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Learning Objectives

1. Understand the reasons for intelligent e-commerce systems
2. Become familiar with the essentials of artificial intelligence
3. Cite the major AI applications in e-commerce
4. Understand knowledge systems and their management
5. Understand intelligent computerized personal assistants and their availability
6. Gain knowledge about IoT
7. Describe self-driving cars, smart homes and appliances, and smart cities

OPENING CASE INRIX SOLVES TRANSPORTATION PROBLEMS

The Problem

The traffic congestion problem is on the rise in many large metropolitan areas. Drivers may spend hours on the roads each day. Air pollution is increasing and more accidents are occurring.

The Solution

INRIX (inrix.com) enables drivers to get real-time traffic information. Drivers can download INRIX-XD Traffic App for iOS and Android. This information is generated by *predictive analysis* of massive data obtained from consumers and the environment (e.g., road construction, accidents). Information sources include:

- Real-time traffic flow and accident information collected in real time by driver services (e.g., helicopters, drones)
- Flow of traffic statuses collected by participating delivery companies and by over 100 million anonymous volunteer drivers that have GPS-enabled smartphones, all reporting in real time
- Public reports about road conditions, current weather, and forecasts
- Traffic congestion reports (e.g., due to road maintenance)

INRIX processes the collected information with proprietary analytical tools and formulas. The processed information is used to generate traffic predictions. For example, it creates a picture of anticipated traffic flows and delays for the next 15–20 min, the next few hours, and the next few days, for many locations. These predictions enable drivers to plan their optimal routes. As of 2016, INRIX offers global coverage in 41 countries and in many major cities, and the company analyzes traffic information from over 100 sources. This service is combined with digital maps. In Seattle, for example, traffic information is disseminated via smartphones and color codes on billboards along the freeways. Smartphones also display estimated times for the roads to be either clear or become jammed. By 2016, the company covered about 5,000,000 miles of highways worldwide, delivering upon request the best recommended routes to use, all in real time.

The INRIX system provides information (or recommendations) for decisions such as:

- Optional routes for delivery vehicles and other travelers
- The best time to go to work or to other places
- How to reroute a trip to avoid encountering a traffic jam that just occurred
- Fees to be paid on highways, which are based on traffic conditions and time of the day

The technologies used to collect data are:

- Closed-circuit TV cameras and radar monitoring traffic conditions
- Public safety reports and traffic information
- Information about freeway access and departure flows
- Toll collection queues
- Magnetic sensing detectors embedded under the road surface (expensive)
- 276 million vehicles, smartphones, and other data collection devices collect data for INRIX

Several of the sources of information are connected to the company via the *Internet of things* (section “[The Internet of Things \(IoT\) and E-Commerce](#)”). According to their website, INRIX has partnered with Clear Channel Radio to broadcast real-time traffic data directly to vehicles via in-car or portable navigation systems, broadcast media, and wireless and Internet-based services. Clear Channel’s Total Traffic Network is available in more than 125 metropolitan areas in 4 countries (inrix.com/why-inrix/customers-partners).

The Results

In addition to use by individual drivers, the information is used by companies and city planners for planning purposes. In addition, less traffic congestion has been recorded in participating cities, which results in less pollution and road accidents, and in increased productivity of happier employees, who spend less time commuting.

The INRIX Traffic App (available for download at inrix.com/mobile-apps) is suitable for all smartphones, and it supports ten languages, including English, French, Spanish, and Hungarian. For the INRIX traffic free features, see inrixtraffic.com/features. For interesting case studies, see inrix.com/global-resources/case-studies.

Sources: Based on inrix.com, Gitlin (2016), inrix.com/mobile-apps, and inrix.com/why-inrix/customers-partners (all accessed December 2016).

LESSONS LEARNED FROM THE CASE

The INRIX case illustrates to us how the collection and analysis of a very large amount of information (*big data*) can improve cars' mobility in large cities. Specifically, by collecting information from drivers and other sources, instead of collecting it from just expensive sensors, the company was able to optimize mobility. Furthermore, the company is using applications of the *Internet of things* (IoT) to connect vehicles and devices with its computing system. This application is one of the building blocks of *smart cities*. Analysis is done by using powerful algorithms, some of which are applications of artificial intelligence (AI).

7.1 INTRODUCTION TO INTELLIGENT E-COMMERCE

We would all like to see e-commerce simpler, easier to use, intuitive, and less threatening. In addition, indeed, efforts have been made over time to simplify and automate many tasks of e-commerce. Just think of the day that your refrigerator will be able to measure and evaluate its contents and place orders for goods that need replenishment. Such a day is not too far in the future and the task will be supported by the IoT. This is an example of what we call “smart” or “intelligent” e-commerce—the subject of this chapter.

CIO Insight projected that by 2035, intelligent computer technologies will have \$5–\$8.3 trillion in economic value (cioinsight.com/print/ot-strategy/tech-trends/slideshow/ten-technologies-that-will-disrupt-business-07). Among the technologies listed as intelligent ones are the Internet of things, advanced robotics, and self-driven vehicles. All are described in this chapter. Gartner, a leading technology consultant, lists the following in their 2016 Hype Cycle for Emerging Technologies: expert advisors, natural language questions and answering, commercial drones, smart workspaces, IoT platforms, smart data discovery, context brokering, general-purpose machine intelligence, and personal analytics. All these are described or cited in this chapter (see Greengard 2016a, b).

An Overview of Intelligent E-Commerce

There is an increasing trend to make e-commerce “smarter” (as seen in Chap. 2). For example, Web 3.0 supposes to enable systems to exhibit more intelligence. Several applications are already based on *artificial intelligence* (AI). This means that we can see more automation in various e-commerce activities. For example, the area of machine translation of languages is already helping people buy online products that are advertised in languages they do not speak. Similarly, machine translation can help people that know only their own language to converse, in real time, with people speaking other languages.

Other smart or intelligent applications include those that can help with machines answering customers' questions asked in natural languages. Another area is that of *knowledge-based systems* (also known as *expert systems*). These systems can provide advice, assist people to make decisions, and even make decisions on their own. For example, such systems can approve or reject buyers' requests to purchase online (if they are not preapproved or do not have a line of credit). Other examples include the automatic generating of online purchasing orders and arranging fulfillment of orders placed online. Both Google and Facebook are experimenting with projects that attempt to teach machines how to learn (*machine learning*) and make decisions. Other companies are doing the same (e.g., Toyota; see Markoff 2015). For more smart applications in the enterprise, see Dodge (2016).

Smart EC systems are also important for *innovation*, and they are related to the areas of analytics and big data processing. One of the most advanced projects in this area is IBM's Watson Analytics (e.g., see Taft 2014, Niccolai 2015, and section “[Intelligent Personal Assistants and Robot Advisers](#)”).

Smart EC can be recognized by its smart applications. The major applications are supported by foundations; smart technology is mostly related to artificial intelligence. Both the foundations and the applications are illustrated in Fig. 7.1.

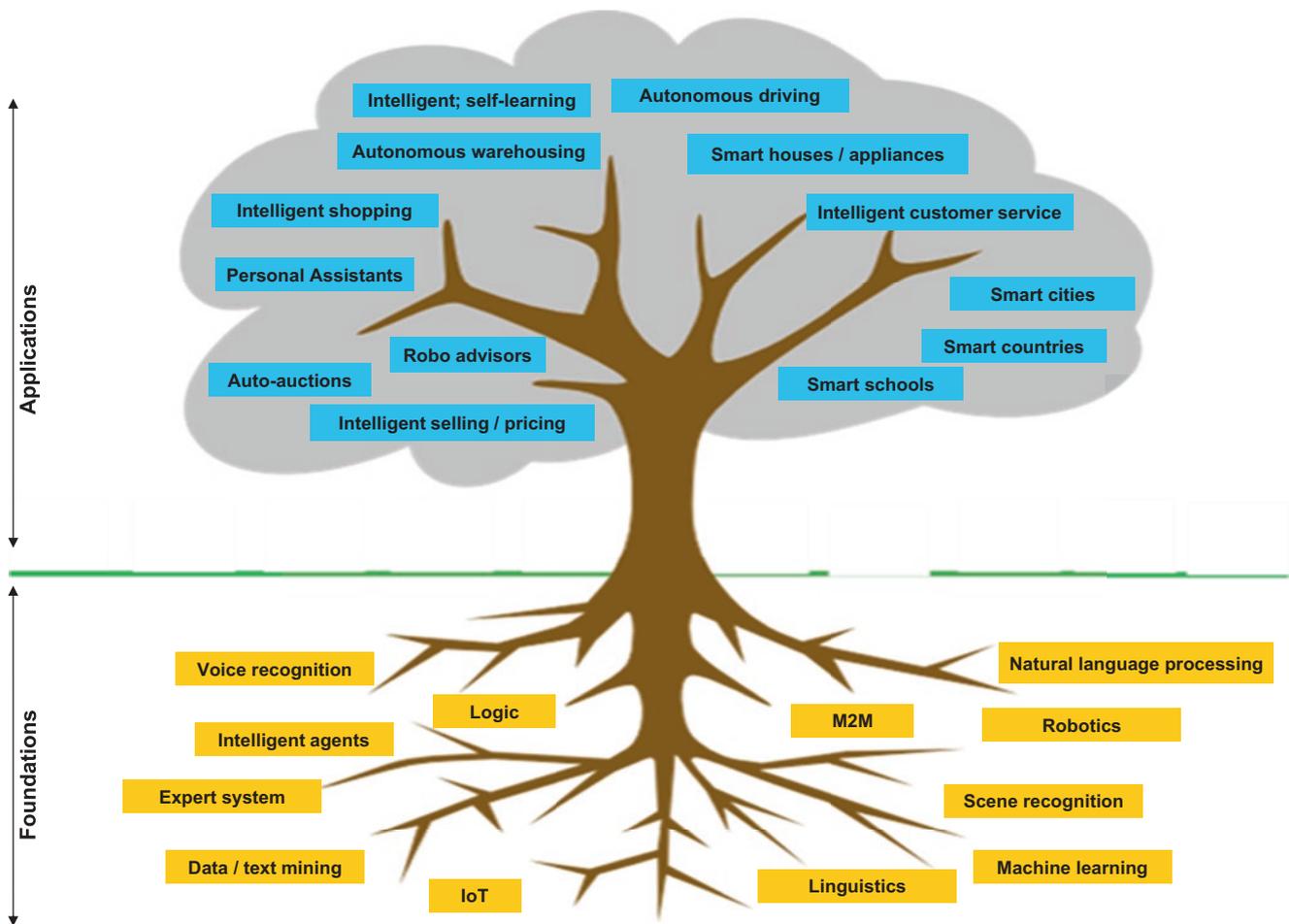


Fig. 7.1 The functionalities and applications of artificial intelligence

In January 2016, Mark Zuckerberg, the CEO of Facebook, announced that his goal in 2016 is to build an AI-based assistant to help with his personal and business activities and decisions. Zuckerberg is teaching a machine to understand his voice and follow his basic commands as well as to recognize faces of his friends and business partners (see Bell 2016 and Ulanoff 2016).

Example: Pitney Bowes Is Getting Smarter with AI

Pitney Bowes Inc. is a US-based global e-commerce solution provider in areas such as shipping products, location intelligence, customer engagement, and customer information management. The company powers billions of physical and digital transactions annually, across the connected and borderless world of commerce.

Today, shipping prices are calculated automatically based on the dimensions, weight, and packaging of each product. The fees' calculations create data that are fed into algorithms. The more data that are collected, the more accurate are the calculations. The company estimates a 25% improvement in an accuracy yield from their algorithms. This gives the company an accurate base for pricing, better customer satisfaction, and improved competitive advantage.

The above example shows an application of artificial intelligence (AI), which is the major driving force in intelligent e-commerce systems. And indeed, AI adoption is on the rise (Khani 2016).

SECTION 7.1 REVIEW QUESTIONS

1. Why do we need intelligent EC?
2. List some of technologies that provide intelligence to EC.
3. List some benefits of smart EC.

7.2 THE ESSENTIALS OF ARTIFICIAL INTELLIGENCE

The major building technology in intelligent e-commerce is artificial intelligence (AI). For an overview, see Russell (2015).

