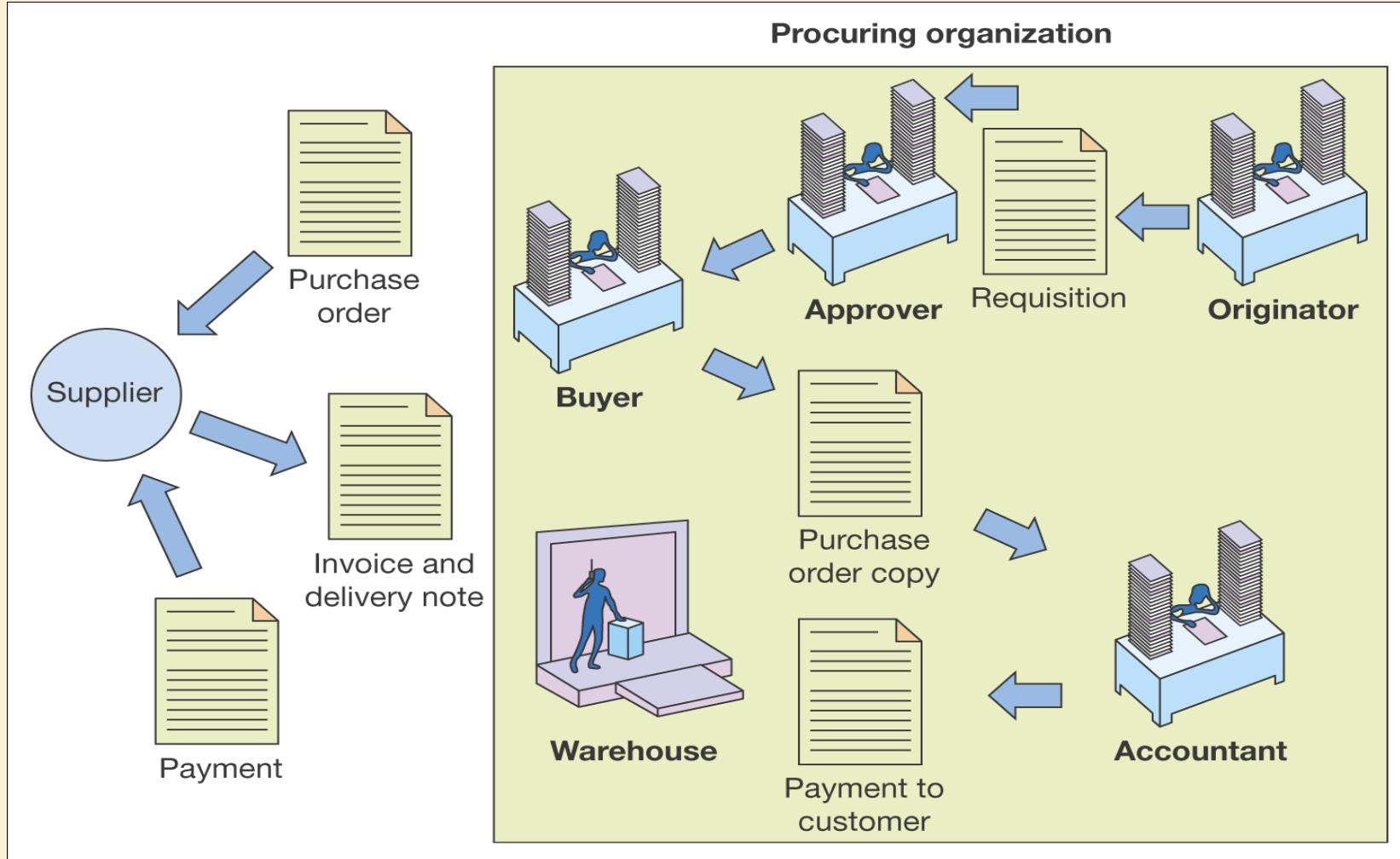


Figure 22: Key procurement activities within an organization

Types of Procurement

- What is bought?
 - Production-related
 - Non-production related
- How are items bought?
 - Systematic sourcing
 - ❖ Long term relationships
 - Spot sourcing
 - ❖ Fulfillment of immediate need

Online Procurement

- Eight types of intermediaries
 - Tradition manufacturers
 - Direct sales manufactures
 - Procurement partners
 - Online hubs
 - Knowledge expert
 - Online information services
 - Online retailers
 - Portal communities

Risks and Impact of E-procurement

- What are the main reasons for low adoption of e-Procurement?
- What are the main organizational risks?
 - Displace employees and Maverick purchases.
- Failure to Achieve real cost reductions
- Technology risks
 - New technologies and models are emerging on an ongoing basis. Hard to decide which one to use.

Implementing E-procurement

- Companies should consider improving business processes rather simply automate the existing process.
- The biggest challenges are
 - Training / Change management
 - Supplier relationship management
- IS manager and procurement team must work together.
- Different types of IS can be used for different parts of procurement cycle.

The three main E-Procurement model alternatives for buyers

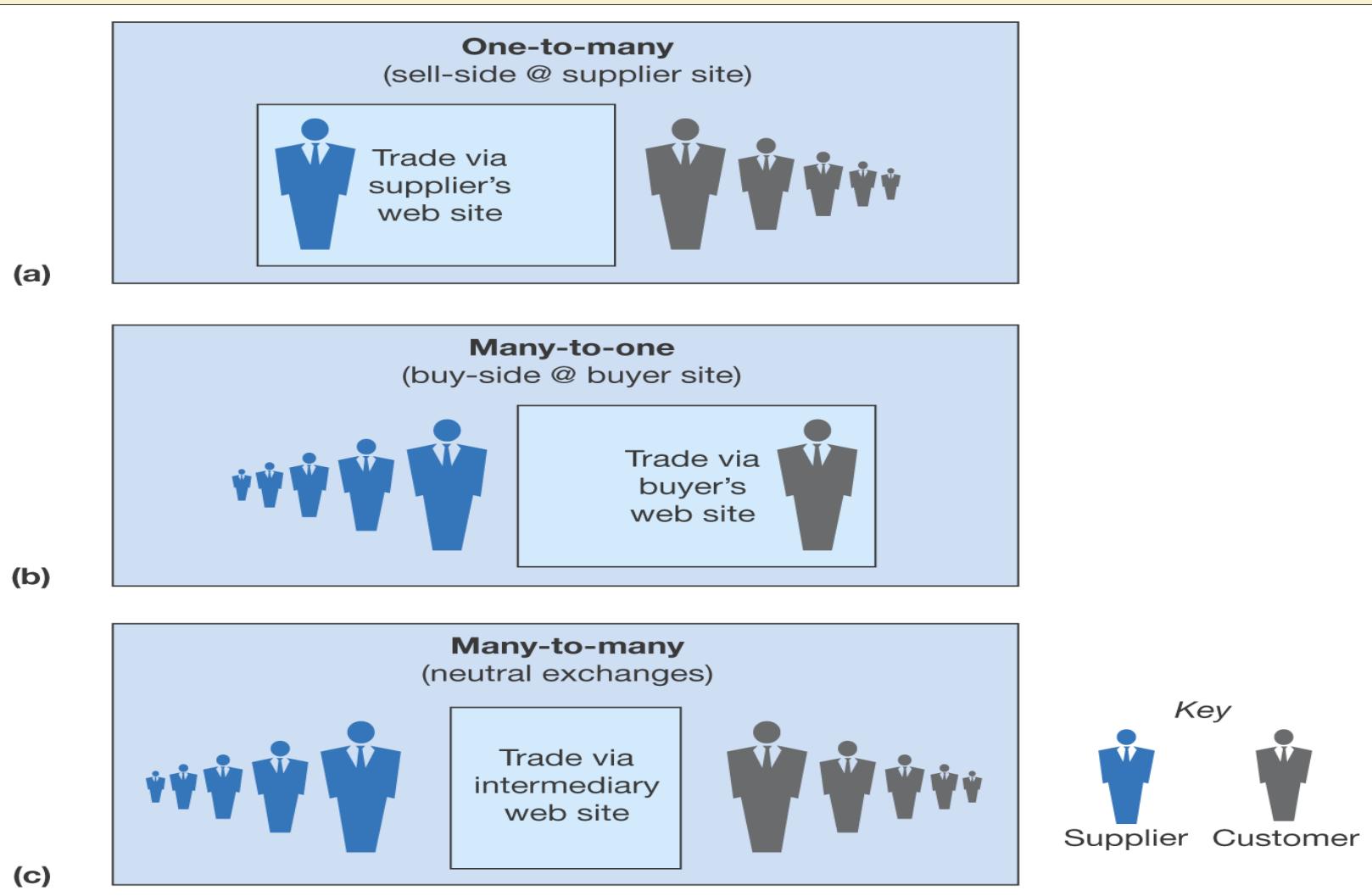


Figure 23: The three main e-procurement model alternatives for buyers

Types of Marketplace

- Vertical marketplace
 - Serves the same industry
- Horizontal marketplace
 - Serves multiple industries
- Reverse aggregation
 - Combines the purchasing power
- Forward aggregation
 - Combines multiple suppliers or supply chain functions
- Metamediaries
- Etc.

Enterprise Resource Planning

What is Enterprise Resource Planning?

- Enterprise resource planning (ERP) software packages are business systems that integrate all facets of a business.
- ERP includes accounting, logistics, manufacturing, marketing, planning, project management, treasury functions, etc.

