

Welcome to the first week of Innovation and IT Management. This week we will cover the following topics under the umbrella of "Competing with IT" :

Importance of managing information systems in organisations

The consequences of using IT

The properties of digital goods and how they can be leveraged to compete with IT

Why do organisations build information systems? Welcome to the first session on information technology management and innovation. I am Professor Rahul Dé and through this course I also have Guru with me. Guru: Hi One of the first questions to ask is why do businesses and organisations use information technology? What do you think is the answer? I want you to pause the video and think about this question. Please pause the video for a minute and write down your answer. I will repeat the question. So, why do businesses and organisations use information technology? Over the years that I have asked this question to students in my classes I have received many responses. Here is an illustration of some of them: control the organisation, manage data, communicate within the organisation, manage knowledge, store and retrieve data, timely reports on activities, securing the data of the organisation, share knowledge, help with doing business, reach out to markets, get feedback from customers, because competitors are using IT, implement business strategy. All these answers are correct. Because, they certainly are ways in which organisations use IT. If we see the many ways in which organisations use IT, we find that what is listed here will certainly be included. There are of course more reasons why IT is used. Information Technology is immensely flexible and configurable. So, organisations have found many ways to innovate with them. However, let us return to the list and ask another question. Are organisations able to achieve all these objectives? Your responses will be varied. I want you to pause this video once again and think about this question.

I have found that many students who have worked in older organisations or firms that have been active for decades, say that IT is not able to achieve all the objectives for which it is used. Other students say that organisations are able to meet these objectives mostly, if not entirely. The point is that along with successes there are failures in use of IT. Firms have benefited massively by innovating with IT. By changing their business or by offering you products and services. However, there are also many situations in which organisations have failed at implementing their systems or in deriving benefits from their implemented system. Use of IT has its own consequences. Typically, when an organisation implements a system, it is to increase efficiency. This may be by increasing the speed of processing or by increasing the volume of processing. Sometimes organisations implement IT to improve the accuracy of processing. For instance, banks implement IT to increase the speed, the volume and the accuracy of financial transactions. An automated teller machine, what we call an ATM, allows people to obtain cash quickly and accurately. ATM transactions are faster. ATMs can handle more volume of transactions than human tellers and banks. These are consequences a bank would hope to attain by implementing IT. These are positive consequences. However, there can be negative consequences also. If employees or customers of an organisation refuse to use the IT or misuse it, the consequences are negative. In some situations organisations may not even be able to implement IT at all. An important point to note here is that the consequences of using IT could be intended or unintended. If the intended or unintended consequence is positive, we are happy. Organisations will achieve what they hope for and gain some extra benefit. However, if there are unintended negative consequences, the organisations will suffer. The whole point of managing IT and innovation is to ensure that organisations achieve the intended positive consequences and restrict, if possible, the negative unintended consequences. Of course, they would need to do nothing about positive unintended consequences. Guru: So, what exactly is an unintended consequence of using IT? Good question, Guru. Unintended consequences are those that are enabled or made possible by the use of information technology. However, these were not designed or planned for. For example, the use of ATMs by banks the intended consequence was to increase speed, volume and accuracy of dispensing cash. However, the unintended consequence is that banks now know when customers typically withdraw cash. How much cash an average customer wants? Whether ATMs are mainly used near markets or near offices, etc. Banks may not have designed the ATMs for this purpose. However, this information is now available because IT is being used. Banks can use this information for providing better services in future. That is why this can be considered as an unintended positive consequence. Before we move ahead, I want you to think about one last question. What could be unintended negative consequences of using IT? Do think about it.