Artificial Intelligence (AI): Definitions and Characteristics

Artificial intelligence (AI) has several definitions; however, many experts agree that AI is concerned with two basic ideas: (1) the study of human thought processes (to understand what intelligence is) and (2) the representation and duplication of those thought processes in machines (e.g., computers, robots).

One well-publicized definition of AI is “behavior by a machine that, if performed by a human being, would be called intelligent.”

A well-known application of artificial intelligence is the chess program hosted at a supercomputer. (Deep Blue was developed by a research team at IBM.) The system beat the famous world champion, Grand Master Garry Kasparov.

The Capabilities of Intelligence

To understand what artificial intelligence is, it is useful to examine those abilities that are considered signs of intelligence:

- Learning or understanding from experience
- Making sense out of ambiguous, incomplete, or even contradictory messages and information
- Responding quickly and successfully to a new situation (i.e., the most correct responses)
- Understanding and inferring in a rational way, solving problems, and directing conduct effectively
- Applying knowledge to manipulate the environment and situations
- Recognizing and judging the relative importance of different elements in a situation

Artificial intelligence attempts to provide these capabilities, but in general, it still does not match human intelligence.

How Intelligent Is AI?

AI machines demonstrated superiority over human in playing games such as chess (beating the world champion), Jeopardy (beating the best players), and Go (a complex Chinese game), whose top players were beaten by a computer. A well-known program is Google’s DeepMind (see Hughes 2016). Despite these remarkable demonstrations (that cost extremely large amounts of money), many AI applications are still showing significantly less intelligence than humans. To define what we consider intelligent machines, let us look at the Turing test.

Turing Test

Alan Turing designed an interesting test to determine whether a computer exhibits intelligent behavior; the test is called the **Turing test**. According to this test, a computer can be considered smart only when a human interviewer posing the same questions to both an unseen human being and an unseen computer (see Fig. 7.2) cannot determine which is which.

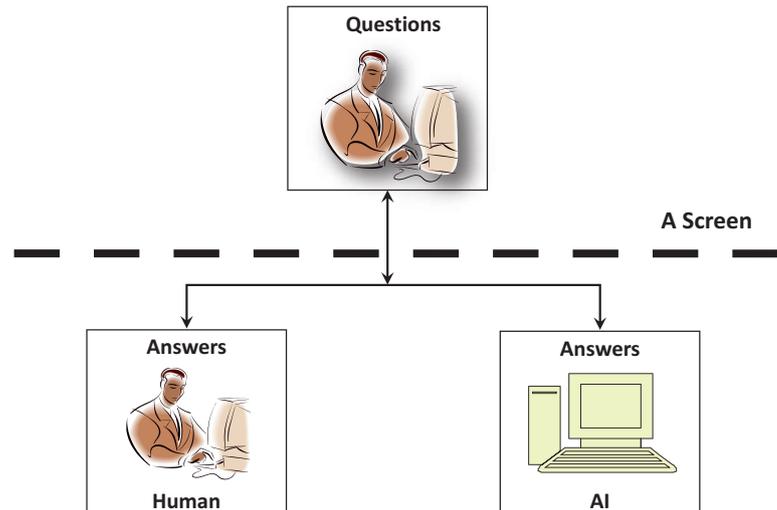
The Content of the AI Field

The AI field is very broad since we can find AI technologies and applications in hundreds of disciplines ranging from medicine to sports. Here we present only some major AI derivatives, which are used in e-commerce.

Intelligent Agents

An **intelligent agent (IA)** is an autonomous, relatively small, computer program that observes and acts upon a changing environment and directs its activities toward achieving specific goals, related to the above changes, by running specific tasks, autonomously. Intelligent agents may have the ability to learn by using and expanding the knowledge embedded in them. Intelligent agents are powerful tools for overcoming the most critical burden of the Internet— *information overload*—and making e-commerce a more viable organizational tool. Interest in using intelligent agents for e-commerce started in the

Fig. 7.2 A pictorial representation of the Turing test



academic world soon after the birth of EC, in the mid-1990s. However, it is only since 2014, when the capabilities of IA increased remarkably, that we started to see many applications, which will be presented in section “[Recent AI Applications in E-Commerce](#)”.

Initially, intelligent agents were used mainly to support routine activities such as searching for products, getting recommendations, determining products’ pricing, planning marketing, conducting negotiations, improving computer security, managing auctions, facilitating payments, and improving inventory management. However, these applications were very simple, using a lower level of intelligence. Their major benefit was increasing speed, reducing cost, reducing errors, and improving customer service. Today’s applications, as we will see throughout this chapter, are more sophisticated.

For more on EC/IA, see ai.ijs.si/sandi/docs/ECIAgents.pdf.

Example: Virus Detection Program

A simple example of an intelligent software agent is a virus detection program. It resides in your computer, scans all incoming data, and removes found viruses automatically while learning new virus types and detection methods.

Intelligent agents are also applied in personal digital assistants, e-mail servers, news filtering and distribution, appointment handling, and automated information gathering.

Machine Learning

AI systems do not have the same learning capabilities that humans have; rather, they have simplistic (but improving) learning capabilities (modeled after human learning methods) called **machine learning**. The machine learning scientists try to teach computers to identify patterns and make connections by showing it a large volume of examples and related data. Machine learning allows computer systems to monitor and sense their environmental activities and adjust their behavior to match changes in the environment. Technically speaking, machine learning is a scientific discipline that is concerned with the design and development of algorithms that allow computers to learn, based on data coming from sensors, databases, or other sources.

Machine learning algorithms are used today by many companies. Well-known examples are product recommendation services. For an executive guide to machine learning, see Pyle and San Jose (2015).

According to Taylor (2016), the “increased computing power, coupled with other improvements including better algorithms and deep neural networks for image processing and ultra-fast in-memory databases like SAP HANA are the reason why Machine Learning is one of the hottest areas of development in enterprise software today.” Machine learning applications also expand due to availability of big data sources, especially those provided by the Internet of things (section “[The Internet of Things \(IoT\) and E-Commerce](#)”).

Robotics Systems

Sensory systems, such as scene recognition systems, and signal-processing systems, when combined with AI, define a broad category of complex systems generally called *robots*. There are several definitions of robots and they are changing over time. A classical definition is that a **robot** is an electromechanical device that can be programmed to perform manual and/or mental tasks.

The Robotics Institute of America formally defines a *robot* as “a programmable multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.” This definition ignores the many mental tasks done by today’s robots.

An “intelligent” robot or a *bot* has some kind of sensory apparatus, such as a camera, that collects information about the robot’s surroundings and its operations. The collected data are interpreted by the “brain” of the robot, allowing it to respond to the changes in the environment.

Robots can be fully autonomous, programmed to do tasks completely on their own, or they can be remotely controlled by a human. Some robots resemble humans and are known as *androids*. Most industrial robots are not. The autonomous robots are equipped with an AI intelligent agent. The more advanced smart robots are not only autonomous, but they can learn from their environment, building on their capabilities. Robots today can learn complex tasks by watching what humans do. This leads to better human–robot collaboration. The Interactive Group at MIT experiments with this capability, aiming to teach robots to make complex decisions. For details, see Shah (2016). For an overview of the robots revolution, see Waxer (2016).

Robots are used extensively in EC warehouses (e.g., tens of thousands are used by Amazon.com; see Chap. 13). They also are used in make-to-order manufacturing (Chap. 13) and lately in self-driven machines and in drones. A new generation of robots is designed to work as advisors as described in section “[Intelligent Personal Assistants and Robot Advisers](#).” Notably, they are planned for use in areas such as investments, travel, medicine, and academic advising. They can serve as recipients and be used as teachers and trainers.

Robots can help in online shopping by collecting shopping information (search) and conduct price and capability comparisons. These are known as **shopbots** (e.g., see igi-global.com/dictionary/shopbot/26826). Robots can carry goods in open-air markets. Walmart is experimenting now with robotic shopping carts (Knight 2016). For a video (4:41 min.), see businessinsider.com/personal-robots-for-shopping-and-e-commerce-2016-9?IR=T.

A special category of robots is the *chatbot*, which are described later in this section. Intelligent personal advisors, including *robo advisors* for investments, are described in section “[Intelligent Personal Assistants and Robot Advisers](#)”.

Robots are Taking Our Jobs

There are major concerns about robots taking not only industrial jobs but also many white-collar jobs. Oxford University in the United Kingdom looked at 700 jobs and ranked them from 0 (no risk of automation) to 1 (very high risk of automation). Rickard-Straus provided the list of the top 100 most-at-risk jobs (all above .95) and the least-at-risk 100 jobs (with .02 or less). The top 10 “safe” and 10 at risk are listed in Table 7.1.

Table 7.1 Top ten Safe and at-risk occupations

Probability	Title
	<i>Low-risk jobs</i>
0.0036	First-line supervisor of fire fighting and prevention workers
0.0036	Oral and maxillofacial surgeons
0.0035	Healthcare social workers
0.0035	Orthotists and prosthetists
0.0033	Audiologists
0.0031	Mental health and substance abuse social workers
0.0030	Emergency management directors
0.0030	First-line supervisors of mechanics, installers, and repairers
0.0028	Recreational therapists
	<i>High-risk jobs</i>
0.99	Telemarketers
0.99	Title examiners, abstractors, and searchers
0.99	Sewers, hand
0.99	Mathematical technicians
0.99	Insurance underwriters
0.99	Watch repairer
0.99	Cargo and freight agents
0.99	Tax preparers
0.99	Photographic process workers and processing machine operators
0.99	New account clerks

Based on Rickard-Straus (2014)

Chui et al. (2016) provide an analysis on where machines could replace humans—and where they cannot (yet). The major reason for the concern is that many jobs are in danger; the advantages of robots are growing rapidly—together with their capabilities, and the large number of occupations with high level of risk. (See discussion by Reich 2015.)

Natural Language Processing

Natural language processing (NLP) technology gives computer users the ability to communicate with a computer in their native language. This technology allows for a conversational type of interface, in contrast to using a programming language that consists of computer jargon, syntax, and commands. It includes two subfields:

- *Natural language understanding* that investigates methods of enabling computers to comprehend instructions or queries provided in ordinary English or other languages
- *Natural language generation* that strives to have computers produce ordinary spoken language so that people can understand the computers more easily

NLP is related to voice-generated data, as well as text and other data.

Speech (Voice) Understanding

A **speech (voice) understanding** is the recognition and understanding of spoken languages by a computer. Applications of this technology have become more and more popular. For instance, many companies have adopted this technology in their call centers. For an interesting application, see cs.cmu.edu/~.listen.

Related to NLP is machine translation of languages, which is done both of written text (e.g., Web content) and of voice conversation (e.g., by Skype).

Language Translation

Machine translation uses computer programs to translate words and sentences from one language to another. For example, you can use Babel Fish translation, available at babelfish.com, to try more than 25 different combinations of language translation. Similarly, you can also use Google's free Translate to translate dozens of different languages (translate.google.com). Finally, users can post their status in Facebook in any language. Then translation can be made (per Keating 2016).

Another AI technology related to NLP and robots is *chatbots*.

Chatbots

Short for *chat robot*, a **chatbot** is a computerized service that enables conversations between human and computers, usually over the Internet. The conversations are frequently done by short questions and answers. More intelligent chatbots are equipped with natural language processors, so the computer can *understand unstructured* dialog. Some companies experiment with learning chatbots, which gain more knowledge with experience. The ability of the computer to converse with a human is provided by a knowledge system (usually rule-based; see section “**Knowledge (Expert) Systems**”). The computer side can look like a person or an avatar. The service is also available at messaging services such as Facebook's Messenger and on Twitter.

Chatbots in E-Commerce

The most common use of chatbots (bots in short) in EC is in customer service. For example, Taco Bell is experimenting with a food ordering chatbot on Slack (a messaging service). Schlicht (2016) provides a beginner's guide to chatbots. He presents the following hypothetical example about today's shopping at Nordstrom (a department store) vs. the use of chatbots.

Example: Nordstrom Uses Chatbots

“If you wanted to buy shoes from Nordstrom online, you would go to their website, look around until you find the shoes you wanted, and then you would purchase them. If Nordstrom makes a bot, which I am sure they will, you would simply be able to message Nordstrom on Facebook. It would ask you what you are looking for and you would simply tell it.

