**Lesson Proper for Week 7**

**The Productivity Paradox**

In 1991, Erik Brynjolfsson wrote an article, published in the *Communications of the ACM*, entitled “The Productivity Paradox of Information Technology: Review and Assessment.” By reviewing studies about the impact of IT investment on productivity, Brynjolfsson was able to conclude that the addition of information technology to business had not improved productivity at all – the “productivity paradox.” From the article[1] He does not draw any specific conclusions from this finding, and provides the following analysis:

Although it is too early to conclude that IT’s productivity contribution has been subpar, a paradox remains in our inability to unequivocally document any contribution after so much effort. The various explanations that have been proposed can be grouped into four categories:

1.      **Mismeasurement**of outputs and inputs,

2.      **Lags**due to learning and adjustment,

3.      **Redistribution**and dissipation of profits,

4.      **Mismanagement**of information and technology.

In 1998, Brynjolfsson and Lorin Hitt published a follow-up paper entitled “Beyond the Productivity Paradox.” In this paper, the authors utilized new data that had been collected and found that IT did, indeed, provide a positive result for businesses. Further, they found that sometimes the true advantages in using technology were not directly relatable to higher productivity, but to “softer” measures, such as the impact on organizational structure. They also found that the impact of information technology can vary widely between companies.

**IT Doesn’t Matter**

Just as a consensus was forming about the value of IT, the Internet stock market bubble burst. Just two years later, in 2003, Harvard professor Nicholas Carr wrote his article “IT Doesn’t Matter” in the *Harvard Business Review.*In this article Carr asserts that as information technology has become more ubiquitous, it has also become less of a differentiator. In other words: because information technology is so readily available and the software used so easily copied, businesses cannot hope to implement these tools to provide any sort of competitive advantage. Carr goes on to suggest that since IT is essentially a commodity, it should be managed like one: low cost, low risk. Using the analogy of electricity, Carr describes how a firm should never be the first to try a new technology, thereby letting others take the risks. IT management should see themselves as a utility within the company and work to keep costs down . For IT, providing the best service with minimal downtime is the goal.

**Competitive Advantage**

What does it mean when a company has a competitive advantage? What are the factors that play into it? While there are entire courses and many different opinions on this topic, let’s go with one of the most accepted definitions, developed by Michael Porter in his book *Competitive Advantage: Creating and Sustaining Superior Performance.*A company is said to have a competitive advantage over its rivals when it is able to sustain profits that exceed average for the industry. According to Porter, there are two primary methods for obtaining competitive advantage: cost advantage and differentiation advantage. So the question becomes: how can information technology be a factor in one or both of these methods? In the sections below we will explore this question using two of Porter’s analysis tools: the value chain and the five forces model. We will also use Porter’s analysis in his 2001 article “Strategy and the Internet,” which examines the impact of the Internet on business strategy and competitive advantage, to shed further light on the role of information technology in competitive advantage.

**The Value Chain**

**Porter’s value chain**

The primary activities are:

·       Inbound logistics: These are the functions performed to bring in raw materials and other needed inputs. Information technology can be used here to make these processes more efficient, such as with supply-chain management systems, which allow the suppliers to manage their own inventory.

·       Operations: Any part of a business that is involved in converting the raw materials into the final products or services is part of operations. From manufacturing to business process management information technology can be used to provide more efficient processes and increase innovation through flows of information.

·       Outbound logistics: These are the functions required to get the product out to the customer. As with inbound logistics, IT can be used here to improve processes, such as allowing for real-time inventory checks. IT can also be a delivery mechanism itself.

·       Sales/Marketing: The functions that will entice buyers to purchase the products are part of sales and marketing. Information technology is used in almost all aspects of this activity. From online advertising to online surveys, IT can be used to innovate product design and reach customers like never before. The company website can be a sales channel itself.

·       Service: The functions a business performs after the product has been purchased to maintain and enhance the product’s value are part of the service activity. Service can be enhanced via technology as well, including support services through websites and knowledge bases.

The support activities are the functions in an organization that support, and cut across, all of the primary activities. The support activities are:

§  Firm infrastructure: This includes organizational functions such as finance, accounting, and quality control, all of which depend on information technology; the use of ERP systems is a good example of the impact that IT can have on these functions.

§  Human resource management: This activity consists of recruiting, hiring, and other services needed to attract and retain employees. Using the Internet, HR departments can increase their reach when looking for candidates. There is also the possibility of allowing employees to use technology for a more flexible work environment.

§  Technology development: Here we have the technological advances and innovations that support the primary activities. These advances are then integrated across the firm or within one of the primary activities to add value. Information technology would fall specifically under this activity.

§  Procurement: The activities involved in acquiring the raw materials used in the creation of products and services are called procurement. Business-to-business e-commerce can be used to improve the acquisition of materials.

§  This analysis of the value chain provides some insight into how information technology can lead to competitive advantage. Let’s now look at another tool that Porter developed – the “five forces” model.