ERP system integration with EDI

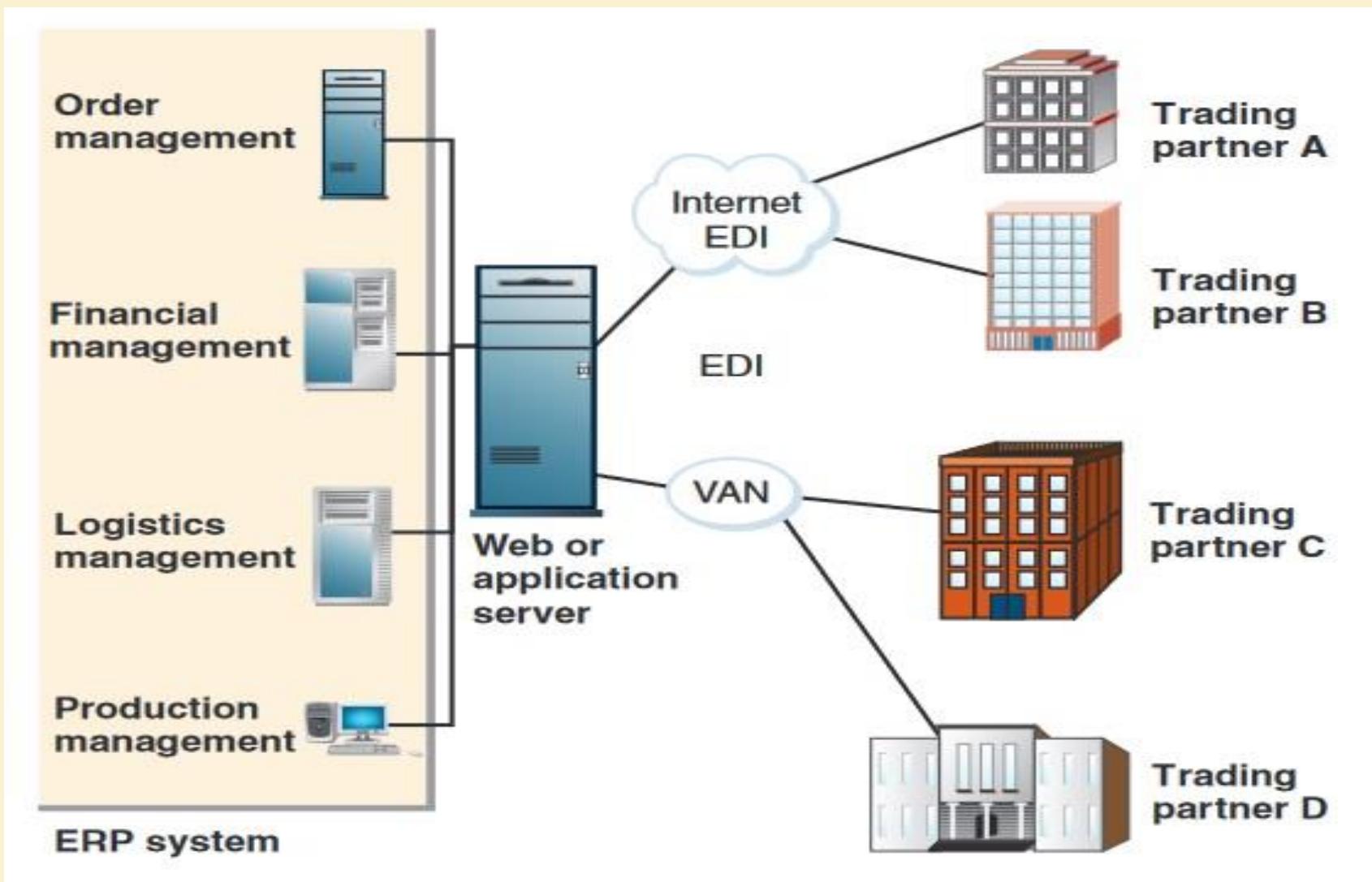


Figure 24: ERP system integration with EDI. Source: Gary P. Schneider, *Electronic Commerce 12th*, Cengage Learning, 2017.

ERP Vendors

- The two major ERP vendors are Oracle & SAP.
- Smaller online businesses cannot afford to buy a full ERP software implementation; however, they can purchase products such as NetSuite that offer subscriptions to ERP software for all sizes of businesses.
- Instead of installing and customizing ERP software on their own computer network, the business uses a Web browser to access the ERP software on the vendor's site.
- This practice of offering software use online is called software as a service (SaaS).

Web Hosting

What is Web Hosting?

- Web hosting is a service that allows organizations and individuals to publish or upload a website or web page onto the Internet.
- A web host or web hosting service provider is a business that provides the technologies and services needed for the website or webpage to be viewed on the Internet.
- Websites are hosted, or stored, on special computers called web servers.

What is Web Hosting?

- A few web hosting service providers are GoDaddy, Bluehost, Dreamhost, IONOS, and etc.
- Steps to Hosting a Website
 - Upload file from our computer to server webhosting
 - The host computer makes server site available on the internet
 - Visitors are able to view web site

Features provided by Web Hosting Service Providers

- ***Provided Features***

➤ Amount of Storage	➤ Database Support
➤ Amount of Bandwidth	➤ Technical Support
➤ Domain Registration	➤ Site Backup
➤ Number of Sub-domains	➤ Choice of Operating System
➤ Email Support	➤ 24/7 Availability

Selecting best Web Hosting Provider

- ***Web Host Provider***

- | | |
|---|--|
| ➤ Evaluate the disk space and bandwidth needs | ➤ Choosing the right operating system |
| ➤ Reliability and availability | ➤ Security like firewalls, daily backup, user authentication, etc. |
| ➤ 24/7 support | ➤ E-mail services |
| ➤ Price | |

Types of Web Hosting

- ***Free Web Hosting***
 - Many free hosting providers support the hosting costs through advertising added automatically to Web pages through pop-ups, frames, and scripts.
 - Free Web hosting is typically limited in some way compared to the paid hosting.
 - For instance, we may get less space and bandwidth.
 - Free Web hosting can be done through a hosting service like Google Cloud Hosting or through the Internet Service Provider (ISP).

Types of Web Hosting (Cont.)

- ***Shared Web Hosting***
 - Shared hosting is the most popular form of web hosting.
 - It is called "shared" because many different web applications (most often websites) are stored on one single physical server and thus share its resources.
 - All the websites in the server share all a common pool of server resources, such as RAM and the CPU.

Types of Web Hosting (Cont.)

- ***Shared Web Hosting (Cont.)***
 - With shared paid hosting, we pay money typically once a month your space and services to web hosting service provider.
 - The price depends upon what services we want.
 - Services include email support, database support, security, extra space, extra bandwidth, and so on.

Types of Web Hosting (Cont.)

- ***Dedicated Web Hosting***
 - In contrast to shared hosting, dedicated hosting implies that the client's applications do not share the server's resources with other users' applications.
 - Furthermore, the server uses the entire available bandwidth for purposes of its own.
 - This type of hosting is intended for high-traffic websites and web applications.

Types of Web Hosting (Cont.)

- ***Cloud Web Hosting***
 - The term “Cloud” is more of an electronic structure where data is stored over many different computers and served up via a network connection, typically the Internet.
 - In cloud hosting, the actual website data (such as HTML, CSS files, images, etc.) is spread out over a cluster of hard drives that are linked together.

Types of Web Hosting (Cont.)

- ***Cloud Web Hosting (Cont.)***
 - Cloud hosting services are the hottest trend in the hosting market.
 - Cloud hosting has many advantages over the shared hosting services and sometimes performs better than dedicated hosting solutions.
 - Cloud hosting is based on the most innovative Cloud computing technologies that allow unlimited number of machines to act as one system.

Types of Web Hosting (Cont.)

- ***Co-location Web Hosting***

- This kind of web hosting is similar to the dedicated web hosting service, but the user owns the server.
- The hosting company provides physical space that the server takes up and takes care of the server. This is the most powerful and expensive type of web hosting service.
- The client would have his own administrator visit the data center on-site to do any hardware upgrades or changes.

Types of Web Hosting (Cont.)

- ***Co-location Web Hosting (Cont.)***
 - Co-location comes in two flavors: managed and unmanaged.
 - ❖ Unmanaged is where we handle all the administration and management of the server, including software updates, the web server, and the site itself.
 - Co-location is perfect for companies who want something software configuration or need extra something in their Web security.

In conclusion

- Building E-commerce Presence
- Shopping Cart Software
- Customer Relationship Management
- Supply Chain Management
- E-procurement
- Enterprise Resource Planning
- Web Hosting

Understand



3. Online Security

The E-commerce Security Environment

- Scope of the problem
 - Overall size of and losses due to cybercrime unclear.
 - McAfee/Center for Strategic and International Studies study:
 - ❖ Global economic impact of cybercrime and cyberespionage between \$455 billion to \$600 billion.

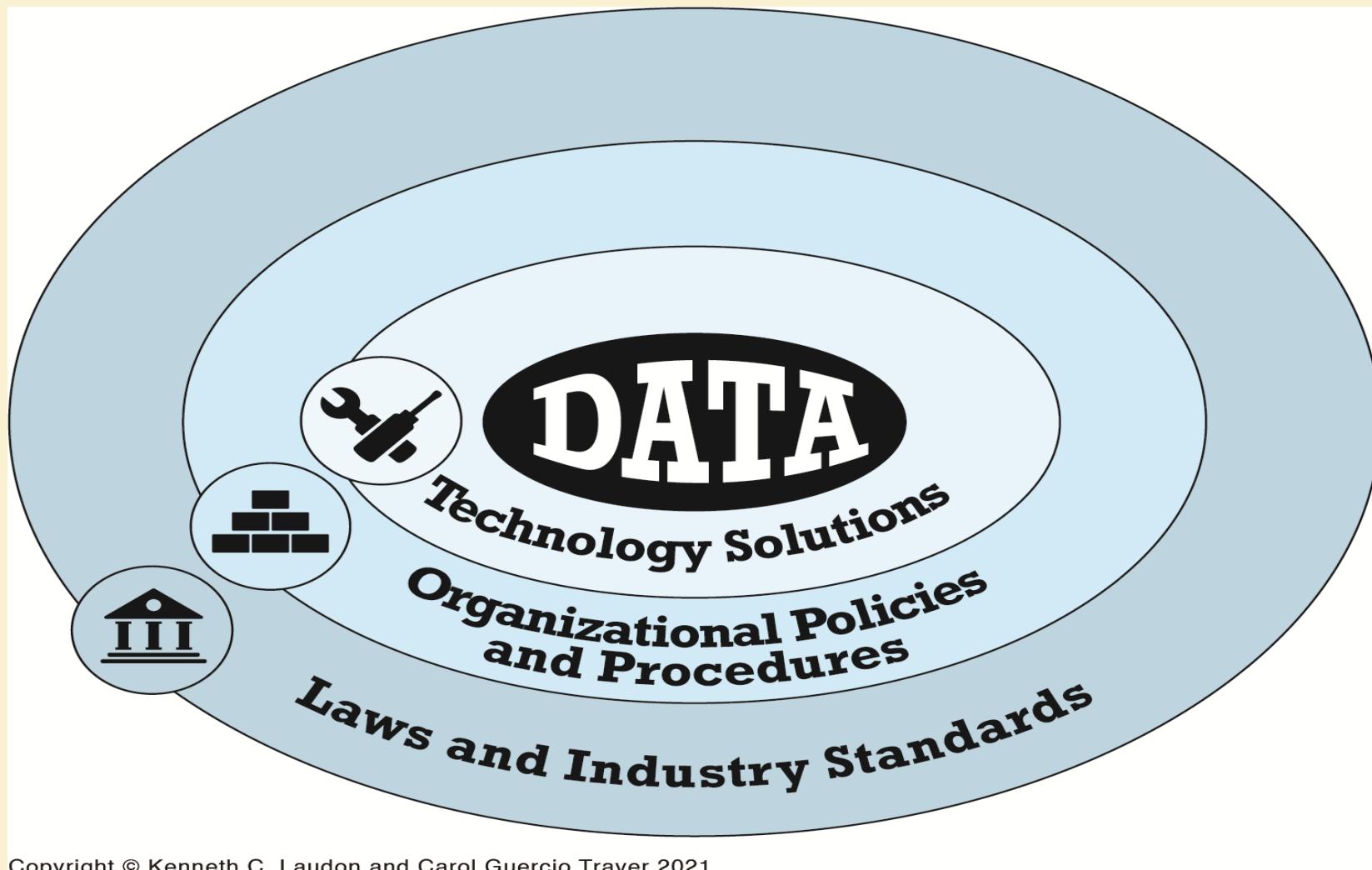
The E-commerce Security Environment

- Scope of the problem (Cont.)
 - Reports by security product providers indicate increasing cybercrime.
 - Online credit card fraud is one of the most high-profile forms.
- Underground economy marketplaces sell stolen information, malware and more.

What is Good E-commerce Security?

- To achieve highest degree of security
 - New technologies
 - Organizational policies and procedures
 - Industry standards and government laws
- Other factors
 - Time value of money
 - Cost of security versus the potential loss

The E-commerce Security Environment



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Figure 25: The E-commerce Security Environment

Customer and Merchant Perspectives on the Different Dimensions of E-commerce Security

Dimension	Customer's Perspective	Merchant's Perspective
Integrity	Has information I transmitted or received been altered?	Has data on the site been altered without authorization? Is data being received from customers valid?
Nonrepudiation	Can a party to an action with me later deny taking the action?	Can a customer deny ordering products?
Authenticity	Who am I dealing with? How can I be assured that the person or entity is who they claim to be?	What is the real identity of the customer?
Confidentiality	Can someone other than the intended recipient read my messages?	Are messages or confidential data accessible to anyone other than those authorized to view them?
Privacy	Can I control the use of information about myself transmitted to an e-commerce merchant?	What use, if any, can be made of personal data collected as part of an e-commerce transaction? Is the personal information of customers being used in an unauthorized manner?
Availability	Can I get access to the site?	Is the site operational?