Instead of browsing a website, you will have a conversation with the Nordstrom bot, mirroring the type of experience you would get when you go into the retail store.”

A 5-min Facebook video is available at cnbc.com/2016/04/13/why-facebook-is-going-all-in-on-chatbots.html. It shows a Q&A. A session with David Marcus on why Facebook is going all in for chatbots.

O'Brien (2016b) provides a discussion of what chatbots can do for e-commerce. This presentation includes Amazon's Alexa, which is presented in section "[Intelligent Personal Assistants and Robot Advisers](#)". Mah (2016) discusses the increasing role of chatbots in marketing.

Chatbots are also used in advertising and marketing. Quoc (2016) provides 11 examples of conversational bots in 2016. These include Allo from Google, Slack, Operator Amazon's Echo, Snapchat Discover, Apple TV and Siri Magic, Telegram, Kik, and WeChat. WeChat provides a popular Chinese bot that enables you to:

- Hail a taxi
- Order food delivery
- Buy movie tickets
- Customize and order a pair of Nikes
- Send an order to the nearest Starbucks
- Track your daily fitness progress
- Shop Burberry's latest collection
- Book doctor's appointments
- Pay your water bill
- Host a business conference call
- And much more

For a list of bots, see botlist.co/bots

Example 1: LinkedIn

LinkedIn is introducing chatbots, which will conduct tasks such as comparing the calendars of people participating in meetings, and suggesting times and meeting places. For details, see CBS News (2016).

Example 2: Mastercard

Mastercard is launching two AI-backed messaging platforms: Mastercard bot for banks and Mastercard bot for merchants.

Knowledge Systems

These systems, which are presented in section "[Knowledge \(Expert\) Systems](#)", are computer programs that store knowledge, which the applications use to generate expert advice and/or solve problems. It also helps people verify communications and can make certain types of routine decisions.

SECTION 7.2 REVIEW QUESTIONS

1. Define artificial intelligence.
2. List some capabilities of AI.
3. What is the Turing test?
4. Define intelligent agents and list some of their capabilities.
5. Prepare a list of applications of intelligent agents (IA) in EC.
6. What is machine learning? How can it be used in EC?
7. Define robotics and explain its importance for EC.
8. Describe robotic systems.
9. What is natural language processing (NLP)? What are its two major formats?
10. Describe machine translation of languages. Why is it important in EC?
11. Describe chatbots and list some of their applications in EC.
12. What are knowledge systems?

7.3 RECENT AI APPLICATIONS IN E-COMMERCE

Since 2014, we have witnessed increasing numbers of AI applications in various EC activities. This increase is due to several reasons such as technological innovations, the widespread use of smartphones, the increased competition between retailers and e-tailers, and several success stories that show that AI-supported EC can provide strategic advantages. In this section, we provide several illustrative examples, after a general discussion about the potential benefits of AI in EC.

The AI Contribution to E-Commerce

As described earlier, AI enhanced EC since its inception. However, it is only now that we see a wave of powerful applications. Here is what the major technology companies do with AI:

- **Apple.** According to Fingas (2016), AI and augmented reality are core technologies in Apple's future. Apple is continuously improving Siri (its personal assistant robot; see section "[The Internet of Things \(IoT\) and E-Commerce](#)"). Apple has several other AI initiatives, including making the iPhone "smarter" (see Statt 2016).
- **Google.** Google is involved in several AI initiatives. One major effort is *Google Brain*, a secretive project that includes *machine learning*. We already mentioned the company's DeepMind in section "[Introduction to Intelligent E-Commerce](#)". Google believes that AI will be able to solve the world's biggest problems. O'Brien (2016a), a scientist at Google Brain, stresses that it "will take some smart humans to get it there."
- **Facebook.** Facebook's CEO is a great believer in AI. He is developing a personal assistant robot for his own use (section "[The Internet of Things \(IoT\) and E-Commerce](#)"). Facebook is working on several other projects related to advertising and customer service. Facebook says that its new AI can understand text with near-human accuracy.
- **IBM.** IBM pioneered the concept of *smart commerce* in 2013/2014 (e.g., see Taft 2014). At that time, they concentrated on big data and analytics. A major part was the use of *data mining technologies* (an AI product) for discovering hidden correlations. This enables a better *predictive analysis*, which is used in EC strategy and decision-making. Deep Blue was the powerful computer that defeated the world's chess champion in the 1990s. IBM is also known for its Watson, the supercomputer that won the Jeopardy game, and for its contribution to medical research. Watson is also used to psycho-analyze people from their tweets to help marketers.
- **Amazon.com.** This company pioneered the use of AI in the 1990s. The most well known are their book recommendation engines. Today, the company is experimenting or using AI in many activities of its e-tailing. Well known is the use of smart robots in the warehouse. The company is also using predictive analysis and machine learning to assess demand for its products. AI is also used for inventory management.

Many other companies are installing, or at least experimenting with, AI applications related to EC. For example, ViSense of Singapore is a start-up that brings the benefits of AI to e-commerce users (mostly in Asia; see Russel 2016). In summary, it looks like AI is changing the "face" of e-commerce (e.g., Choudhury 2016).

Tverdohleb (2016) describes how AI is helping the world of e-commerce using a special platform called Deep Agent. AI is especially appealing to Internet start-ups and those interested in "deep learning." Several illustrative examples are presented next.

AI in E-Commerce: Some Illustrative Examples

Here are examples of recent applications:

Marketing and Advertising

AI is being used in many marketing and advertising online tasks such as:

- Predictive analytics and AI are used to customize and automate e-mail marketing campaigns (Insightly Blog 2015).
- ClickZ Intelligence (2013) lists the following areas: new customer experience, new product launching, programmatic advertising, content creation, and designing websites.

- Rossi (2016) describes three ways AI helps customers: improve search, help buyers to understand their preferences, and serve as a personal assistant to shoppers.
- Blog (2016) provides a list of 13 companies that use AI in marketing, advertising, and sales.
- 15 examples of AI in marketing are provided by Davis (2016), starting with product recommendation.
- Salesforce’s AI Einstein Service facilitates sales transactions (see Womack 2016).
- Kohl (2016) describes the use of AI to boost customer engagement. This is especially important, since shopping is evolving to transactions, which will take place without human interaction (e.g., see IoT and section “[Selective Demonstrations of IoT in Action](#)”).
- IBM’s Watson is learning about people from their tweets. This will help companies predict consumer behavior, deciding what to offer and when (see details by Russell 2014).
- In general, AI is believed to have a big role in retailing’s future (Arthur 2016).
- Chatbots are used extensively in marketing (Mah 2016).
- For using AI in e-auctions, watch the video at [youtube.com/watch?v=O65XJd7j2BE](https://www.youtube.com/watch?v=O65XJd7j2BE).
- For a comprehensive discussion, see Sutton (2016).

Customer Service and Advice

Related to marketing is customer service. Chatbots (section “[The Essentials of Artificial Intelligence](#)”) are used extensively to answer customers’ questions (Friedman 2016).

Example: Chatbots Advising in Healthcare

As will be seen in section “[Intelligent Personal Assistants and Robot Advisers](#)”, chatbots are used as the user–computer interface in personal assistants. One company that promotes chatbots in healthcare is Baidu of China. Baidu’s *Melody* is an intelligent chatbot that can help patients to determine whether or not they should go to see a doctor. The dialog is currently text-based and the mode is questions and answers. The system is integrated with Baidu’s *Doctor*, which lets patients ask doctors questions, make appointments, and search for health- and medical-related information. *Melody* gains her wisdom by pulling data from digitized material, including research papers and online forums. For details, see Larson (2016).

- Google’s computers are using chatbots for its Google Cloud Platform to answer a customer’s queries. This improves the efficiency of IBM’s data centers (see Clark 2016b for details).
- Using AI (machine learning) and cloud computing enables smarter CRM, as demonstrated by Salesforce’s Einstein (see Nicolaus 2016).

AI in B2B

AI applications in B2B are mostly in e-procurement (Clinton 2016), supply chain management (Chandra and Darbhe 2016), and Smart Robotics (see [McMahon](#), undated).

Other Applications

Many other applications emerge:

- Applications in social networks (Smith 2014).
- Applications in travel (e.g., trip planning, Brady 2016). Examine utip.com and eurovacations.com.
- Robot advisers (see section “[Intelligent Personal Assistants and Robot Advisers](#)”).
- AI in e-learning is in its initial development. For the future of AI in e-learning, see Smith (2016). However, some wonder if the industry is ready for this (e.g., see Taylor 2016).

Conclusion

There is increasing evidence that AI is transforming many businesses (see Pickup 2016 on how this is done). A major area in this transformation will be automation of many EC tasks and the replacement of humans with AI (is it a good or a bad thing?). See River Logic (2016).

SECTION 7.3 REVIEW QUESTIONS

1. What are the reasons for using AI in EC?
2. What are the major technology companies doing in this area?
3. How can AI assist in marketing?
4. How can AI assist in advertising?
5. What contributions can AI provide to customer service and CRM?
6. How can AI facilitate B2B?

7.4 KNOWLEDGE (EXPERT) SYSTEMS

A major derivative of AI is the knowledge system. Such a system has several e-commerce related applications. The major trust of such a system is the creation and use of knowledge.

The terms *knowledge systems and management* are frequently mentioned in discussions about smart EC. Why is this? To answer this question, you first need to understand what knowledge management is.

An Overview of Knowledge Management

Knowledge is one of the most important assets in any organization, and thus it is important to capture, store, secure, and reuse (share) it, and these are the major purposes of knowledge management. Thus, **knowledge management (KM)** refers to the process of capturing or creating knowledge, storing and protecting it, updating it constantly, disseminating it, and using it whenever necessary (see en.wikipedia.org/wiki/Knowledge_management and Milton and Lambe 2016).

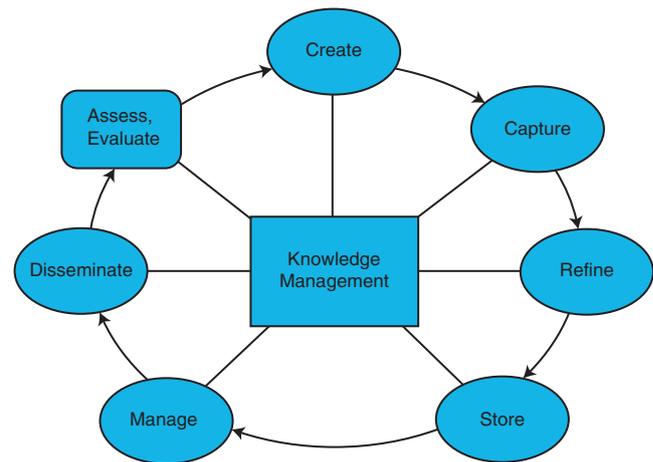
Knowledge in organizations is collected from both external and internal sources. It can also be created by AI systems. It is then examined, interpreted, refined, and stored in what is called an *organizational knowledge base*, the repository for the enterprise's knowledge, or it can immediately be used in different applications. A major purpose of an organizational knowledge base is to allow for *knowledge sharing*.

Knowledge Management Types and Activities

Organizational knowledge is embedded in the following key resources: (1) human capital, which includes employee knowledge, competencies, intelligence, and creativity; (2) organizational capital, which includes stored organizational experiences (e.g., best practices, patents, manuals, teaching materials); (3) knowledge generated by AI systems; (4) customer and partner knowledge, which includes the experience of working with customers and business partners.

This organizational knowledge must be managed properly and leveraged through sharing and dissemination. This is the major purpose of KM, which has the following major tasks:

- **Create knowledge.** Knowledge is created as people gain more experience (e.g., trial and error) and education. Sometimes, external knowledge is brought in (e.g., provided by vendors and consultants).
- **Capture knowledge.** Existing knowledge must be identified and assembled. Remember that a considerable amount of knowledge is not documented, and it just dwells in people's memory.
- **Refine knowledge.** New knowledge must be placed in context so that it is actionable. This is why human insights (tacit qualities) must be captured along with explicit facts.
- **Store knowledge.** Useful knowledge must be stored into an easily retrievable format in a secured knowledge repository.
- **Update knowledge.** The knowledge must be kept current. It must be reviewed to verify that it is relevant and accurate; if not, it must be updated.
- **Disseminate knowledge.** Knowledge must be made available in a useful format to anyone in the organization who needs it and who is authorized to access it.