**Porter’s Five Forces**

**Porter’s five forces**

Porter developed the “five forces” model as a framework for industry analysis. This model can be used to help understand just how competitive an industry is and to analyze its strengths and weaknesses. The model consists of five elements, each of which plays a role in determining the average profitability of an industry. In 2001, Porter wrote an article entitled “Strategy and the Internet,” in which he takes this model and looks at how the Internet impacts the profitability of an industry. Below is a quick summary of each of the five forces and the impact of the Internet.

§  **Threat of substitute products or services:**How easily can a product or service be replaced with something else? The more types of products or services there are that can meet a particular need, the less profitability there will be in an industry. For example, the advent of the mobile phone has replaced the need for pagers. The Internet has made people more aware of substitute products, driving down industry profits in those industries being substituted.

§  **Bargaining power of suppliers:**When a company has several suppliers to choose from, it can demand a lower price. When a sole supplier exists, then the company is at the mercy of the supplier. For example, if only one company makes the controller chip for a car engine, that company can control the price, at least to some extent. The Internet has given companies access to more suppliers, driving down prices. On the other hand, suppliers now also have the ability to sell directly to customers.

§  **Bargaining power of customers:**A company that is the sole provider of a unique product has the ability to control pricing. But the Internet has given customers many more options to choose from.

§  **Barriers to entry:**The easier it is to enter an industry, the tougher it will be to make a profit in that industry. The Internet has an overall effect of making it easier to enter industries. It is also very easy to copy technology, so new innovations will not last that long.

§  **Rivalry among existing competitors:**The more competitors there are in an industry, the bigger a factor price becomes. The advent of the Internet has increased competition by widening the geographic market and lowering the costs of doing business. For example, a manufacturer in Southern California may now have to compete against a manufacturer in the South, where wages are lower.

**Using Information Systems for Competitive Advantage**

Now that we have an understanding of competitive advantage and some of the ways that IT may be used to help organizations gain it, we will turn our attention to some specific examples. A strategic information system is an information system that is designed specifically to implement an organizational strategy meant to provide a competitive advantage. These sorts of systems began popping up in the 1980s, as noted in a paper by Charles Wiseman entitled “Creating Competitive Weapons From Information Systems. Specifically, a strategic information system is one that attempts to do one or more of the following:

§  deliver a product or a service at a lower cost;

§  deliver a product or service that is differentiated;

§  help an organization focus on a specific market segment;

§  enable innovation.

**Collaborative Systems**

As organizations began to implement networking technologies, information systems emerged that allowed employees to begin collaborating in different ways. These systems allowed users to brainstorm ideas together without the necessity of physical, face-to-face meetings. Utilizing tools such as discussion boards, document sharing, and video, these systems made it possible for ideas to be shared in new ways and the thought processes behind these ideas to be documented.

Broadly speaking, any software that allows multiple users to interact on a document or topic could be considered collaborative. Electronic mail, a shared Word document, social networks, and discussion boards would fall into this broad definition. However, many software tools have been created that are designed specifically for collaborative purposes. These tools offer a broad spectrum of collaborative functions. Here is just a short list of some collaborative tools available for businesses today:

§  Google Drive. Google Drive offers a suite of office applications (such as a word processor, spreadsheet, drawing, presentation) that can be shared between individuals. Multiple users can edit the documents at the same time and threaded comments are available.

§  Microsoft SharePoint. SharePoint integrates with Microsoft Office and allows for collaboration using tools most office workers are familiar with.

§  Cisco WebEx. WebEx is a business communications platform that combines video and audio communications and allows participants to interact with each other’s computer desktops. WebEx  also provides a shared whiteboard and the capability for text-based chat to be going on during the sessions, along with many other features. Mobile editions of WebEx allow for full participation using smartphones and tablets.

§  Atlassian Confluence. Confluence provides an all-in-one project-management application that allows users to collaborate on documents and communicate progress. The mobile edition of Confluence allows the project members to stay connected throughout the project.

§  IBM Lotus Notes/Domino. One of the first true “groupware” collaboration tools, Lotus Notes (and its web-based cousin, Domino) provides a full suite of collaboration software, including integrated e-mail.

**Decision Support Systems**

A decision support system (DSS) is an information system built to help an organization make a specific decision or set of decisions. DSSs can exist at different levels of decision-making with the organization, from the CEO to the first-level managers. These systems are designed to take inputs regarding a known (or partially-known) decision-making process and provide the information necessary to make a decision. DSSs generally assist a management-level person in the decision-making process, though some can be designed to automate decision-making. An organization has a wide variety of decisions to make, ranging from highly structured decisions to unstructured decisions. A structured decision is usually one that is made quite often, and one in which the decision is based directly on the inputs. With structured decisions, once you know the necessary information you also know the decision that needs to be made. For example, inventory reorder levels can be structured decisions: once our inventory of widgets gets below a specific threshold, automatically reorder ten more. Structured decisions are good candidates for automation, but we don’t necessarily build decision-support systems for them.