Table 9: Customer and Merchant Perspectives on the Different Dimensions of E-commerce Security

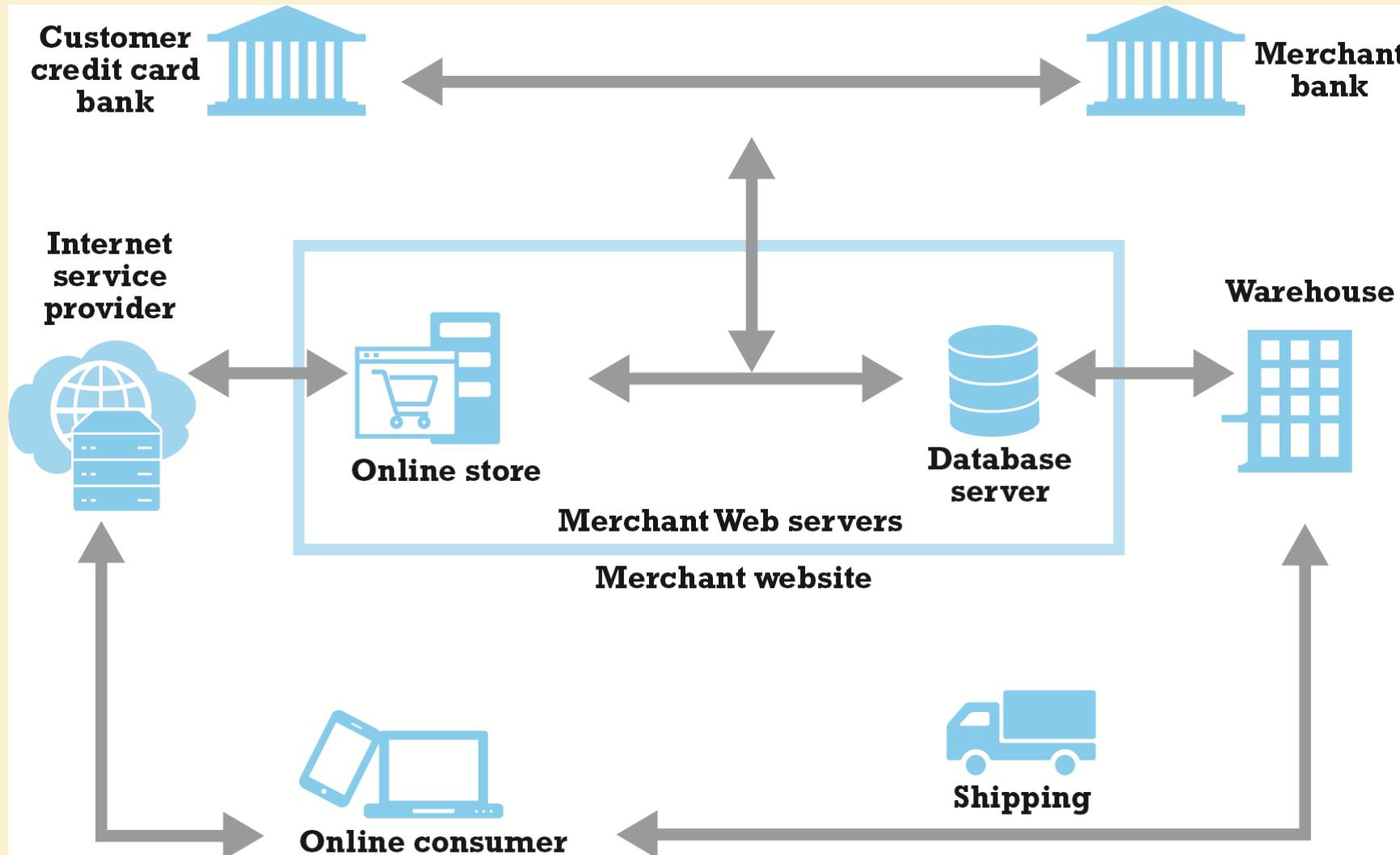
The Tension between Security and Other Values

- Ease of use
 - The more security measures added, the more difficult a site is to use, and the slower it becomes
- Public safety and criminal uses of the Internet
 - Use of technology by criminals to plan crimes or threaten nation-state

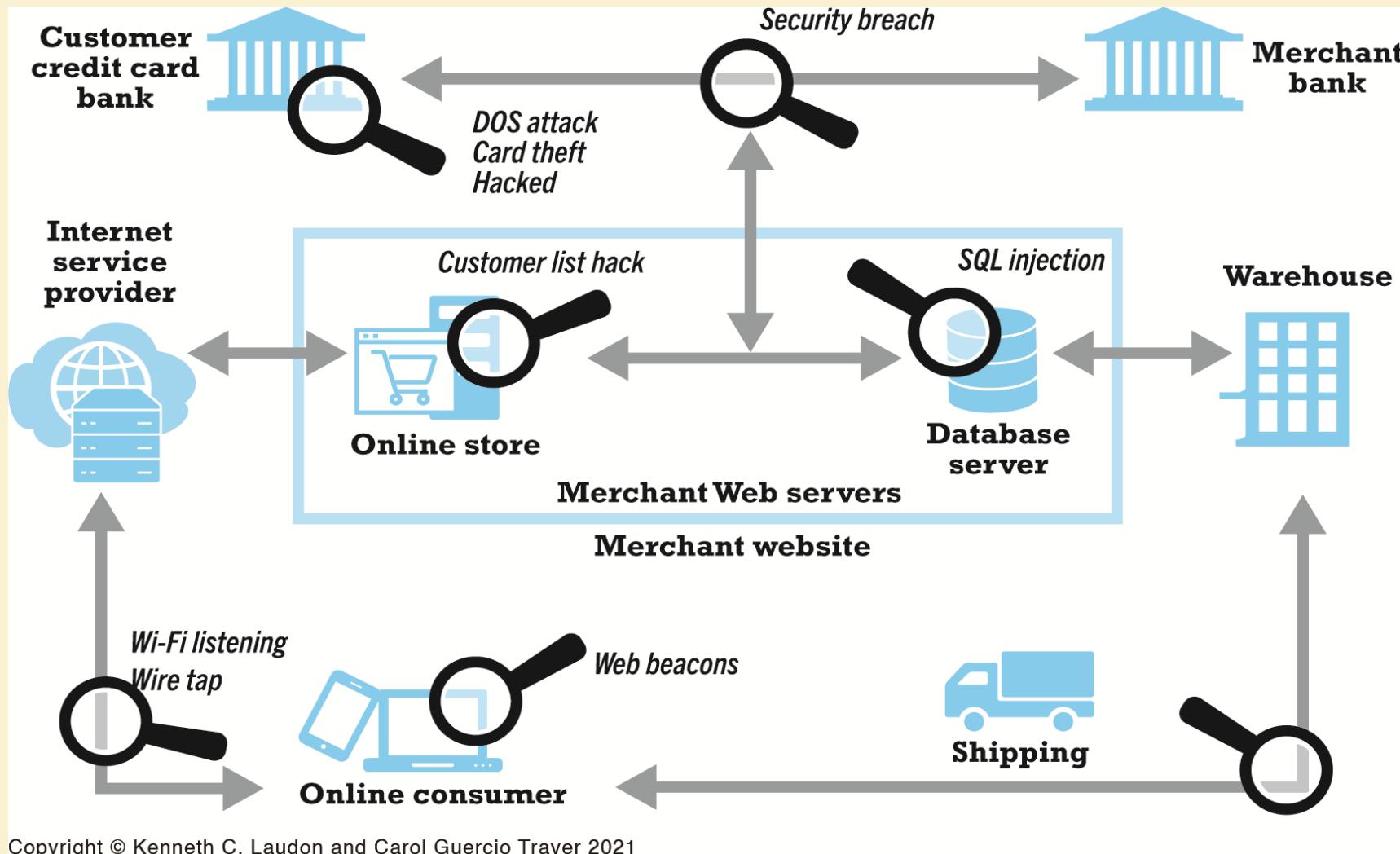
Security Threats in the E-commerce Environment

- Three key points of vulnerability in e-commerce environment:
 - Client
 - Server
 - Communications pipeline
(Internet communications channels)

A Typical E-commerce Transaction



Vulnerable Points in an E-commerce Transaction



Malicious Code

- Malvertising
- Viruses
- Worms
- Ransomware
- Trojan horses
- Backdoors
- Drive-by downloads
- Etc.

Potentially Unwanted Programs

- Browser parasites
 - Monitor and change user's browser
- Adware
 - Used to call pop-up ads
- Spyware
 - Tracks users keystrokes, e-mails, IMs, etc.

Phishing

- Any deceptive, online attempt by a third party to obtain confidential information for financial gain
- Tactics
 - Social engineering
 - E-mail scams and BEC phishing
 - Spear phishing
- Used for identity fraud and theft

Hacking, Cybervandalism, and Hacktivism

- Hacking
 - Hackers versus crackers
 - White hats, black hats, grey hats
 - Goals: cybervandalism, data breaches
- Cybervandalism:
 - Disrupting and destroying Web site
- Hacktivism

Data Breaches

- Organization loses control over corporate information to outsiders
- The ITRC recorded 1,244 breaches in 2018, a decrease in 23% over 2017
- Ex: Facebook breach in 2018 exposed personal information of 30 million people.
- Leading causes
 - Hacking
 - Unauthorized access
 - Employee error/negligence

Credit Card Fraud/Theft

- Stolen credit card rates about 0.9% on the Web and about 0.8% of mobile transactions
- Hacking and looting of corporate servers are primary cause
- Central security issue: establishing customer identity
 - E-signatures
 - Multi-factor authentication
 - Fingerprint identification

Identity Fraud/Theft

- Unauthorized use of another person's personal data for illegal financial benefit
 - Social security number
 - Driver's license
 - Credit card numbers
 - Usernames/passwords
- 2017: Almost 17 million U.S. consumers suffered identity fraud
- 2018: 14.4 million US consumers suffered identity fraud.