Fig. 7.3 Knowledge management cycle

These tasks can be viewed as a cyclical process, as shown in Fig. 7.3. The objective of e-commerce is to automate KM activities as well as help in using the stored knowledge.

For a comprehensive list of KM activities and tools, see en.wikipedia.org/wiki/Knowledge_management and kmworld.com.

Knowledge Sharing

Knowledge is of limited value if not updated and shared. The ability to share and then distribute knowledge decreases its cost per user and increases its effectiveness. Shared knowledge can also decrease risk and uncertainty and facilitate problem solving. Knowledge is a major component in intelligent EC applications. An example of a knowledge-sharing system at Infosys Technologies is provided in Morin (2014).

How Is Knowledge Management Related to E-Commerce?

Organizations need knowledge, which is provided by KM, in order to better perform their tasks.

In the past, KM and EC initiatives were dealt with independently; however, now they are used together for mutual benefits.

Examples

According to Britt (2013), “E-commerce retailers are using knowledge management solutions to pull together purchasing orders, inventory, sales, and other transaction information, as well as to improve customer feedback and to enhance the overall e-commerce experience.” Britt provides the following examples:

- Dog Is Good Inc. (a merchant of “canine-themed apparel”) is using KM to help in the integration of EC subsystems (ordering, inventory, order fulfillment, accounting, and EC stores) using the offerings from NetSuite.
- Ideeli, Inc., an online daily flash retailer, uses KM analytics (ForeSee’s Satisfaction Analytics) to learn about customer experiences from collected feedback.
- Ideeli, Inc. also uses KM analytics (ForeSee’s mobile analytics solution) to identify the needs of frequent visitors (by segments on mobile devices). As a result, the company modified its e-commerce strategies.
- Retina-X Studios provides tracking and monitoring of activities on mobile phones, computing devices, etc. The KM system is used to improve the handling of EC chargebacks due to cancellation. The company turned to Avangate’s e-commerce solution that cut costs and improved customer service.

For more on KM-enabling technologies and how they can be applied to business unit initiatives, see kmworld.com and knowledgestorm.com.

KM and Social Networks

A major venue of knowledge creation is in online communities, including social networks. This is done by *crowdsourcing* and customer and employee discussions and feedbacks. This area has several variations. One variety is limited within a single company. Knowledge can also be created by *user-generated content* (see Chap. 8) and in the “answer” function of some social networks.

Web 2.0 applications help aggregate corporate knowledge, facilitate communication and collaboration, and simplify the building of repositories of best practices, as demonstrated by the following example.

Example: IBM Jam Events

Since 2001, IBM has been using communities for online brainstorming sessions, idea generation, and problem solving. These sessions are called “Jam Events.” According to their Web page, “IBM’s Jams and other Web 2.0 collaborative mediums are opening up tremendous possibilities for collaborative innovation...” (collaborationjam.com). Each Jam has a different topic. For example, a large IBM online brainstorming session held, called the *Innovation Jam*, brought a community of over 150,000 employees from 104 countries and 67 companies to launch new IBM businesses (see collaborationjam.com).

Virtual meetings where IBM employees can participate in Innovation Jam launches were conducted in Second Life (SL). IBM’s former CEO even created an avatar to represent himself. Besides business, recent topics that have been explored by IBM Jams include social issues. See collaborationjam.com/IBMJam. Other topics that have been explored are new technologies for water filtration, 3-D Internet, and branchless banking. For the history of IBM Jams, see collaborationjam.com/IBMJam.

Knowledge management is a major activity needed to create expert systems.

Expert Systems

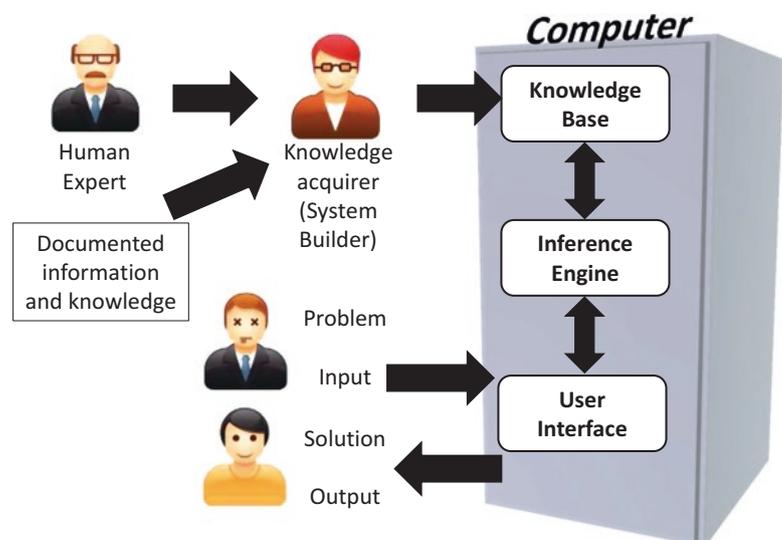
An **expert system**, also referred to as **knowledge-based system**, is a computer system that uses knowledge to solve problems that require expertise and provide advice to nonexperts, usually in specific domains. Thus, it emulates the decision-making of human experts. It is considered a derivative of artificial intelligence. Knowledge required for this capability is stored in a *knowledge base* and organized there such that it can be disseminated to nonexpert users upon request. Expert systems (ES) are used extensively in many AI applications in EC (e.g., in product recommenders and in advisory systems).

The Major Components of an Expert System

The major components are illustrated in Fig. 7.4. They include:

- *Users*—who need the expertise
- *Human experts*—who provide the specific knowledge to the system

Fig. 7.4 The components and processes of expert systems



- *System builders*—who acquire the knowledge from expert(s) and documented sources
- *Knowledge base*—the repository where the acquired knowledge is organized, frequently as if then rules and stored
- *Inference engine*—the program that matches the users' requests with computerized answers (that are derived from the rules)
- *User interface*—the interface that enables the user–machine communication. Users can select from several input–output communication modes (written, voice, images)
- *Explanation mechanism*—provides the logic of the system output

For details, see en.wikibooks.org/wiki/Expert_Systems/Components_of_Expert_Systems.

The Process and Capabilities of Expert Systems

Knowledge of specific domain, or expertise, resides with human experts and/or in documented sources. This knowledge is collected by a knowledge acquirer, who uses it to program the system (or she/he asks a system builder to do it).

The knowledge is stored in a knowledge base where it is organized. This knowledge can be in the “cloud,” namely, it can be shared by many users. When a user interacts with the system, a dialog between the user and the inference engine takes place. The inference engine then selects the appropriate knowledge (e.g., rules) and, at the end of a Q&A dialog, provides a solution or advice. Some systems have an explanation mechanism that shows the reasoning process (e.g., all the rules used).

- Analyzing symptoms
- Identifying problems
- Interpreting user input
- Driving solutions and advices
- Instructing and assisting humans in decision-making
- Displaying and demonstrating processes
- Predicting results
- Justifying conclusions, providing explanations

Expert systems have the following major capabilities:

For details, see Beard (2014) and en.wikipedia.org/wiki/Expert_system.

These capabilities enable many applications. However, remember, the quality of the output is highly dependent on the quality of the knowledge and the input of the symptoms provided by the user.

Knowledge-Based System

Expert systems are often used synonymously with the *knowledge-based system*. However, some distinguish between the two. According to en.wikipedia.org/wiki/knowledge-based_systems, “Expert system refers to the type of task the system is trying to solve, to replace or aid a human expert in a complete task. Knowledge-based system refers to the architecture of the system, that it represents knowledge explicitly rather than as procedural code. While the earliest knowledge-based system were almost all expert systems, the same tools and architectures can and have since been used for a whole host of other types of systems. That is, virtually all expert systems are knowledge-based systems, but many knowledge-based systems are not expert systems.”

There are a large number of applications of knowledge-based and expert systems. For example, the chatbots described earlier usually use expert systems to generate their output. Similarly, the virtual personal assistants described in section “[The Internet of Things \(IoT\) and E-Commerce](#)” are equipped with knowledge-based systems and so is the Allstate case (see Case 7.1). In summary, expert systems and knowledge-based systems provide a quick, consistent, and inexpensive expertise to nonexperts as well as enable sharing knowledge in a fast and economic way.

CASE 7.1

EC APPLICATION

ALLSTATE IS USING KNOWLEDGE SYSTEMS

Allstate Corp. is using a virtual assistant to help call center employees. Allstate insurance business has been growing rapidly, supplemented by *Allstate Business Insurance* that targets small businesses with less than 50 employees.

The Problem

Allstate agents tried to develop expertise in the many types of small businesses they encounter. The agents tried to be qualified as trusted advisors, that is, to make themselves experts in the different industries and be more “customer centric rather than product centric.” The agents needed help to get up to speed in the new role. With 10,000 exclusive agents and 2000 independent ones, this was not a simple task. To deal with the many calls received from customers, the agents needed time to research the answers to questions customers ask, and if they did not know the answers, call the Allstate call center for advice. The result was that customers and the agents wasted time. Instead of dealing only with difficult issues, the agents called the center even for small issues; thus, the center was bogged down by training the agents all the time.

The Solution

The company decided to construct a knowledge-based system that would be able to provide quick answers to the agents, even during the time they are working with customer clients. Allstate acquired such a system from an AI vendor, called Earley Information Science. The system acts as an intelligent virtual assistant that helps to make information accessible and usable. To build the system, the vendor collected information from the call center employees and from the sales and marketing team agents. This helps the AI vendor identify large amounts of “common scenarios” (such as providing proof of insurance for contractors). For each scenario, the AI vendor then developed step-by-step instructions. The total knowledge then was packaged in a knowledge system for the agents to use when needed.

The Results

The knowledge system, known as the *Allstate Business Insurance Expert (ABIE)*, a Web-based, real-time system, is available as to all the company’s agents. When logged in, the agents see an avatar with which they can communicate. According to PRWeb, “ABIE has become the primary communications channel for Allstate to engage with its agents and ensures they always have the most accurate and up-to-date information available. As a result, the company has been able to dramatically reduce its call center call volume while improving the efficiency and performance of its agents.” The impact on the growth of commercial policy sales and on the operational efficiency of the business since the arrival of ABIE has been significant. In addition, the agents are becoming self-sufficient in knowledge and building skills and are more productive. The system was recognized by KMWorld as a “leader in knowledge management.”

Source: Based on McCooley (2016) and prweb.com/printer/13154986.htm

Questions for the Case

1. Explain why this is an intelligent advisory system.
2. How is the knowledge based used?
3. How is time saved by the sales agents?
4. How is time saved by the call center employees?
5. Read the “Allstate case study summary” at earley.com/knowledge/case-studies/allstate's-intelligent-agent-reduces-call-center-traffic-and-provides-help and analyze the impact on Allstate.

In section “[Intelligent Personal Assistants and Robot Advisers](#)”, we will introduce the intelligent personal assistants who use expert systems to generate intelligent answers to queries.

SECTION 7.4 REVIEW QUESTIONS

1. Define knowledge management (KM).
2. Describe the major activities of KM and its cyclical process.
3. Describe the relationships between KM, EC, and social networks.
4. Define expert systems.
5. List and briefly describe the major components of expert systems.
6. Describe the process of operating an expert system.
7. List the major capabilities of expert systems.
8. Distinguish between expert systems and a knowledge-based system.

7.5 INTELLIGENT PERSONAL ASSISTANTS AND ROBOT ADVISERS

In the previous sections, we introduced you to chatbots, machines with which you can conduct limited conversations and which are used mostly for providing information or conducting a simple Q&A dialog with users. Chatbots and similar machines have been improved over time. For example, several hospitals employ robot receptionists to direct patients to their place of treatment. Zora Robotics created a robot named Nao to act as a chatting companion for the sick elderly, offering it as a form of therapy for those suffering from dementia.