Spoofing, Pharming, and Spam (Junk) Websites

- Spoofing
 - Attempting to hide true identity by using someone else's e-mail or IP address
- Pharming
 - Automatically redirecting a URL to a different address, to benefit the hacker
- Spam (junk) websites
 - Offer collection of advertisements for other sites, which may contain malicious code

Sniffing and Man-In-The-Middle Attacks

- Sniffer
 - Eavesdropping program monitoring networks
 - Can identify network trouble spots
 - Can be used by criminals to steal proprietary information
- E-mail wiretaps
 - Recording e-mails at the mail server level
- Man-in-the-middle attack
 - Attacker intercepts and changes communication between two parties who believe they are communicating directly

Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks

- Denial of service (DoS) attack
 - Flooding website with pings and page request
 - Overwhelm and can shut down site's web servers
 - Often accompanied by blackmail attempts
- Distributed Denial of Service (DDoS) attack
 - Uses hundreds or thousands of computers to attack target network
 - Can use devices from Internet of Things, mobile devices

Insider Attacks

- Largest threat to business institutions comes from insider embezzlement
- Employee access to privileged information
- Poor security procedures
- Insiders more likely to be a source of cyberattacks than outsiders

Poorly Designed Software

- Increase in complexity of and demand for software has led to increase in flaws and vulnerabilities
- SQL injection attacks
- Zero-day vulnerability
- Heartbleed bug; Shellshock (BashBug); FREAK

Social Network Security Issues

- Social networks are an environment for:
 - Viruses, site takeovers, identity fraud, malware-loaded apps, click hijacking, phishing, spam
- Manual sharing scams
 - Sharing of files that link to malicious sites
- Fake services, fake Like buttons, and fake apps

Mobile Platform Security Issues

- Little public awareness of mobile device vulnerabilities
- 2017: Over 26,500 different mobile malware variants identified by Symantec
- Vishing
- Smishing
- SMS spoofing
- Madware

Cloud Security Issues

- DDoS attacks
- Infrastructure scanning
- Lower-tech phishing attacks yield passwords and access
- Use of cloud storage to connect linked accounts
- Lack of encryption and strong security procedures

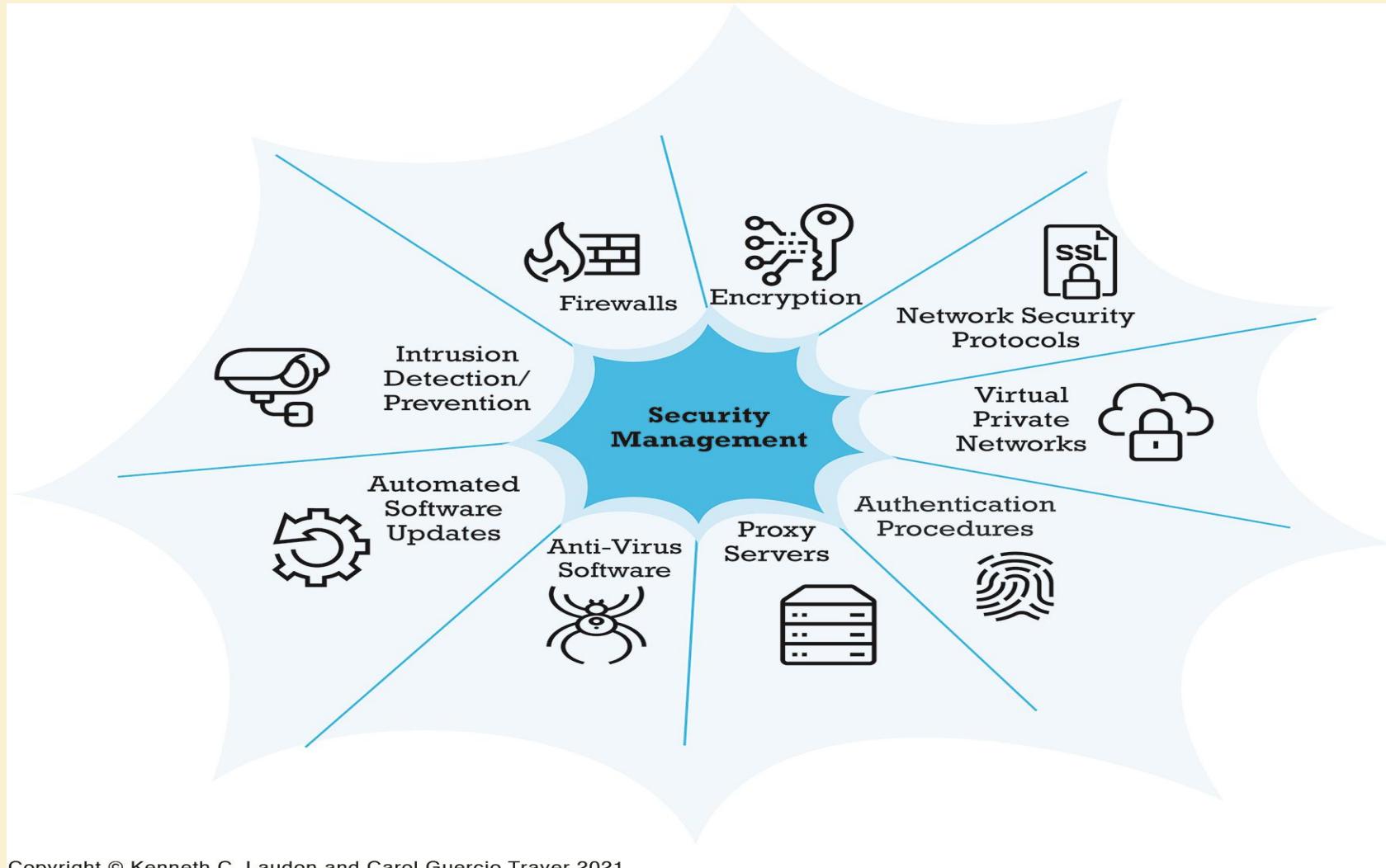
Internet of Things Security Issues

- Challenging environment to protect
- Vast quantity of interconnected links
- Near identical devices with long service lives
- Many devices have no upgrade features
- Little visibility into workings, data, or security

Technology Solutions

- Protecting Internet communications
 - Encryption
- Securing channels of communication
 - SSL, TLS, VPNs, Wi-Fi
- Protecting networks
 - Firewalls, proxy servers, IDS, IPS
- Protecting servers and clients
 - OS security, anti-virus software

Tools Available to Achieve E-commerce Security



Encryption

- Encryption
 - Transforms data into cipher text readable only by sender and receiver
 - Secures stored information and information transmission
 - Provides 4 of 6 key dimensions of e-commerce security:
 - ❖ Message integrity
 - ❖ Nonrepudiation
 - ❖ Authentication
 - ❖ Confidentiality

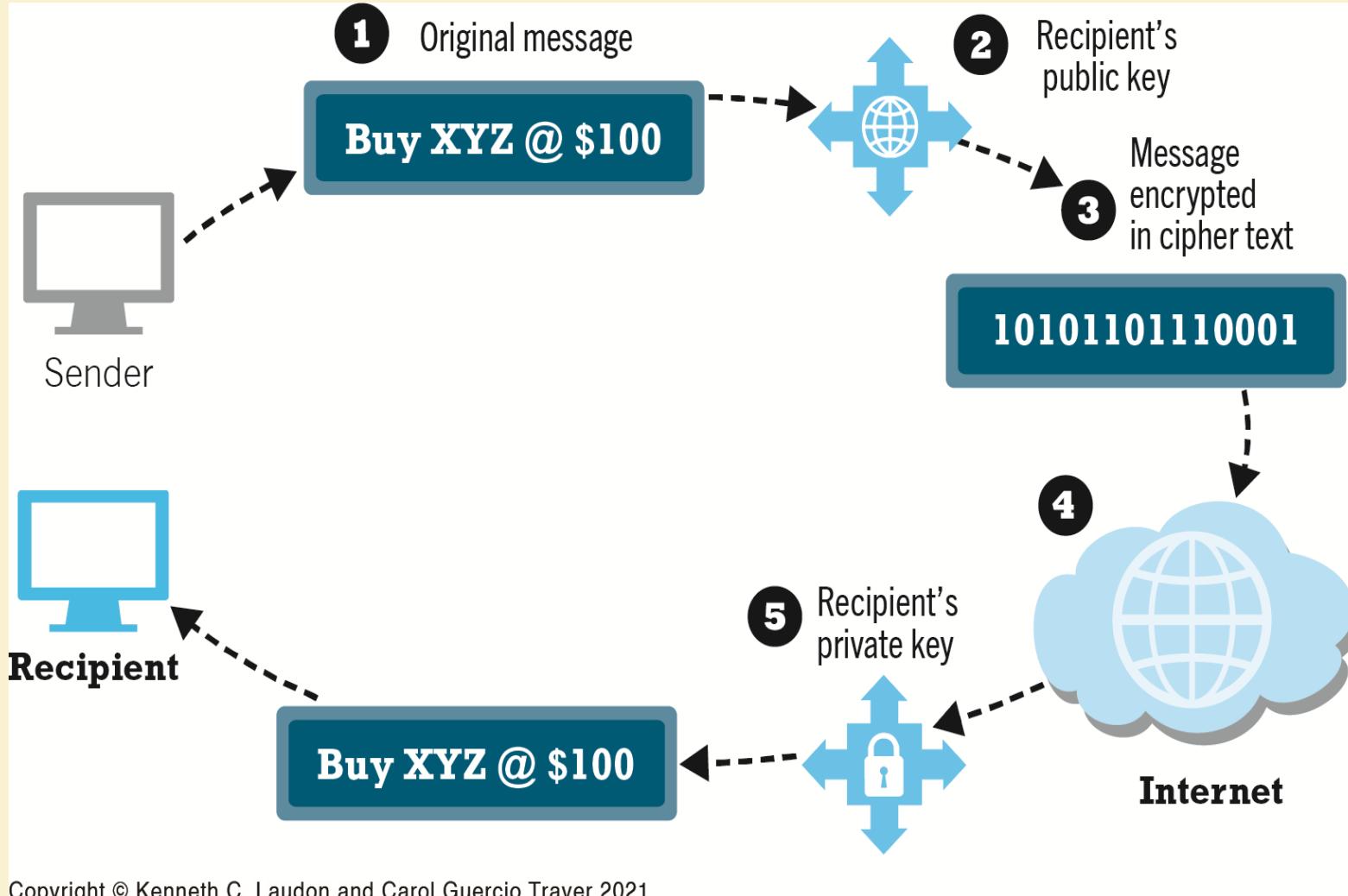
Symmetric Key Cryptography

- Sender and receiver use same digital key to encrypt and decrypt message
- Requires different set of keys for each transaction
- Strength of encryption: Length of binary key
- Data Encryption Standard (DES)
- Advanced Encryption Standard (AES)
- Other standards use keys with up to 2,048 bits

Public Key Cryptography

- Uses two mathematically related digital keys
 - Public key (widely disseminated)
 - Private key (kept secret by owner)
- Both keys used to encrypt and decrypt message
- Once key used to encrypt message, same key cannot be used to decrypt message
- Sender uses recipient's public key to encrypt message; recipient uses private key to decrypt it.