The coming generations of the above-cited machines are much more intelligent. Their knowledge bases are more capable and frequently maintained centrally, in the “cloud,” which makes it more economical for a large amount of users. Users can get even complex assistance and advice from them. These assistants are known as **intelligent personal assistants** which help people to improve their work or their lifestyle. In this section, we will provide you with some interesting applications. The first set of applications involves virtual personal assistants, notably Amazon’s Alexa and Apple’s Siri. The second set is about personal robots, who act mostly as advisers on specific topics (e.g., investments).

Amazon’s Alexa

Of the several virtual personal assistants, the one considered the best (in 2016) is Alexa. Alexa was developed to compete with Apple’s Siri, and it turned to be a superior product. (See Fig. 7.5.)

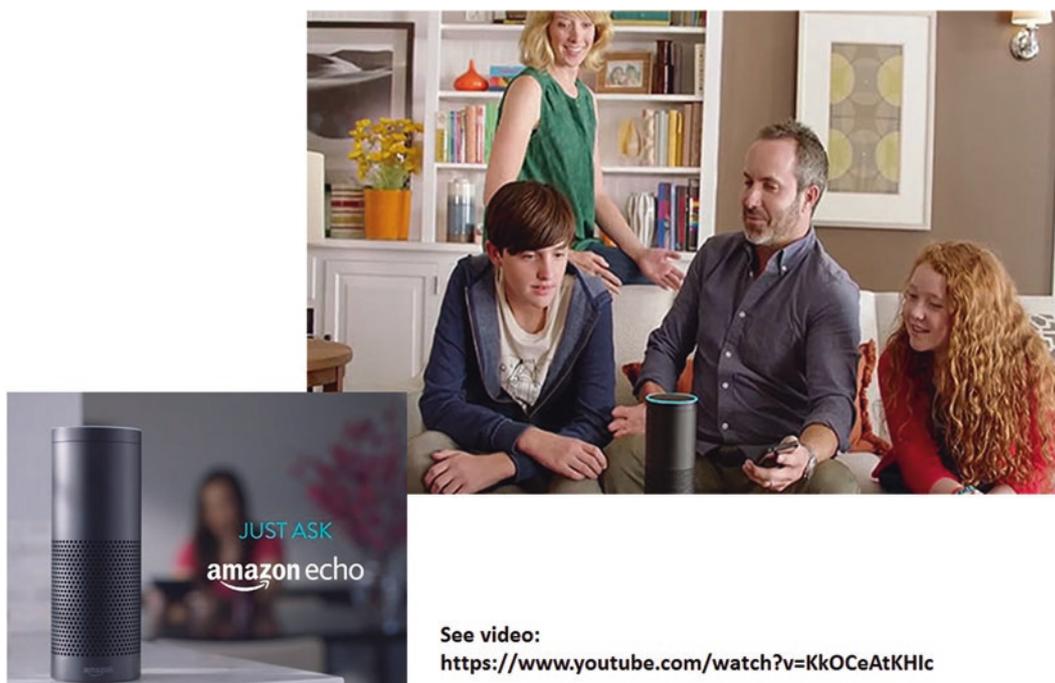


Fig. 7.5 Amazon’s Echo and Alexa

Amazon Alexa is a cloud-based intelligent personal voice assistant product that can do many things such as:

- Answer questions in several domains
- Control your smartphone operations by voice commands
- Provide real-time weather and traffic updates
- Control smart home (Section 7.6) appliances and devices using itself as a home automation hub
- Make to-do lists
- Arrange music Playbox
- Set your alarms
- Play audio books for you
- Control home automation devices
- Analyze shopping lists

To see how Alexa works, watch the 3:55 min video: [youtube.com/watch?v=KkOCeAtKHlc](https://www.youtube.com/watch?v=KkOCeAtKHlc).

Alexa Skills

In addition to the standard (native) capabilities listed above, people can use Alexa apps (referred to as skills) to download customized capabilities to Alexa (via your smartphone). *Skills* are intended to teach Alexa something new.

Examples of Skills Apps

- Call an Uber for you and let you know the cost.
- Order a pizza (e.g., from Domino).
- Provide financial advice from Capital One.
- Start your Hyundai Genesis car from your house (Korosec 2016).

These skills are provided by third-party vendors; they require invocation commands to activate.

For example, you need to tell Alexa: “Alexa, call Uber to pick me up at my office at 4:30 pm.” For more on Amazon’s Alexa, see Crist (2016); for its benefits, see Reisinger (2016).

Alexa is equipped with NLP (section “Recent AI Applications in E-Commerce”) user interface, so all you need to activate it is to provide a voice command. This is done by combining the Alexa software with an intelligent speaker called Echo.

Voice Interface and Speakers in Alexa

Amazon has a family of three types of speakers for Alexa: Echo, Dot, and Tap. Alexa can also be accessed by Fire TV line and by some non-Amazon devices. For the relationship of Alexa and Echo, see Gikas (2016).

Amazon Echo

Amazon Echo is a hands-free intelligent wireless speaker that is controlled by voice. It is the hardware part of Alexa, so the two operate hand in hand. Echo is always on, always listening. When Echo hears your questions, commands, or requests, it will send the audio up to the “cloud.” From there, Amazon’s servers will match a respond to the questions, delivering it to Alexa to tell it to you.

Amazon Echo Dot

Amazon Echo Dot is the “little brother” of Echo. It offers full Alexa functionality, but it only has one very small speaker inside. It can be linked to any existing speaker systems to provide an Echo-like experience.

Amazon Echo Tap

Amazon Echo Tap is another “little brother” of Echo that can be used on the go. It is completely wireless and portable, and it is charged via a charging dock.

Both Dot and Tap are less expensive than Echo, but offer less functionalities and quality. However, if you already have good home speakers, you can use Dot.

For a discussion about the three speakers, see Trusted Reviews at trustedreviews.com/news/amazon-echo-vs-amazon-dot-vs-amazon-tap-difference.

Apple's Siri

Siri (short for Speech Interpretation and Recognition Interface) is an intelligent virtual personal assistant and knowledge navigator. It is a part of Apple's several operating systems. According to en.wikipedia.org/wiki/Siri, Siri can "answer questions, make recommendations and perform action by delegating requests to a set of *Web services*. The software, both in its original version and as an iOS feature, adapts to the user's individual language usage and individual searches (preferences) with continuing use, and returns results that are individualized."

Siri can be integrated into Apple's *Siri Remote*. Using CarPlay, Siri is available in some car models, where it can be controlled by iPhones (5 and higher).

Viv

In 2016 Dag Kittlaus, the creator of Siri, introduced its Viv, "an intelligent Interface for everything." Viv is expected to be the next generation of intelligent virtual interactions (see Matney 2016 for details). In contrast with Siri, the Viv as a platform is open to all developers (third-party ecosystem products). Viv is now a Samsung Company. Samsung plans to launch its own personal assistant with the Galaxy S8.

Other Personal Assistants

Several other companies have virtual personal assistants. For example, Google Home (see Kelly 2016) and Microsoft Cortana are well known. In September 2016, Microsoft combined Cortana and Bing (see Hachman 2016).

Facebook and Its CEO

Mark Zuckerberg, Facebook's CEO, is busy perfecting its own virtual assistant. For details see Ulamoff (2016). Initially, the personal assistant will help Mark to run his home (e.g., follow commands related to music and home appliances operations) and do his work.

IBM Watson

Probably the smartest virtual personal assistant is IBM Watson. It costs billions of dollars. However, its services can be purchased by organizations, paying back some of the expense. The machine can understand and speak eight different languages. It can read close to a billion (1000 million) pages each second. It can learn, understand, reason, and interact. It is built with 50 different AI technologies ranging from NLP to machine vision. It contains a powerful analytical capability. Watson can be accessed via the Web—it is a "cloud" utility. IBM works with several hundred developers in 36 countries to create the necessary knowledge bases for more and more applications. Here are some examples:

- Macy's developed a service to help customers navigate its stores while they shop. Using location-based software, the app knows where you are in the store. Customers can ask questions regarding products and services in the stores. Then, they get a customized response from "Macy's On Call."
- Watson can help physicians to make quicker diagnosis and suggest the best treatment using Medical Advisor. It can analyze images faster and look for things that physicians may miss. Watson already is used extensively in India, where there is a large shortage of doctors.
- Deep Thunder provides accurate weather-forecasting service.
- Hilton Hotels is using Watson-based "Connie robot" in the front desks of their hotels. The service is improving and in experiments did a superb job.
- Clark (2016a) reports that one billion people will use Watson by 2018. This is due in part because IBM Watson is coming to the iPhone (DeNisco 2016).

For more, see Noyes (2016).

Alfie: Sears Voice-Controlled Shopping Assistant

Alfie is a Kenmore-branded device similar to Alexa, but less capable and much cheaper. According to Kenmore [kenmore.com/products/Kenmore-alfie-voice-controlled-intelligent-shopper](https://www.kenmore.com/products/Kenmore-alfie-voice-controlled-intelligent-shopper), all you need to do is to connect to your Wi-Fi, and you will be able to:

- **“Personal Shopping:** Get what you want, product reviews you require, prices you approve and delivery to your liking.
- **Groceries:** Shop item by item, schedule reorders, or build a shopping list. Perishable grocery delivery available in selected areas.
- **Perfect gifts:** Describe the recipient and Alfie does the shopping for you, saving time.
- **Gets Smarter:** Alfie learns your needs and preferences the more you use it.
- **Human Touch:** Alfie is backed by real human intelligence, not just computer processing. Avoid virtual assistant frustrations. Alfie works hard to offer great solutions. Response time can vary depending on the request.
- **Kenmore Alfie App:** Available for free download on App Store and Google Play Store.
- **Use Alfie anywhere in your home:** Alfie uses your home Wi-Fi network and can be placed anywhere with its convenient rechargeable battery with built in magnetic base.”

Find out more at alfietech.com. This site includes helpful manuals, instruction videos, FAQs, and troubleshooting and guides.

Personal Robots

Built on the capabilities of chatbots and personal assistants, we see *personal robots* coming to the world. Some of these robots can also do physical tasks. For example, while chatbots are used to provide information as receptionists and in airports as guides, personal robots can improve the service. For example, see Application Case 7.2.

APPLICATION CASE 7.2

EC APPLICATION

AUTONOMOUS’ PERSONAL ROBOT

You do not need to be jealous of Mark Zuckerberg, the CEO of Facebook, for having his own personal assistant. You can buy one if you can afford to pay \$1499. The expense can be considered as a business expense for tax purposes, if you use your robot to help you at work. Looking at its capabilities, the personal assistant can be of considerable help.

The Personal Robot of Autonomous

It is called a **personal robots**, this assistant (autonomous.ai/personal-robot) is designed to live with its owner/s. The personal robot, according to the vendor, is able to:

- Recognize your face.
- Know your mood.
- Understand what you say.
- Know what you really mean.
- Learn and get smarter every day.
- Manage the smart/connected home and its appliances (described in section “[Selective Demonstrations of IoT in Action](#)”).
- Keep your home secure and save on energy.
- Buy your dinner and automatically track your calorie intake.
- Call you a cab.
- Help with your shopping.

A significantly less expensive solution is to buy Amazon's Alexa, which provides you with many of the above capabilities.

Questions for the Case

1. Why do people need a personal robot?
2. Compare Autonomous' personal robot with Amazon's Alexa/Echo.
3. Both Autonomous' robot and Alexa can help with online shopping. Find out how they do it.

Robo Advisors

The personal assistants described earlier can provide you with information and rudimentary advice. However, now there are robots that can provide you with much more complex advice in specific domains.

Example: Robo Financial Advisors

According to A.T. Kearney's survey (Reported by Regan 2015), **robo advisors** are defined as online providers that offer automated, low-cost, *investment advisory* services through mobile platforms. The robo advisors machine uses algorithms that allocate, deploy, rebalance, and trade investments. Once you enroll for the robo service, you enter your investment objectives and references using advanced AI algorithms. Then, the robo will offer *alternative personalized* investment options for you to choose from (this is different from investing in a mutual funds or ETFs that are not personalized). Conducting a dialog with the robot, the machine will refine your investment portfolio. This is all done digitally without you having to talk to a live person.

You may wonder how good the advice is. The answer is that it will depend on the knowledge base of the robot, on the type of investment, on the interference engine of the machine, etc. However, you need to remember that the robots are not biased and they are consistent. They may prove to be even better than humans at one of the most important aspects in investment advising: know how to legally minimize the related tax. This implies that institutional-grade tax-loss harvesting is now within the reach of all investors.