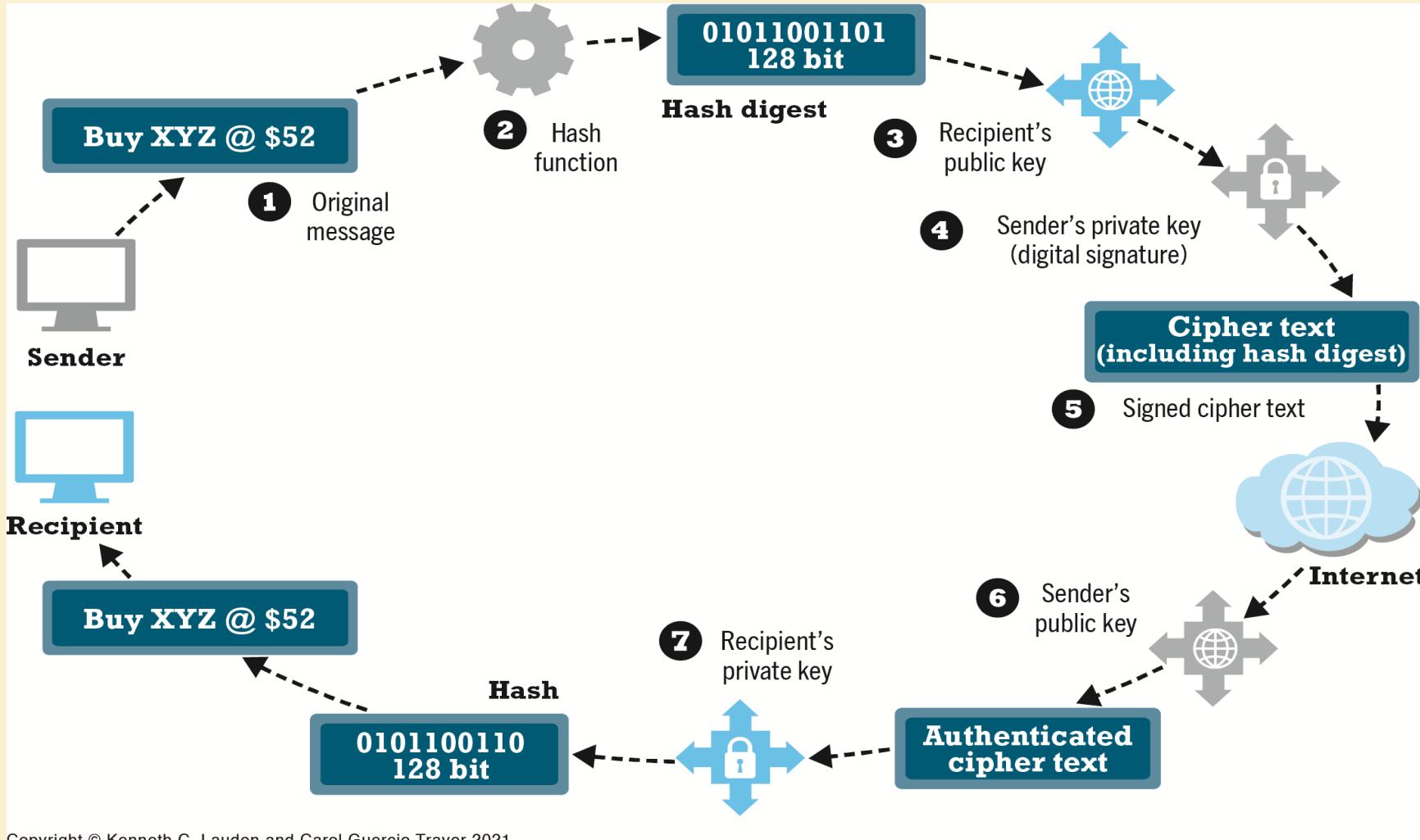
Public Key Cryptography: A Simple Case



Public Key Cryptography Using Digital Signatures and Hash Digests

- Sender applies a mathematical algorithm (hash function) to a message and then encrypts the message and hash result with recipient's public key
- Sender then encrypts the message and hash result with sender's private key-creating digital signature-for authenticity, nonrepudiation
- Recipient first uses sender's public key to authenticate message and then the recipient's private key to decrypt the hash result and message

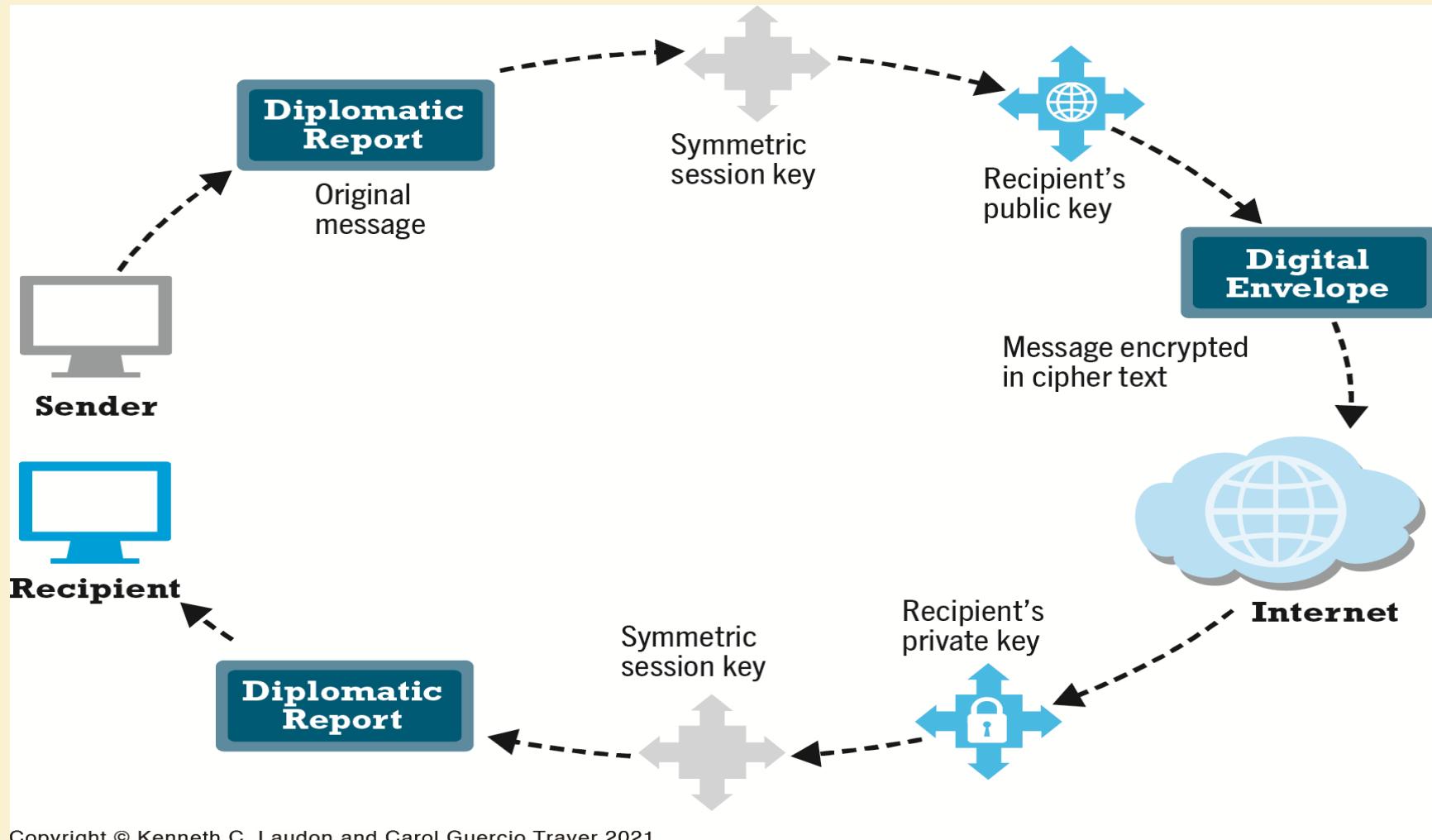
Public Key Cryptography with Digital Signatures



Digital Envelopes

- Address weaknesses of:
 - Public key cryptography
 - ❖ Computationally slow, decreased transmission speed, increased processing time
 - Symmetric key cryptography
 - ❖ Insecure transmission lines
- Uses symmetric key cryptography to encrypt document
- Uses public key cryptography to encrypt and send symmetric key

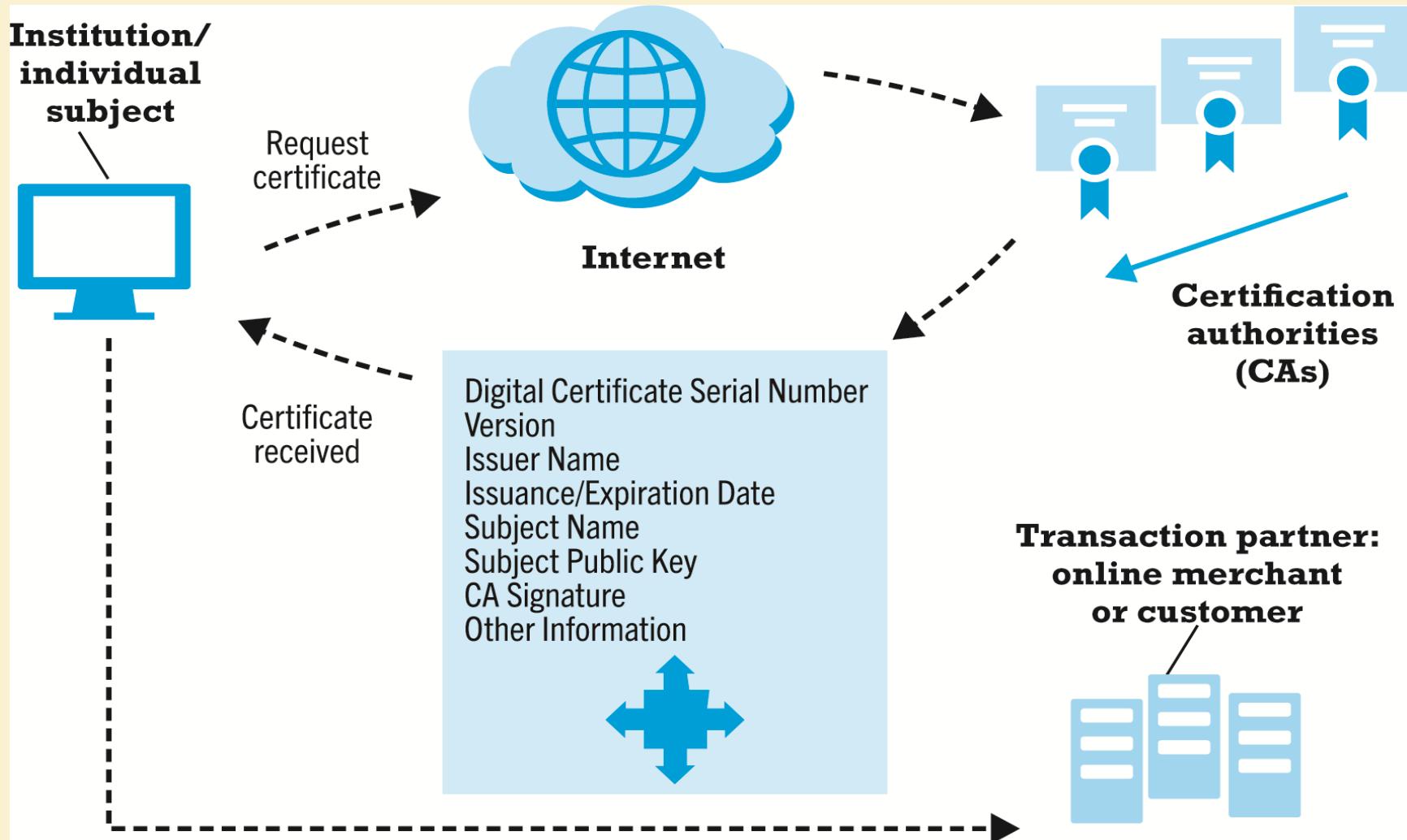
Public Key Cryptography: Creating a Digital Envelope



Digital Certificates and Public Key Infrastructure (PKI)

- Digital certificate includes:
 - Name of subject/company
 - Subject's public key
 - Digital certificate serial number
 - Expiration date, issuance date
 - Digital signature of CA
- Public Key Infrastructure (PKI):
 - CAs and digital certificate procedures
 - PGP

Digital Certificates and Certification Authorities



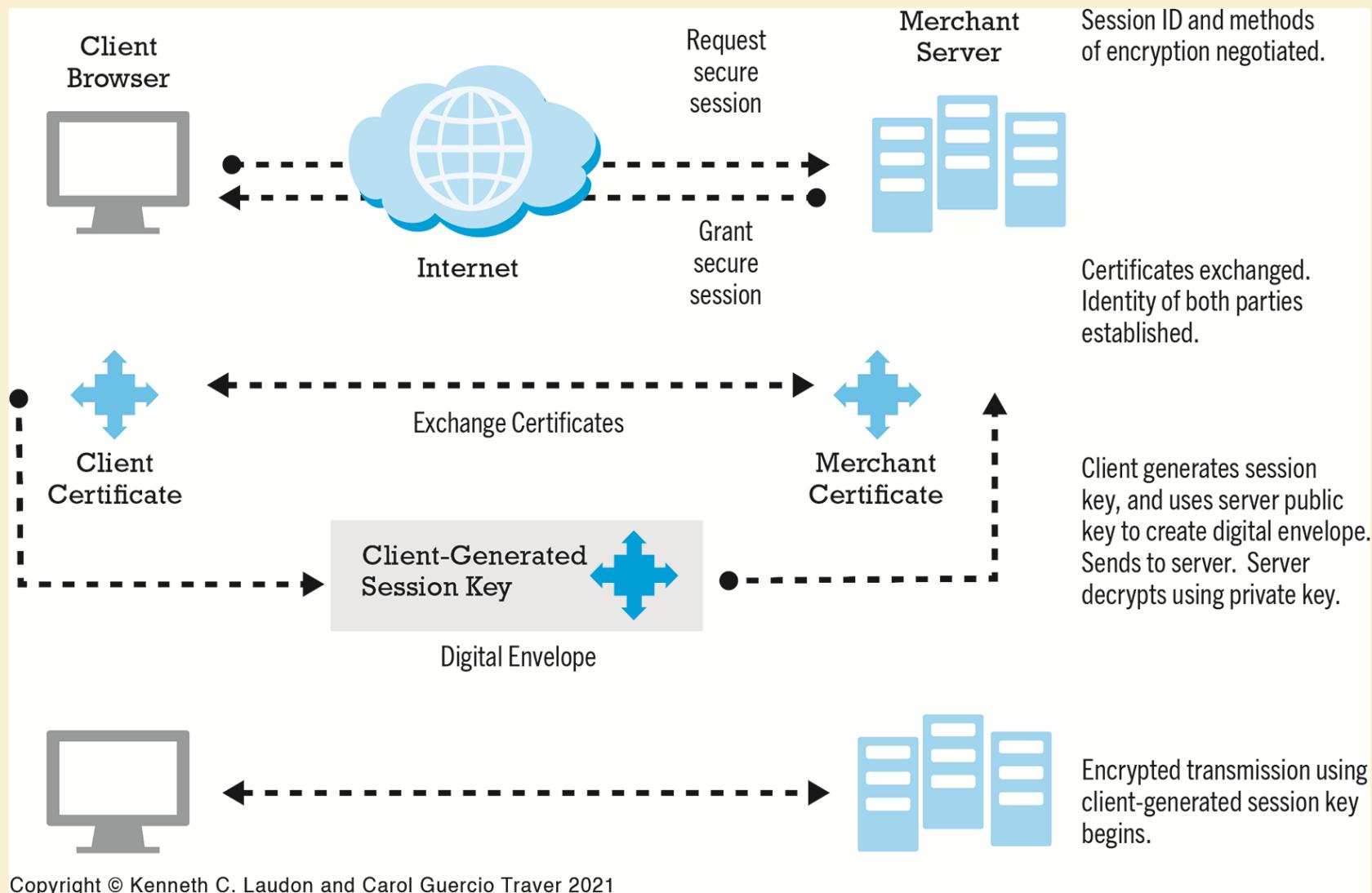
Limitations of Public Key Infrastructure (PKI)

- Doesn't protect storage of private key
 - PKI not effective against insiders, employees
 - Protection of private keys by individuals may be casual
- No guarantee that verifying computer of merchant is secure
- CAs are unpopular and are not controlled.

Securing Channels of Communication

- Secure Sockets Layer (SSL)/Transport Layer Security (TLS)
 - Establishes a secure, negotiated client-server session
- Virtual Private Network (VPN)
 - Allows remote users to securely access internal network via the Internet
- Wireless (Wi-Fi) networks
 - WPA 2
 - WPA 3

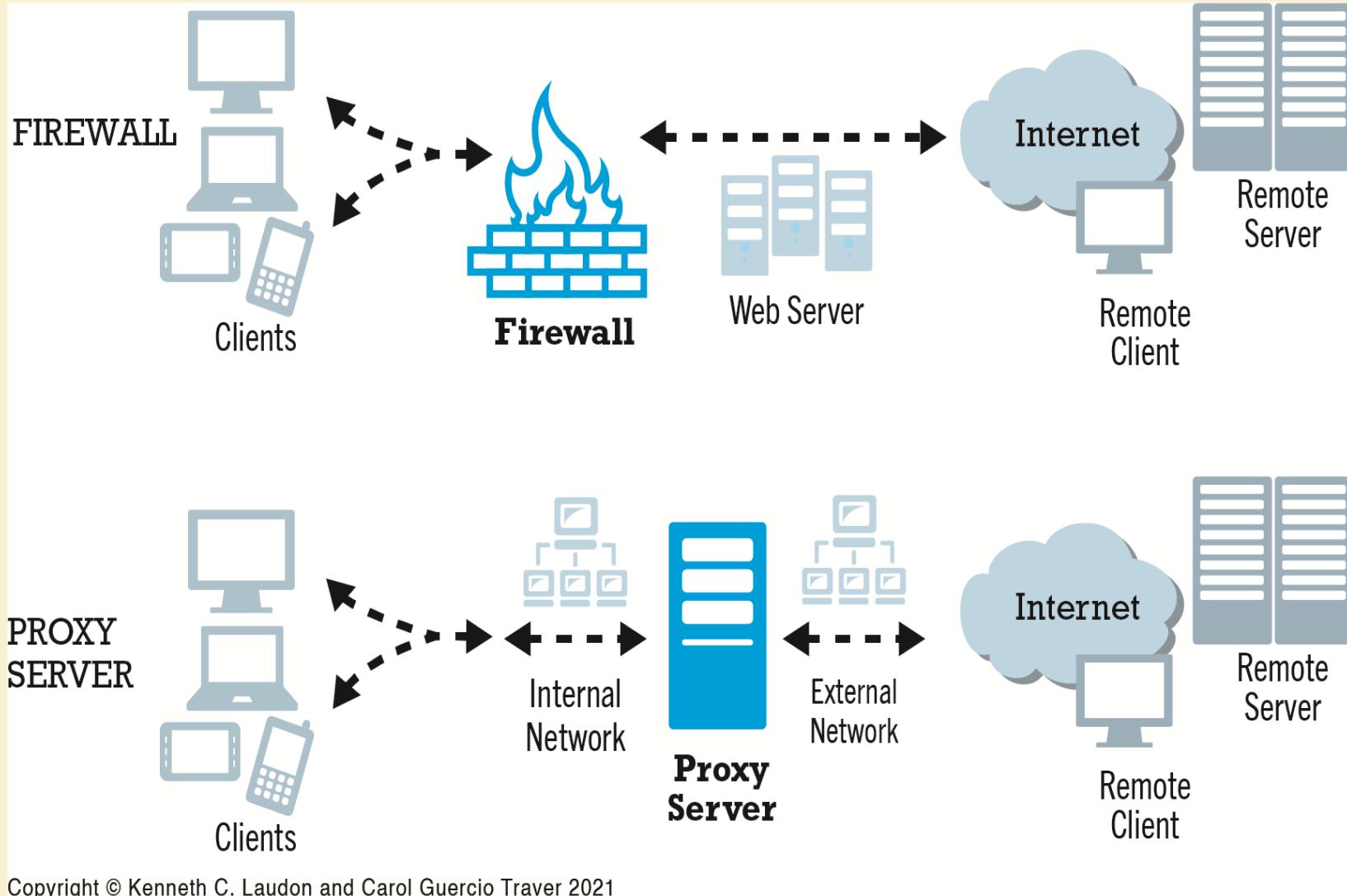
Secure Negotiated Sessions Using SSL/TLS



Protecting Networks

- Firewall
 - Hardware or software that uses security policy to filter packets
 - ❖ Packet filters
 - ❖ Application gateways
 - Next-generation firewalls
- Proxy servers (proxies)
 - Software servers that handle all communications from or sent to the Internet
- Intrusion detection systems (IDS)
- Intrusion prevention systems (IPS)

Firewalls and Proxy Servers



Protecting Servers and Clients

- Operating system security enhancements
 - Upgrades, patches
- Anti-virus software
 - Easiest and least expensive way to prevent threats to system integrity
 - Requires daily updates

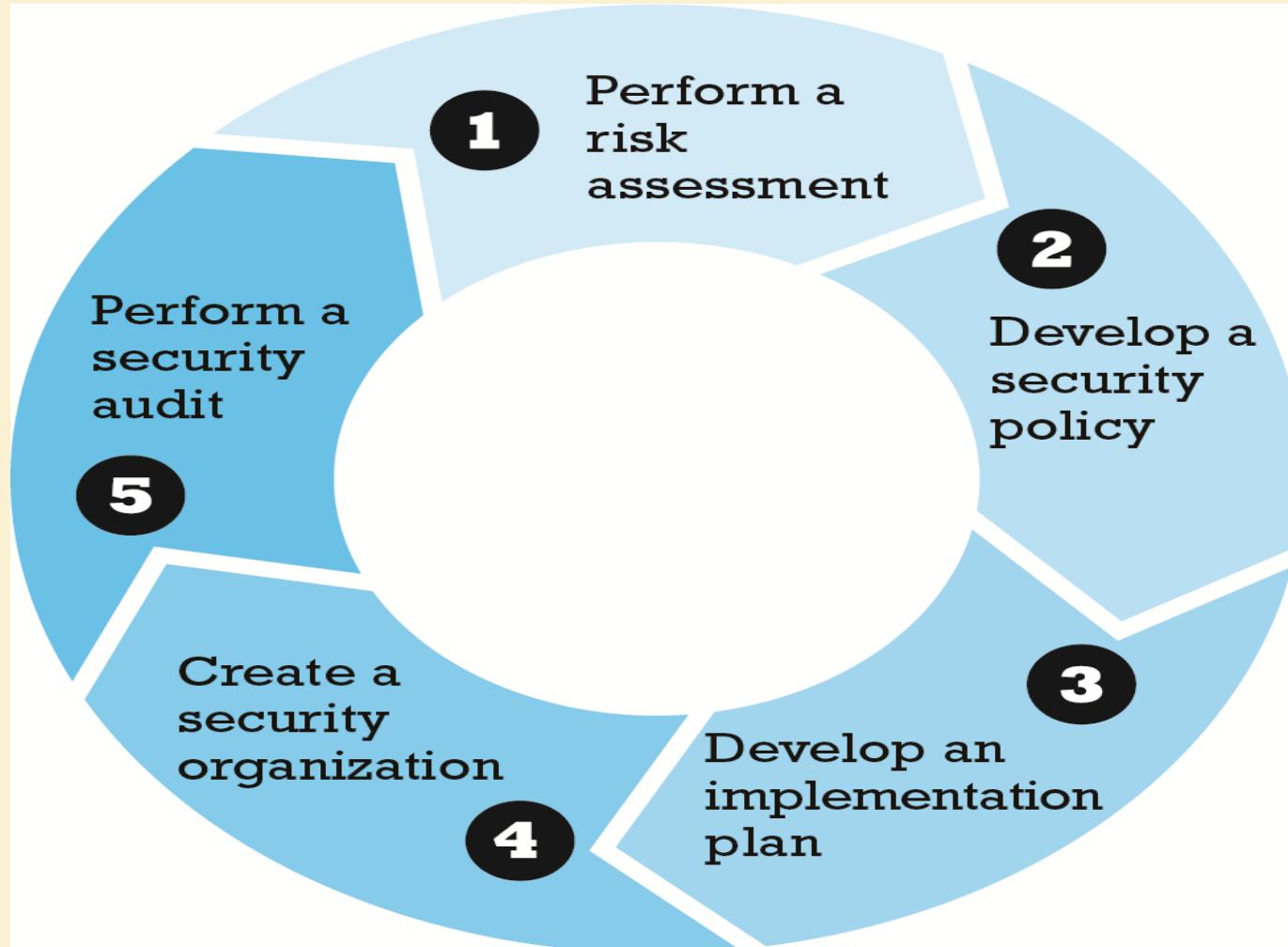
Management Policies, Business Procedures, and Public Laws