It is known that the vast majority of buy and sell decision of stocks, trading in the major exchanges, for financial institutions, are made by computers. However, computers can manage individual people's accounts, as well.

For the best robo advisors, see Bundrick (2015) and O'Shea (2016). For more, see investorjunkie.com/35919/robo-advisors. For a comprehensive coverage of robo advisors in finance and investment, including the major companies in the advisory industry, see McClellan (2016).

An emerging commercial robo advisor was developed at Cornell University under the name Gsphere.

Regan (2015) reports that the robo advisors business could reach \$2 billion a year by 2020.

In addition to investment advisors, there are several other types of robo advisors, ranging from travel to medicine to legal.

A closing note: While current robo advisors are impersonal, future robots will have a personality. Nadine is an experimental social robot that is being developed in Singapore, and it has personality (see upi.com/Science_News/2015/30/New-social-robot-Nadine-has-a-personality).

SECTION 7.5 REVIEW QUESTIONS

1. Describe an intelligent virtual personal assistant.
2. Describe the capabilities of Amazon Alexa.
3. Relate Amazon's Alexa to Echo.
4. Describe Echo Dot and Tap.
5. Describe Apple's Siri.
6. Define personal robots.
7. Explain how robo advisors for investment work.
8. Describe IBM Watson.

7.6 THE INTERNET OF THINGS AND E-COMMERCE

The topic of the Internet of things (IoT) has been receiving significant attention since 2014. While its applications are still emerging, it has a tremendous potential for creating value and innovations in many fields, including e-commerce (e.g., see Manyika et al. 2015). In this section, we present the essentials of IoT. Some evolving applications that are related to e-commerce are described in section “[Selective Demonstrations of IoT in Action](#)”. For the impact of IoT on e-commerce, see Constantinou and Sellebraten (2015) and Mehra (2015). For existing applications, see Karwatka (2015).

The Essentials of IoT

The **Internet of things (IoT)** is an evolving term with several definitions. In general, the IoT refers to a situation where many objects (people, animals, items) with embedded microprocessors are connected mostly wirelessly to the Internet. That is, it uses *ubiquitous computing*. Analysts predict that by the year 2020, there will be more than 50 billion devices connected to the Internet, creating the backbone of the IoT. The challenges and opportunities of this disruptive technology are discussed in an interview with Peter Utzschneider, the vice president of product management for Java at Oracle (see Kvita 2014). In addition, you can join the conversations at [iotcommunity.net](#). For an overview, see Nagpure (2016). For Intel’s vision for fully connected world, see Murray (2016).

Embedding computers and other devices into items everywhere and connecting all devices to the Internet permits extensive communication and collaboration between users and items (e.g., see Zuora 2015). This kind of interaction opens the door to many applications. For business applications of the Internet of things, see Jamthe (2016). In addition, check the “Internet of Things Consortium” ([iofthings.org](#)) and their annual conferences. For an infographic and a guide, see [intel.com/content/www/us/internet-of-things/infographics/guide-to-iot.html](#). An interesting example is provided in the closing case of this chapter.

Definitions and Characteristics

There are many definitions of IoT. Wikipedia provides this definition: “*The Internet of Things (IoT)* is the network of physical objects-devices, vehicles, buildings, and other items embedded with electronics, software, sensors, and network connectivity-that enables these objects to collect and exchange data. The Internet of things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy, and economic benefit; when IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation, and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.”

According to Miller (2015), these are the major characteristics of the Internet: IoT is a connected ecosystem in which:

- Large numbers of objects (things) can be connected.
- Each thing has a unique definition (IP address).
- Ability to receive, send, and store data, automatically.
- Delivered mostly over the wireless Internet.
- Built upon machine to machine (M2M) communication.

The Structure of IoT Applications

Things in IoT refers to a variety of objects and devices ranging from cars and home appliances to medical devices, computers, fitness tracers, hardware, software, data, sensors, and much more. Connecting “things” and allowing them to communicate is a necessary capability of an IoT application; but for more sophisticated applications, we need additional components: a control system and a business model. The IoT enables the “things” to sense or be sensed wirelessly across the network (see the closing case). A non-Internet example will be a temperature control system in a room. Another non-Internet example is

a traffic light at intersections of roads where cameras photograph the number of cars coming from each direction and a control system adjusts the time for changing the lights according to programmed rules. Later on, we will introduce some Internet-based applications.

The Major Benefits of IoT

The major objective of IoT systems is to improve productivity, quality, speed, and the quality of life.

According to Basu and Didyala (2014) and Miller (2015), the major benefits of IoT are:

- Creates new revenue stream.
- Optimizes asset utilization.
- Improves sustainability.
- Improves workers' productivity.
- The Internet of things is changing and improving everything (McCafferty 2015).
- Systems will anticipate our needs.
- People will make smarter decisions/purchases.
- Greater accuracy.
- Identifies problems quickly (even before they occur).
- Reduces cost by automating processes.
- Instant information availability.
- Quick and inexpensive tracking.
- Expedites problem resolution and recovery.
- Supports facility integration.

The Drivers of IoT

The following are the major drivers of IoT:

- 50 to 75 billion “things” may be connected (by 2020–2025).
- Connected autonomous “things”/systems (e.g., cars) are all over the IoT.
- Broadband Internet is more widely available and increasing with time.
- Cost of connecting devices is decreasing.
- More devices are created (via innovation) and they are interconnected (e.g., see Fenwick 2016).
- More sensors are built into devices.
- Smartphones' penetration is skyrocketing.
- Wearable devices are all over.
- Speed of moving data is increasing, to 60HTz.
- Protocols are developing for IoT (e.g., WiGig).
- Customer expectations are on the rise.

How the IoT Works

The following is a comprehensive process for IoT. In many cases, IoT follows only portions of this process.

The process is explained in Fig. 7.6. The Internet ecosystem (top of the figure) includes a large number of things. Sensors and other devices collect information from the ecosystem. This information can be displayed, stored, and/or processed (including data mining). This analysis converts the information into knowledge and/or intelligence. Machine learning may help in turning the knowledge into decision support (made by people and/or machines), which is evidenced by some actions.

The generated decisions can help in creating innovative applications, new business models, and improvements in business processes. These result in “actions,” which may impact the original scenario other things.

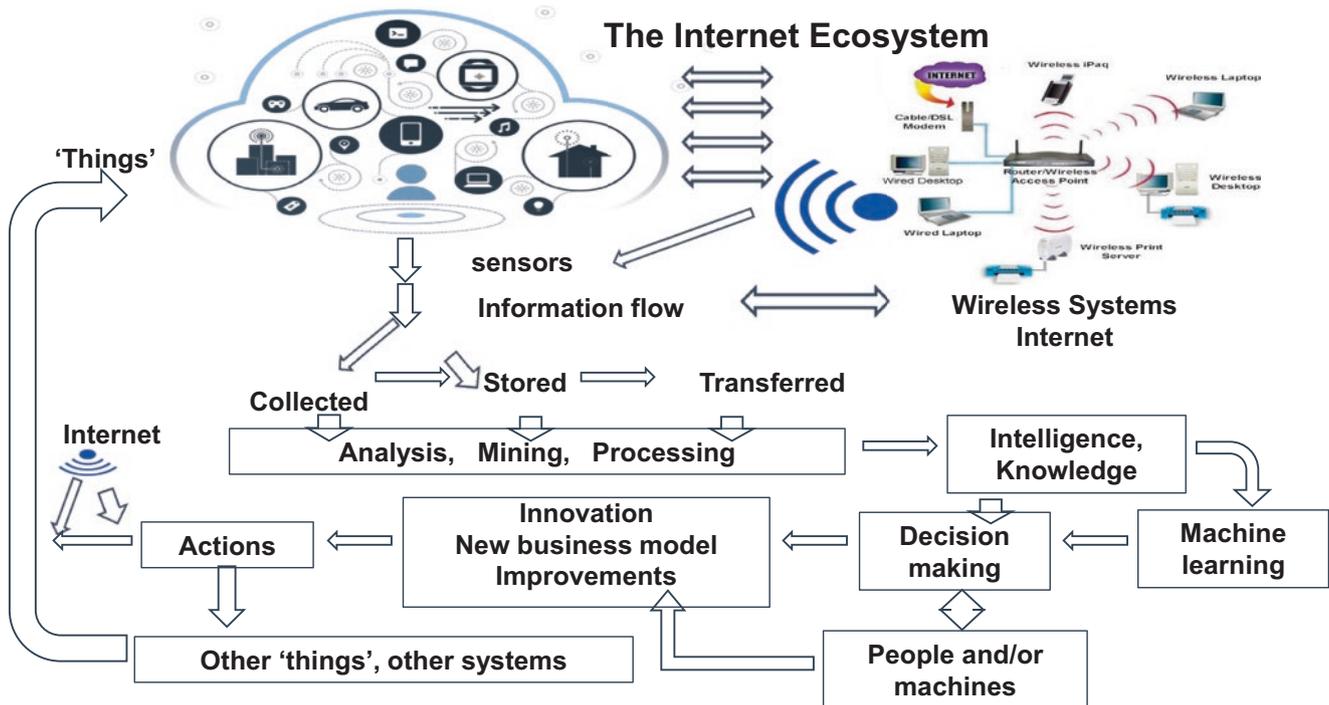


Fig.7.6 How the IoT works

Fig.7.7 Google's self-driving car



Note that most of the existing applications are in the upper part of the figure, which is called “sensor-to-insight,” meaning opt to the creation of, knowledge, or to the delivery of new information. However, now, the focus is moving to the entire cycle, i.e., *sensor-to-action* (see Ricktun 2016).

The IoT may generate huge amount of data (big data) that needs to be analyzed by various business intelligence methods, including *deep analytics*.

Some Issues in Implementing the IoT

The following are several important issues:

- **Security.** Given that the Internet is not well secured, applying IoT requires special security measures. Perkins (2016) summarizes the situation as follow: “IoT creates a pervasive digital presence connecting organizations and society as a whole. New actors include data scientists; external integrators; and exposed endpoints. Security decision-makers must embrace fundamental principles of risk and resilience to drive change.” For details see gartner.com/analyst/25748.

- **Connecting the silos of data.** There are millions of silos of data on the Internet, and many of them need to be interconnected. This issue is known as the need for a “fabric” and the need for connectivity. This can be a complex issue for applications that involve many different silos belonging to different organizations. For a discussion and some solutions, see Lucero (2015) and machineshop.io/blog/the-fabric-of-the-internet-of-things.
- **Preparing existing IT architectures and operating models for IoT can be a complex issue in many organizations.** For a complete analysis and guide, see Deichmann, et al. (2015).

SECTION 7.6 REVIEW QUESTIONS

1. Define the Internet of things.
2. Describe its major components.
3. List the major drivers of the IoT.
4. Explain how the IoT works using Fig. 7.6.
5. Describe the major issues in implementing the IoT.

7.7 SELECTIVE DEMONSTRATIONS OF IOT IN ACTION

We start with a well-known example. Your refrigerator can sense the quantity of food and texts you when inventory is low (sensor-to-insight). One day the fridge will be able to place an order for items that need replenishment, pay for them, and arrange delivery (sensor-to-action).

A Sampler of Existing Applications

The following examples are IoT applications related to e-commerce, based on Koufopoulos (2015):

- **Hilton Hotel.** Guests can check in directly to their rooms with their smartphones (no check-in lobby is needed; no keys are needed). Other hotel chains follow suit.
- **Ford.** Users can connect to apps by voice. Coming up: autopay for gas and preorder from Ford’s cars at Starbucks.
- **Tesla.** Tesla’s software autonomously schedules a valet to pick up a car and drives it to Tesla’s facility when a need for repair or service arises.
- **Johnnie Walker.** The whiskey company connected 100,000 whiskey bottles to the Internet for Brazil’s Father’s Day. Using smart labeling, buyers can create a personalized video. Fathers can share the videos on social networks. Fathers get promotions to buy the whiskey if they like it.
- **Apple.** Enables users of iPhone, Apple Watch, and HomeKit with Apple Pay to streamline shopping.
- **Starbucks Clover Net in the Cloud.** This system connects coffee brewers to customers’ preferences. The system also monitors employee’s performance, improves recipes, tracks consumption patterns, and more.