- Worldwide, companies spend more than \$86 billion on security hardware, software, services
- Managing risk includes:
 - Technology
 - Effective management policies
 - Public laws and active enforcement

A Security Plan: Management Policies

- Risk assessment
- Security policy
- Implementation plan
 - Security organization
 - Access controls
 - Authentication procedures, including biometrics
 - Authorization policies, authorization management systems
- Security audit

Developing an E-commerce Security Plan



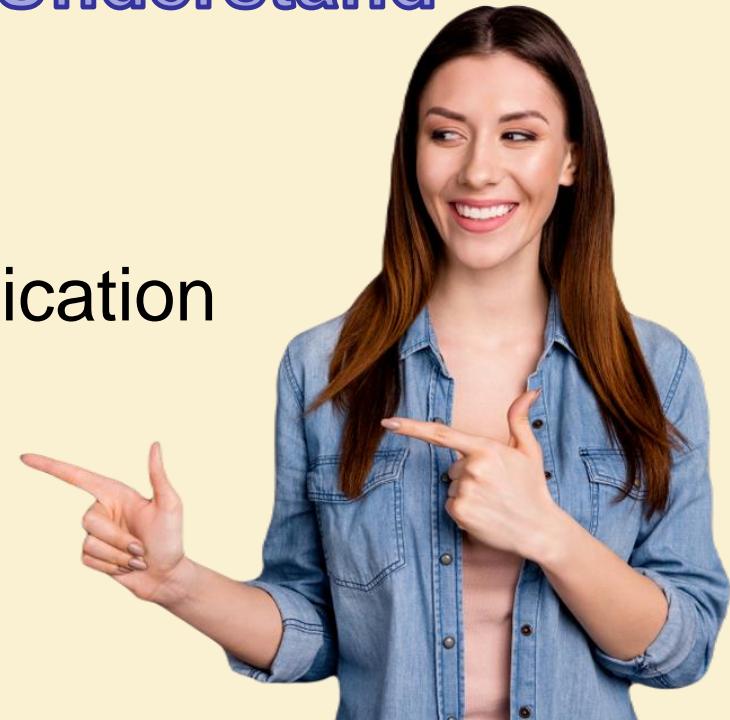
The Role of Laws and Public Policy

- Laws that give authorities tools for identifying, tracing, prosecuting cybercriminals:
 - USA Patriot Act
 - Homeland Security Act
- Private and private-public cooperation
 - US-CERT
 - CERT Coordination Center
- Government policies and controls on encryption software
 - OECD, G7/G8, Council of Europe, etc.
- Vietnam: Cybersecurity Law, ect.

In conclusion

- The E-commerce Security Environment
- Security Threats in the E-commerce Environment
- Vulnerable Points in an E-commerce Transaction
- Social Network Security Issues
- Malicious Code
- Cloud Security Issues
- Social Network Security Issues
- Securing Channels of Communication
- Developing an E-commerce Security Plan
- etc.

Understand



4. Online Payment System

Entities of E-payment

- Electronic payments involve a payer and a payee.
- **Payer**: payer (buyer or customer), is an entity who makes a payment.
- **Payee**: payee (seller or merchant), is an entity who receives a payment. The main purpose of an electronic payment protocols is to transfer monetary value from the payer to the payee.
- **Financial institution**: The process also involves a financial institution (eg. bank, etc.).

Entities in An E-Payment System

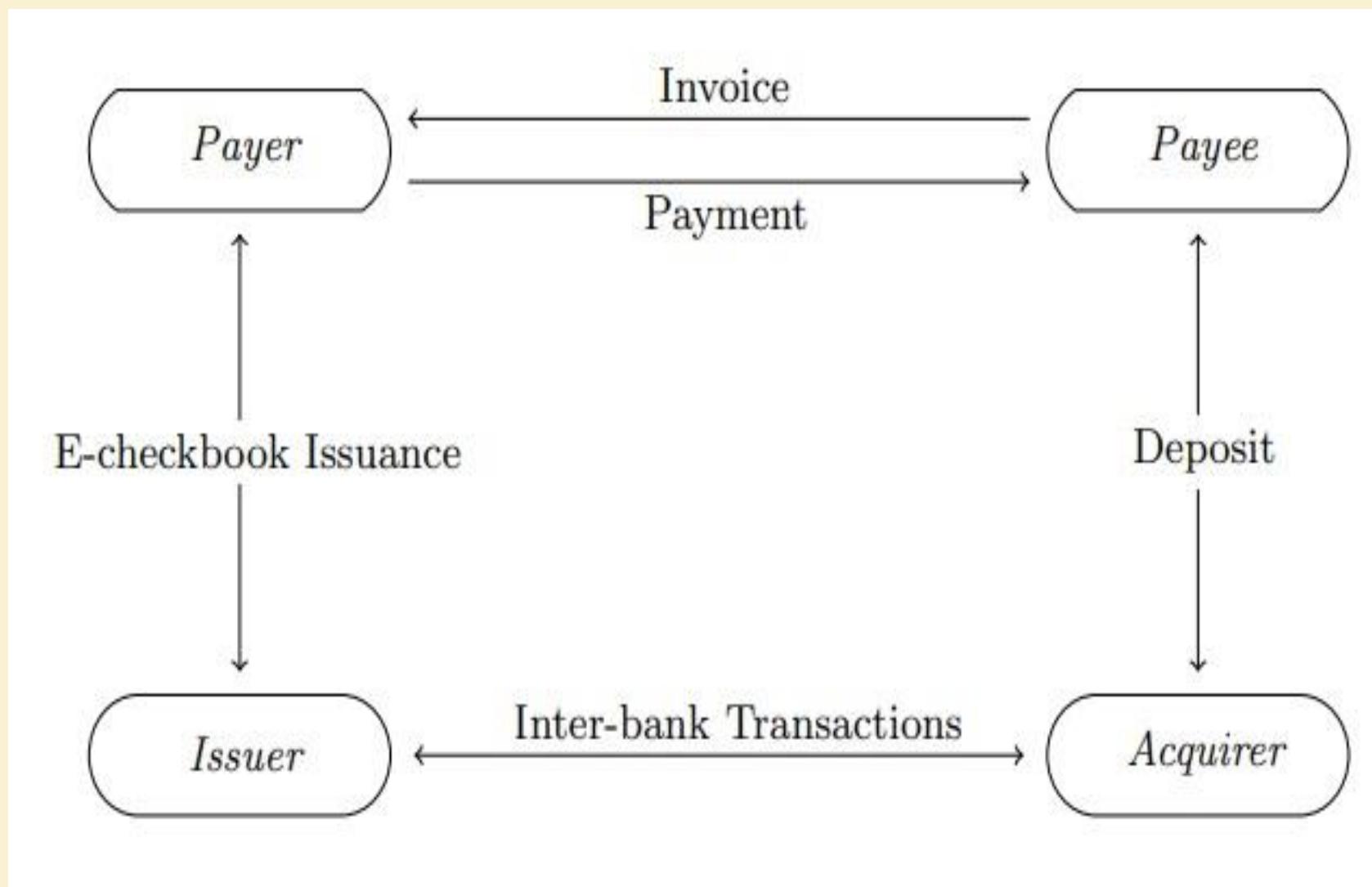


Figure 37: Entities in an e-payment system. Source: Isa Sertkaya & Oznur Kalkar, A Privacy Enhanced Transferable Electronic Checkbook Scheme, Wireless Personal Communications, 2022.

Phases in E-Payment

- ***Registration***
 - This phase involves the registration of the payer and the payee with the issuer and acquirer respectively.
 - Most electronic payments designed require registration of payers and payees with their *corresponding banks* so there is a link between *their identities and their accounts* held at the bank.

Phases in E-Payment (Cont.)

- ***Invoicing***

- In this phase, the payer obtains an invoice for payment from the payee.
- This is accomplished by either browsing and selecting products for purchase from the merchant's (payee's) website in case of purchases made through the internet or obtaining an electronic invoice using other electronic communication mediums like e-mail.

Phases in E-Payment (Cont.)

- ***Payment selection and processing***

- In this phase the payer selects type of payment, (card based, E-cash, E-cheque, etc.,) based on the type of payment the payee accepts.
- Based on the selection, the payer then sends the relevant payment details like account number, unique identifiers of the payer to the payee along with accepted amount based on the invoice.

Phases in E-Payment (Cont.)

- ***Payment authorization and confirmation***
 - In this phase, the acquirer on receiving payment details from the payee authorizes the payment and issues a receipt containing the success or failure of the payment to the payee.
 - The payee based on the message may also issue a receipt of payment to the payer.

Classification of Payment Systems

- *On the basis of Payment instruments*
 - There are three common payment instruments, namely cash, cheque, and card.
- *On the basis of payment time*
 - Pre-paid system: In the pre-paid system the payment is debited from the payer's account before a payment is processed.
 - Pay-now system: In the pay-now system, when an electronic transaction is processed, the payer's account is debited, and the payee's account is credited with the payment amount.

Classification of Payment Systems (Cont.)

- *On the basis of payment time (Cont.)*
 - Post-pay systems: In the post-pay systems, the payer's account is debited only when the payee requests payment settlement with the acquirer.
- *Advantage of online system*
 - The payee connects to the bank to obtain payment authorization, so increasing the communication requirements for the payment system.
 - The payee obtains a guarantee on the payment, as the bank can authorize and check for the availability of funds in the payer's account.