A large number of consumer applications of the IoT are reported by Jamthe (2016) and Miller (2015). Here is another example:

Nest: A Google Company

A leading manufacturer of IoT applications is Google’s Nest. The company is a producer of programmable self-learning, sensor-driven, Wi-Fi-enabled products. In spring 2016, the company had three products:

- **The learning thermostat.** The device learns what temperature and humidity level people like and controls the air conditioner/heater accordingly. The company claims it has an average savings of 13% of energy, which is good enough to pay for the device in 2 years; see nest.com/thermostat/meet-nest-thermostat/?alt=3.
- **Smoke detector and alarm.** This device tests itself automatically and lasts for about a decade. It is controlled from a smartphone. For details, see nest.com/smoke-co-alarm/meet-nest-protect.

- **Nest.com.** It is a webcam-based system that enables you to see from your smartphone or your desktop computer what is going on in your home when you are away. The system turns itself on automatically when nobody is at home. You can monitor your pets, babies, etc. There is a recorder that allows you to go back in time. For details, see nest.com/camera/meet-nest-cam. For how Nest can use your phone to find out when you have left your house, see Kastrenakes (2016).

For more on Nest, see en.wikipedia.org/wiki/Nest_Labs.

Many companies are experimenting with IoT products for retailing (B2C); for B2B operations; for transportation, logistics, and factory warehousing; and more. For details, see Miller (2015) and Jamthe (2016).

Note: For many case studies and examples of the IoT, see ptc.com/internet-of-things/customer-success, divante.co/blog/internet-e-commerce, Greengard (2016b), and Kuntz and Becker (2015).

Of all the consumer-related products, three are well known: smart homes and appliances, smart cars, and smart cities.

Smart Homes and Appliances

In a **smart home**, the appliances such as computers, refrigerators, washers, dryers, lights, air conditioners, heaters, televisions, and security systems are interconnected and can be controlled remotely by smartphones via the Internet. For an overview, see smarthomeenergy.co.uk/what-smart-home and Miller (2015).

In the United States, thousands of homes are already connected to such systems and other countries are following. Currently, smart home systems support a number of different tasks:

- **Lighting.** Users can manage their home lighting from wherever they are.
- **Energy management.** Home heating and cooling systems can be controlled via remote to adjust the thermostat in the house (e.g., Nest nest.com/works-with-nest).
- **Water control.** WaterCop (watercop.com) is a system that reduces water damage by monitoring leaking water via a sensor, which sends a signal to the valve, causing the valve to close.
- **Home entertainment.** Audio and video equipment can be programmed to respond to a remote control device. For instance, a Wi-Fi-based remote control for a stereo system located in the family room can command the system to play on speakers installed anywhere else in the house. Home automation performs for the user all from one remote and all from one button.
- **Home security and safety.** Home security and safety systems can be programmed to alert you to a security-related event on your property. Home security can also be supported by cameras, so you can remotely view your property in real time. Sensors can be used at home to detect intruders, keep an eye on working appliances, and much more.

Example: iHealthHome

Security measures are common in assisted living facilities in senior communities and for seniors who live independently. For example, the iHealthHome Touchscreen system collects data and communicates with the company's software. According to their website, it is a comprehensive monitoring and communication system for professional caregivers and independent living communities. Family caregivers and physicians are given remote access to the patient's health data. Using this technology, the iHealthHome program reminds seniors of their daily appointments, makes the Internet useful, keeps their mind occupied, and much more. iHealthHome also reminds seniors to take their medicine, monitor their blood pressure, and stay in touch with their caregiver.

More on Smart Appliances

According to smartgrid.gov, a smart appliance is "an appliance that includes the intelligence and communications to be automatic or remote-controlled based on user preferences or external signals, from a utility or third-party energy service provider. A *smart appliance* may utilize a *Home Area Network* to communicate with other devices in the customer's premise, or other channels to communicate with utility systems."

McGrath (2016) provides an overview of smart appliances that includes all coming appliances from Haier (a large China-based manufacturer). The company wants everything in a house to communicate, even across other device makers. Examples are smart refrigerators, air conditioners, and washers. The company offers a control board for all appliances, regardless of the manufacturers. Apple is working on a single control for all smart appliances in a home (Heater 2016).

New Home Appliances in CES 2016

The following new smart appliances were exhibited in the CES show in Las Vegas in January 2016 (per Morris 2016).

- **Samsung smart fridge.** Cameras check content, and sensors check temperature and humidity.
- **Gourmet Robotic Cooker.** It does work for you.
- **10-in-1 device for your kitchen.** Stirring food: stir-fry, scrambled eggs, etc. Also choose ten cooking style: baking, sauce making, etc.
- **LG HOM-BOT Turbo+.** It lets you specify an area in your home that needs special attention. A camera lets you monitor your home remotely while you are away (one similar to Google's Nest).
- **Haier R2D2 refrigerator.** According to Morris (2016), "Is this the most practical refrigerator at CES? Of course not, but it's certainly the one with the most entertainment value. It's a very authentic replica of Star Wars' most famous droid, with authentic light and sound effect. It'll hold a six-pack of your beverage of choice and will bring the drinks to you (with a top speed of 0.62 miles per hour). It also has a built-in projector, allowing you to watch films as you enjoy your drink."
- **Whirlpool's smart top load washer.** A fully automated machine with smart controls. It also saves energy and even encourages philanthropy by sending a small amount of money to "Habitat for Humanity," each time you load your washer. The company also offers a smart dryer.
- **LG LDT8786ST dishwasher.** The machine's camera's sensors keep track of what has already been cleaned in order to save water. In addition, it gives you flexibility in operations.

Cericola (2016) noticed the following smart home trends for 2016 at the CES conference:

- Using the TV as a smart hub for the home appliances is coming from Samsung.
- Dolby Atmos products include speakers, receivers, and other entertainment items.
- DIY home smart security cameras (e.g., it makes sure it is not just the cat before alerting the police).
- Water controls for faucets, sprinklers, and flood detectors. In addition, a robot, which will teach you how to save water indoors (hydro.fr/en).

For details and references, see Cericola (2016).

For more about home automation, see smarhome.com/sh-learning-center-what-can-i-control.html. To see the various apps used for home control, see smarhome.com/android_apps.html.

Smart Cities

The idea of smart cities took off around 2007 when IBM launched their Smart Planet project and Cisco began its Smart Cities and Communities program. The idea is that, in **smart cities**, digital technologies (mostly mobile-based) facilitate better public services for citizens, better utilization of resources, and less negative environmental impact. For resources, see ec.europa.eu/digital-agenda/en/about-smart-cities. Townsend (2013) provides a broad historical look and coverage of the technologies. In an overview of his book, he provides the following examples: "In Zaragoza, Spain, a 'citizen card' can get you on the free city-wide Wi-Fi network, unlock a bike share, check a book out of the library, and pay for your bus ride home. In New York, a guerrilla group of citizen-scientists installed sensors in local sewers to alert you when storm water runoff overwhelms the system, dumping waste into local waterways." According to Editors (2015), smart cities will use 1.6 billion connected things in 2016. For more on smart cities, see Schwartz (2015) and Hean (2015). In addition, watch the video "Cisco Bets Big on 'Smart Cities'" at money.cnn.com/video/technology/2016/03/21/cisco-ceo-smart-cities.cnnmoney. Finally, in a smart city, you can find smart campuses, as in Singapore (see Kwang 2016 and Lacy 2016).

In many countries, governments and others (e.g., Google) are developing smart city applications. For example, India is planning to develop 100 smart cities (see enterpriseinnovation.net/article/india-eyes-development-100-smart-cities-1301232910).

Related to smart cities are smart factories (Libelium 2015). In addition, in smart cities, one will be able to find connected and self-driven cars (see Hamblen 2016 and our next section).

Smart Cars (Self-Driven)

Smart cars, also known as **driverless cars**, robot-driven cars, self-driving cars, and autonomous cars, are already on the roads in several places. The concept was initiated by Google (named Google Chauffeur), and it is becoming a reality, with several states in the United States getting ready to allow them on the road. These cars are electric, and they can create a revolution by their ability to reduce emissions, accidents, and traffic jams (e.g., see Neckermann 2015 and Tokuaka 2016). Greenough (2015) estimated ten million such cars to be on the road in the United States by 2020. Thus far, these cars are being tested in several cities worldwide.

The cars have sensor systems that may prevent collisions, and the cars can be completely autonomous. (Today, they still include a human safety driver.) Among the many implementation issues are legal issues, cost, privacy invasion, safety, and more.

Despite these issues, several car manufacturers are ready to sell such cars soon (e.g., BMW, Mercedes, Ford, GM, Tesla, and—of course—Google). For more information, see Bridges (2015).

In addition to passenger cars, we see new developments related to other vehicles. For example, self-driving buses are new in Finland. Here are some more:

- Uber and other ride-sharing companies plan for self-driving cars (Mitchell and Lien 2016).
- Mail is delivered to the home uspsaig.gov/blog/no-driver-needed.
- Driverless buses are being tested in Finland. Watch money.cnn.com/video/technology/2016/08/18/self-driving-buses-hit-the-road-in-helsinki.cnnmoney by self-driving buses (McFarland 2016).
- Self-driving taxis operate in Singapore (Watts 2016).

Note: Driverless cars are closer to getting the US green light (Levin (2016)).

SECTION 7.7 REVIEW QUESTIONS

1. Provide a list of five new IoT applications with a brief description.
2. Describe the IoT for home security and appliances.
3. List all home appliances in a smart home.
4. How can one control all smart appliances?
5. Describe smart cities.
6. What are self-driving cars? How are they related to the IoT?

MANAGERIAL ISSUES

1. **How can one justify the investment in AI systems?** Like the justification of any investment, one should assess the costs and benefits (Chap. 14). The problem is that some of the benefits are intangible and some of the future benefits and costs are unclear. Some companies venture as leaders in innovations; others are followers. Look at the competition. Remember that AI projects may be expensive.
2. **Chatbots are all over. Should we follow?** The concept is appealing. The cost may be reasonable, but the accuracy of the answers you get from a machine clearly depends on the investment you will make in the machine's knowledge and its training. Chatbots can save a lot of money and make customers happy. However, they can frustrate customers with "stupid" conversations.
3. **Our employees contribute their wisdom to the company's knowledge base. Should we give them extra compensation?** It depends on the labor contract and on the nature and size of the contribution. If the contribution to AI projects is not related to the regular work of the employees, management should consider special rewards.
4. **Robots and other AI innovations will result in some people losing their jobs in our business. What to do?** This is a major problem that will intensify in the future. Most companies are installing robots where the benefits are large, and they try to reassign the affected employees. Robots will cause people to lose their jobs, like other automations did.
5. **Our company considers the introduction of robo assistant. How to approach the issue?** Robo assistants (or advisors) are used by companies for various purposes. Most frequent uses are internal advisors to employees (such as in the Allstate case), as assistants to customers (such as used by airlines), and as assistant to decision-makers, such as the use of *robo*

advisors in investments or in approving small loans in banks. Depending on the nature of the application, you need to select a vendor and a product (consult an introduction to IT book on how to do it). Finally, you need to conduct a cost-benefit analysis (see Chap. 14).

6. **Internet of things' applications have lots of promises and potential benefits. Is it for us?** The IoT has many potential advantages, but it is in its early stages of life. As shown in the closing case, large companies can reap considerable benefits. While small applications for a home and appliances are feasible now, large-scale implementation in organizations may involve several problems, such as security, system integration, financial justification, and selection of implementing vendor. It is advisable to seek the advice of an IT management company (such as Gartner) as well as consult a major technology vendor (such as Cisco).

SUMMARY

In this chapter, you learned about the following EC issues as they relate to the chapter's learning objectives.

1. **The reasons for intelligent EC systems.** The major reasons are to make EC easier to use, more capable (enable new applications), more intuitive, and less threatening. Intelligent EC systems can work automatically and autonomously, saving time and money, and perform consistent work. They can also work in rural and remote areas where human expertise is rare or not available. Intelligence can be observed in all EC activities, from buying to customer service. Intelligent virtual systems can also act as assistance to humans.
2. **The essentials of AI.** AI systems are computer systems that exhibit low level (but increasing) intelligence. This enables more automation of EC activities, such as machine translation of languages (e.g., for global trading). Intelligent EC systems can facilitate training and decision-making. AI has several definitions and derivatives and its importance is growing rapidly. Many companies and governments recognize the importance of AI. For example, the US government postulated that AI will be a "critical driver of the U.S. economy" (Gaudin 2016). The major derivatives of AI are intelligent agents, machine learning, robotics systems, natural languages processing and recognition, and knowledge systems.
3. **The major AI applications.** These include robotics and chatbots, intelligent personal assistants, machine translation of languages, expert systems of different variety, advisory systems, and automatic ordering systems. AI is also a critical element in driverless cars.
4. **4. Knowledge systems and management.** Knowledge management creates, captures, stores, processes, refines, protects, and disseminates knowledge. The major objective is to preserve knowledge and enable its sharing by many. Knowledge is stored in knowledge bases in organizations. Knowledge is also a major component of expert systems. Such systems act as an advisory to nonexperts by providing them with answers to inquiries, directing them to what to do, and helping them to solve problems. By matching the stored knowledge with symptoms and other input data provided by the nonexperts, the systems' inference engines generate the advice. Some systems can provide explanations of how the advice was generated. Expert systems are very good with tasks that use low level logic (e.g., match items, do simple computations).
5. **Intelligent personal assistants.** A relatively new application of knowledge systems is the intelligent personal assistant. Major examples of such assistants are Amazon Alexa, Apple's Siri, and Google Home. The knowledge is centrally maintained (in the "cloud") and usually disseminated via a Q&A dialog (user with machine). The assistants can be personalized to their owner's traits. Special breeds of assistance are the personal advisors, such as robo advisors, that provide advice to investors.
6. **The essentials of the Internet of things (IoT).** The IoT refers to an ecosystem in which a large number of objects (like people, sensors, and computers) are interconnected via the Internet (usually wirelessly). By the year 2020, there could be as many as 50 billion connected objects. A system of such connected things can be used for many purposes (e.g., see the CNH closing case). The use of the IoT can provide for improved or new EC applications.
7. **Self-driving cars, smart homes and appliances, and smart cities.** These are some of the major applications of consumer-related IoT. Self-driven cars may reduce accidents, pollution, and traffic jams. Such driverless autos can reduce transportation costs as well. While self-driving cars are not fully implemented yet (we may see them in 2017–2018), smart homes and appliances are all over the place. For a small investment, you can use several applications in your home, ranging from home security to controlling your appliances. The concept of smart cities is taking off globally with projects in Singapore, India, Germany, and the United States. Their objective is to provide a better life to the residents of the cities. Major areas are transportation, healthcare, education, and government services.

KEY TERMS

Amazon Alexa
Amazon Echo
Artificial intelligence (AI)
Chatbot
Driverless cars
Expert systems (knowledge-based systems)
Intelligent agents
Internet of things (IoT)
Knowledge management (KM)
Machine learning
Natural language processing (NLP)
Personal robot (also personal assistant, virtual personal assistant)
Robo advisors
Robot
Shopbot
Siri
Smart cities
Smart homes
Speech (voice) understanding
Turing test

DISCUSSION QUESTIONS

1. Relate the concepts of knowledge sharing to knowledge management and to expert systems.
2. Discuss the flow of expertise and knowledge from the “cloud” (via the Internet) to expert systems’ users. What are the benefits of such a flow?
3. Find recent information about the progress of India’s 100 smart cities. Write a summary.
4. Why is the IoT considered a disruptive technology?
5. Watch the video “What Is a Smart City?” at [youtube.com/watch?v=Br5aJa6MkBc](https://www.youtube.com/watch?v=Br5aJa6MkBc) (3:28 min), and discuss the issues of smart cities.
6. IBM Watson is related to *cognitive computing*. Explain the relationship.
7. Find information on the competition between Google’s DeepMind and the World Go Champion. Summarize the reasons for the advantage for the winner of the competition.
8. Find the status of legalizing driverless cars in your country.

TOPICS FOR CLASS DISCUSSION AND DEBATE

1. Many are concerned with the rapid expansions of robots and the jobs they eliminate. Others claim that in the end, more new jobs will be created than eliminated. Given the rapid globally spread of robots, the threat seems logical. See Table 7.1, Rickard-Strauss (2014), and Egan (2015). Debate the issue.
2. It is said that virtual assistants are not as capable (yet) as Ironman’s Jarvis, or as HAL 9000. However, their intended functions are largely the same. Discuss.
3. Is replacing humans with AI a good or bad thing? Debate the issue. Start by reading River Logic (2016).
4. According to the June 23, 2016, article “Self-Driving Cars May One Day Face Decision of Whom to Save, Kill” at abcnews.go.com/Technology/driving-cars-day-face-decision-save-kill/story?id=40072003, read the article and discuss its assertions.

5. Watch the 16-min video regarding applying AI to auctions (“Applying Artificial Intelligence to Auctions: Colin Rowat at TEDxUniversityofBirmingham” [youtube.com/watch?v=O65XJd7j2BE](https://www.youtube.com/watch?v=O65XJd7j2BE)). Answer the following questions:
 - (a) What are the major advantages of such systems?
 - (b) What are the major obstacles and limitations?
 - (c) For what types of auctions would you recommend AI systems? Why?
 - (d) Comment on possible applications not cited in the video.
6. It is said that the IoT will enable new customer service and B2B interactions. Explain how.
7. Discuss the relationship between knowledge systems and social networking.
8. The IoT has a growing impact on business and e-commerce. Find evidence. Also read Jamthe (2016).
9. Are consumers, automakers, insurers, and politicians really ready for self-driving cars? Discuss and debate.
10. Discuss how IBM Watson will reach 1 billion people by 2018 and what the implications are. Do some research, write a report.

INTERNET EXERCISES

1. Read salesforce.com/products/Einstein/overview, a story about *Salesforce Einstein*. Then enter salesforce.com and find more information about the service. Prepare a list of all the tasks that “Einstein” supports. Why use it?
2. Enter purveya.com and examine the features of their technology. Relate the features to specific benefits for organizations.
3. Enter theinternetofthings.eu and find information about the *IoT Council*. Write a summary.
4. Enter kmworld.com and find recent information on knowledge management and expert systems which is related to e-commerce. Write a report.
5. Enter gravityinvestments.com/digital-advice-platform-demo. Would you invest in this project? Research and write a report.
6. Enter ptc.com/internet-of-things/customer-success and select three cases. Write a summary of each.
7. Enter nuance.com and find information about Dragon Medical Advice. Describe the benefits. Find other applications by the company. Write a report.
8. Enter shopadvisor.com/1/platform and review the platform 3 components. Examine their capabilities and compare them to other shopping advisors.

TEAM ASSIGNMENTS AND PROJECTS

Questions for the Opening Case

1. Read the opening case and research related material, and answer the following questions:
 - (a) Explain why traffic may be down while congestion is up (see the case of London at inrix.com).
 - (b) How does this case relate to m-commerce?
 - (c) Identify the intelligent elements in this system.
 - (d) Explore the revenue model of the system.
 - (e) Enter the press releases from the recent 4 months at index.com/global-resources/press-releases and identify developments related to smart commerce. Write a report.
 - (f) According to Gitlin (2016), INRIX’s new mobile traffic app is a threat to Waze. (Waze is introduced in Chap. 6.) Explain why.
2. Sales intelligence systems are getting very popular both for online and offline sales. Have teams research the major software vendors and then make a comparison as a class project. Suggested vendors are Salesforce, LinkedIn, Sales Navigator, Nimble, InsideView for Sales, DiscoverOrg, RainKing, ZoomInfo, and Salestools.10 (you can find more). Read Dunhill (2016).
3. A major concern of the IoT is its security and privacy protection. The team or teams are assigned to investigate this topic. Begin by reading Schuman (2016), and prepare a presentation that will concentrate on the threats to IoT (under various scenarios; e.g., in the house, in the enterprise, for a country). Then, examine the existing and proposed defense mechanisms. Finally, discuss the organizational issues related to implementation.
4. Find information about Nest’s thermostats and then explain how Amazon’s Alexa can control this product.

5. Examine [autonomous.ai/personal-robot](#). Compare its capabilities to that of Amazon's Alexa, Google Home, and Apple's Siri. There are significant differences in the product costs. Prepare an analysis that will justify (or not justify) the difference in costs.
6. Join the "smart e-commerce" group and blog on LinkedIn ([linkedin.com/company/smart-e-commerce](#)). Describe the major current topics discussed there. Find similar groups that are interested in smart commerce. Write a report.
7. Several vendors offer trip advising. Well-known ones are Utrip in Europe and TripAdvisor in the United States. Check several of these as to the quality of the advice provided by machines.
8. Find the status of *smart cities* as it is related to Cisco. Write a report.
9. Read the Fintech Editors (2016) article about Mastercard bots and search for more information. Write a report.

CLOSING CASE: CNH INDUSTRIAL USES THE INTERNET OF THINGS TO EXCEL

CNH Industrial N.V. (CNH) is a Netherlands-based global manufacturer of vehicles for the agriculture, construction, and commercial vehicle markets. The company produces and services more than 300 types of vehicles and operates in 190 countries (it employs over 65,000 people). The company's business is continuously growing while operating in a very competitive environment.

The Problem

To manage and coordinate such a complex business from its corporate office in London, the company needed a superb communication system as well as an effective customer service network. For example, parts availability is critical. Customer's equipment does not work until a broken part is replaced. Competitive pressures are very strong, especially in the agriculture sector where weather conditions, seasonal, and harvesting pressure may complicate operations. Monitoring and controlling of equipment are important competitive factors. Ideally, predicting equipment failures is very desirable. Rapid connectivity with the customers and the equipment they purchase from CNH is essential, as well as efficient data monitoring and data collection.

The Solution

Using PTC Transformational, as a vendor, the company implemented an IoT system together with internal structural transformation, in order to solve its problems and reshape its connected industrial vehicles. The initial implementation was in the agricultural sector. The details of the implementation are provided by PTC, Inc. (2015). The highlights are summarized next.

- The IoT connects all vehicles, in hundreds of locations worldwide (those that are equipped with the connectivity to the system), to CNH's command and control center. This connection enables monitoring performance.
- The IoT monitors the products' condition and operation, as well as the surrounding environments, through sensors, and to collect external data.
- The IoT enables customization of products' performance at customers' sites.
- The IoT provides the data necessary for optimizing equipment's operation.
- Using the IoT to analyze the behaviors of the people that drive CNH's produced trucks and recommend changes that can improve the efficiency of the vehicles.
- Predicts the range of the fuel supply in the vehicles.
- Alerts owners to the needs of preventive maintenance and orders the necessary parts for such services (e.g., by monitoring usage and/or predicting failures). This enables proactive maintenance practice.
- Finds when trucks are overloaded, violating the warranty contracts.
- Provides fast diagnosis of products' failures.
- Enables trucks' deliveries on schedule by connecting the trucks to planners and delivery sources and destinations.
- Helps farmers to optimally plan the entire farming cycle, from preparing the soil to harvesting.
- Analyzes collected data as compared to standards.
- All this is done mostly wirelessly.

The Results

According to Marcus (2015), CNH halved the downtime of the participating equipment at customer sites by using the IoT. It also helps farmers monitor their fields and equipment to improve efficiency. The company is now helping customers by showing examples to less effective users of superb operating practices. Parts of incoming orders can be fulfilled very quickly. In addition, product development benefits from the analysis of collected data.

Sources: Compiled from PTC, Inc. (2015), Marcus (2015), and cnhindustrial.com/en-us/pages/homepage.aspx

Questions for the Case

1. Why is the IoT the only viable solution to CNH's problems?
2. List and discuss the major benefits of the IoT in this case.
3. How can product development benefit from the collected data about usage?
4. It is said that the IoT enables telematics and connected vehicles. Explain.
5. Why is the IoT considered the "core of the future business strategy?"
6. It is said that the IoT will enable new services for CNH (e.g., for customers and for B2B partners).
7. View Fig. 7.5 (the process of IoT) and relate it to the usage of IoT at CNH.

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