Secure Electronic Transaction Protocol (SET Protocol)

- SET is a form of protocol for electronic credit card payments.
- SET protocol is used to facilitate the secure transmission of consumer credit card information via electronic avenues, such as the Internet.
- SET blocks out the details of credit card information, thus preventing merchants, hackers, and electronic thieves from accessing this information.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***Key features***
 - To meet the business requirements. SET incorporates the following features
 - ❖ Confidentiality of information
 - ❖ Integrity of data
 - ❖ Cardholder account authentication
 - ❖ Merchant authentication
 - ❖ Participants

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***Participants of SET system***

- Card holder
- Merchant
- Issuer
- Acquirer
- Payment gateway
- Certification authority

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***SET Transaction***
 - The sequence of events required for a transaction is as follows:
 - ❖ The customer obtains a credit card account with a bank that supports electronic payment and SET.
 - ❖ The customer receives a digital certificate signed by the bank.
 - ❖ Merchants have their own certificates. The customer places an order with the merchant.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***SET Transaction (Cont.)***
 - The sequence of events required for a transaction is as follows (Cont.):
 - ❖ The merchant sends the customer his public key and a copy of his certificate so that the customer can verify that it's a valid store.
 - ❖ The customer sends the merchant:
 - ✓ His certificate
 - ✓ His order details .. encrypted.
 - ✓ His bank account details encrypted with the bank's public key.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***SET Transaction (Cont.)***
 - The sequence of events required for a transaction is as follows (Cont.):
 - ❖ The merchant requests payment authorization by sending the bank:
 - ✓ The payment details encrypted with the bank's public key.
 - ✓ The customer's bank account details encrypted with the bank's public key.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***SET Transaction (Cont.)***
 - The merchant doesn't know the client's payment and bank account details.
 - ❖ The bank sends the merchant a confirmation encrypted with the merchant's public key.
 - ❖ The merchant sends the client the bank's response encrypted with the client's public key.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***SET Transaction (Cont.)***
 - The merchant doesn't know the client's payment and bank account details (Cont.).
 - ❖ The merchant ships the goods or provides the service to the customer.
 - ❖ The merchant sends the bank a transaction request encrypted with the bank's public key.
 - ❖ The bank transfers the payment to the merchant.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

- ***Advantages of SET***

- It is secure enough to protect user's credit-card numbers and personal information from attacks.
- The hardware independent.
- It is used world-wide.
- It provides confidentiality of information.
- It provides integrity of data.
- It provides for cardholder account authentication.
- It also provides for merchant authentication.

Secure Electronic Transaction Protocol (SET Protocol) (Cont.)

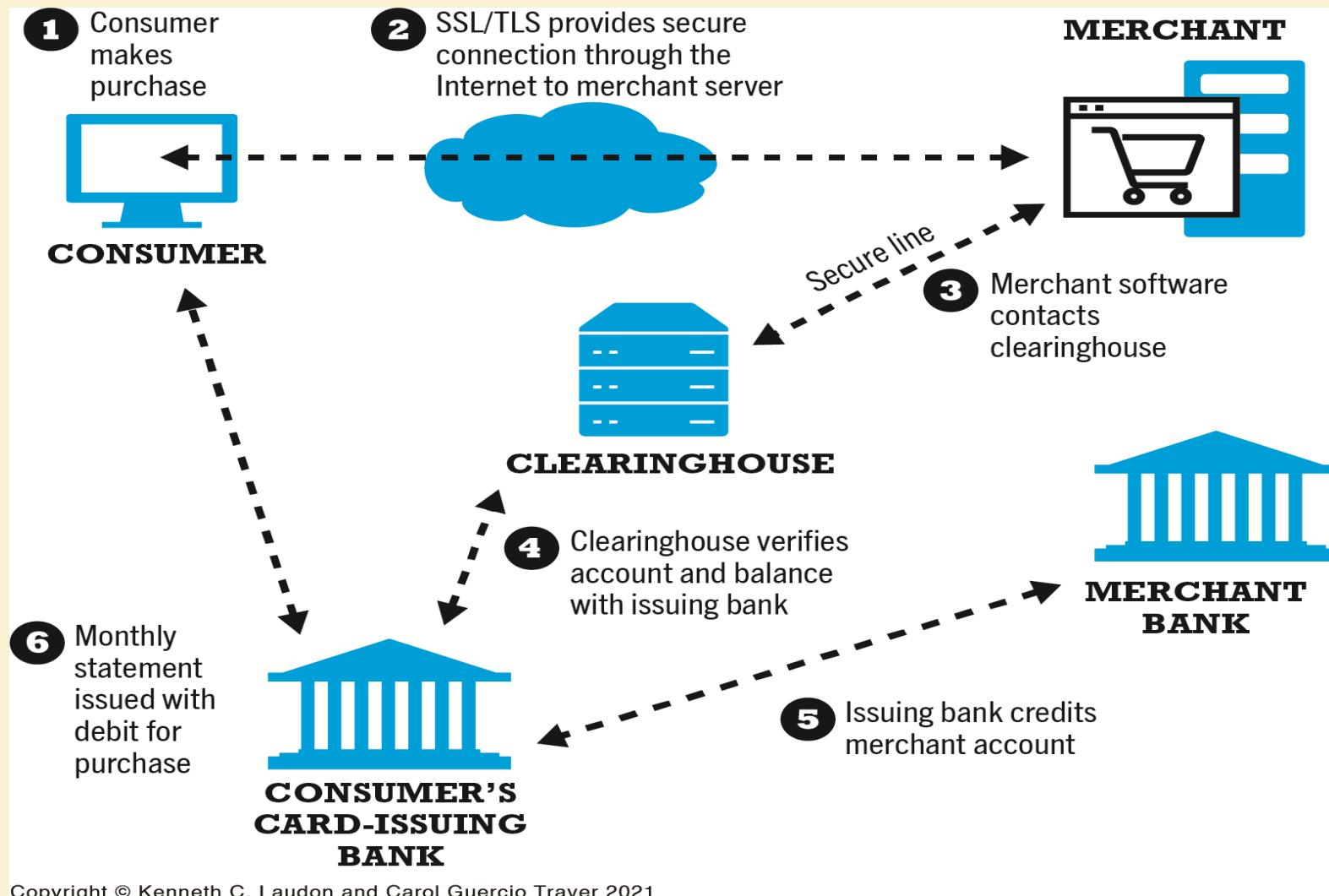
- ***Disadvantages of SET***

- Users must have credit card
- It is not cost-effective when the payment is small.
- None of anonymity and it is traceable.
- Network effect
 - ❖ Need to install client software (an e-wallet).
- Cost and complexity for merchants to offer support, contrasted with the comparatively low cost and simplicity of the existing SSL-based alternative.

E-commerce Payment Systems

- In U.S., credit and debit cards are primary online payment methods
 - Other countries have different systems
- Online credit card purchasing cycle
- Credit card e-commerce enablers
- Limitations of online credit card payment
 - Security, merchant risk
 - Cost
 - Social equity

How an Online Credit Card Transaction Works



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Figure 38: How an Online Credit Card Transaction Works

Alternative Online Payment Systems

- Online stored value systems:
 - Based on value stored in a consumer's bank, checking, or credit card account
 - Example: PayPal
- Other alternatives:
 - Amazon Pay
 - Visa Checkout, Mastercard's MasterPass

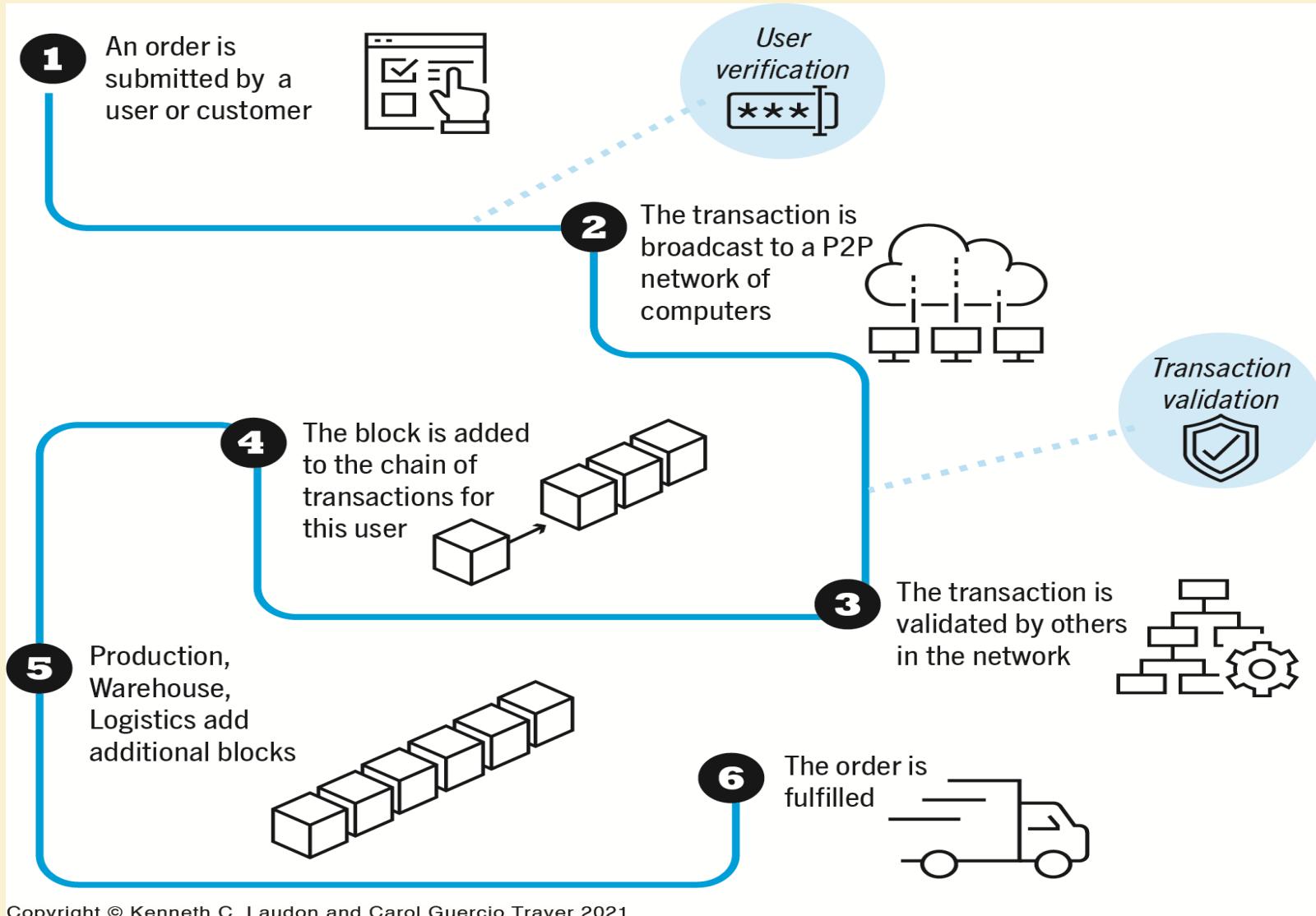
Mobile Payment Systems

- Use of mobile phones as payment devices
 - Established in Europe and Asia
 - Expanding in United States
- Near field communication (NFC)
- Different types of mobile wallets
 - Universal proximity mobile wallets, such as Apple Pay, Google Pay, Samsung Pay, PayPal Mobile
 - Branded store proximity wallets, offered by Walmart, Target, Starbucks, others
 - P2P mobile payment apps, such as Zelle, Venmo

Blockchain

- Blockchain
 - Enables organizations to create and verify transactions nearly instantaneously using a distributed P2P database (distributed ledger)
- Benefits:
 - Reduces costs of verifying users, validating transactions, and risks of storing and processing transaction information
 - Foundation technology for cryptocurrencies and supply chain management, as well as potential applications in financial services and healthcare industries

How Blockchain Works



Cryptocurrencies

- Use blockchain technology and cryptography to create a purely digital medium of exchange
- Bitcoin the most prominent example
 - Value of Bitcoins have widely fluctuated
 - Major issues with theft and fraud
 - Some governments have banned Bitcoin, although it is gaining acceptance in the U.S.
- Other cryptocurrencies (altcoins) include Ethereum/Ether, Ripple, Litecoin and Monero

In conclusion

- Entities of E-Payment
- Phases in E-Payment
- Classification of Payment Systems
- Secure Electronic Transaction Protocol
E-commerce Payment Systems
- How an Online Credit Card Transaction Works
- Alternative Online Payment Systems
- Mobile Payment Systems
- Blockchain
- How Blockchain Works
- Cryptocurrencies

Understand



**THANK YOU
FOR YOUR ATTENTION**

Q&A