First, Second and third order effects of using IT

Did you think about what could be negative consequences of using IT? I am sure you found many answers. One negative consequence many people mention is that of drowning in information. There is so much to read and see and listen to that we find it difficult to focus on any one thing. So, can consequences be only negative or positive? Can we think of different types of consequences? Certainly! MIT scientists have conceived three types of consequences that result from the use of IT. Rockart and Malone wrote in 1991 that IT has first, second and third order effects. First order effects are immediate effects of using a technology. These could be increase in speed, increase in volume or increase in accuracy of doing something. For instance, when cars were introduced in the U.S. in place of horse-drawn carts, people could travel faster and make more trips. When computers were first introduced they increased the speed of data processing. This resulted in the increase in volume of data processing as did the accuracy of processing. These were any ways the intended consequences. Second order effects are those that become visible after some time. For instance, with the invention of cars the second order effect was that people could travel more and go to places they would otherwise not have visited. The second order effect of using computers is that it often changes the organisation. For instance, the increase in processing speed and volume some departments and personnel may not be needed at all and may shift to other tasks. When ATMs were introduced in banks, the job of tellers was reduced and sometimes eliminated. Third order effects come in much later. These are large scale effects that impact the environment or the economy or the industry. So, when cars were introduced and began to be used widely cities started building roads, buildings, started creating parking lots and eventually suburbs of cities emerged as people realized that they could stay far away from their place of work and use the car to commute. On this slide, I will show you the emergence of suburbs here in New York City. The difference is in many years and you can see here that roadways or commuting pathways have been created which have emerged because now people have cars and they can use them to travel to different parts of the city. Third order effects of computers is varying. In some cases, businesses have been eliminated. For instance, with online booking sites, the people based travel agent services have disappeared. Also, across the banking industry, for instance, use of IT has led to a large number of banks becoming uncompetitive as they were unable to implement IT effectively and eventually closed down or were acquired

Rockart and Malone also predicted that there would be significant second and third order effects. Guru: So Prof. I don't get it. Don't you have to re-structure and change the organisation before you bring in computerisation? Or, don't you need second order effects before first order effects? Good question, Guru. The point is that first order effects eventually result in second order effects and not the other way round. Your intended consequences was the improvement in speed and accuracy that you wanted from computerization. The restructuring or second order effect happened because of the computerization. The second order effect could be an unintended consequence. To continue with what Rockart and Malone had predicted, they predicted that firms would begin to outsource their work and services a lot more, while relying on IT for co-ordination. This meant that firms could focus on their core business and rely on vendors and partners for other activities. They also predicted the demise of hierarchy in organisations. Because of communication, the big hierarchies of older days would not be necessary and matrix organisations would emerge. Matrix organisations have a mixed reporting structure. Employees are assigned to groups based on projects and tasks that they are working on. So, in a typical organisation, you would have a CEO or a top manager to whom other managers report and these managers would have people reporting to them otherwise. In matrix organisations, this reporting structure is changed so that you may still have one or two people reporting to the CEO, but there may be others who are also reporting to the CEO and to other managers in the organisation. A reporting structure is established in this manner. This is only for the duration of the project. When the project finishes the employees are reassigned to other groups and tasks. This is what is known as a matrix organisation.

In this unit, you learnt about another type of consequence of using IT, order effects i.e.

First order effect - increase in speed or efficiency

Second order effect - restructuring of organizations

Third order effect - restructuring of the industry

Through the video, you would have learnt that these effects can have significant influence, to the extent of eliminating an industry. The order effects can change the organization and the industry significantly. It is important for managers to understand these effects of using IT and then manage them to meet their objectives.

The decision making here involves:

knowing how to leverage IT to increase speed or efficiency - by reducing the negative consequences of using IT, and increasing the positive consequences.

knowing what are the retraining and restructuring needs of the organisation, so as to derive benefits from use of IT - some of the restructuring may be intended, while others may be unintended. Either way, it is important for managers to retrain workers so as to reduce the negative consequences.

knowing how to manage the consequences of restructuring of the industry - the consequences can be positive as well as negative for the organisation. The role of the manager is to reduce the impact (on the organisation) of negative consequences, while increasing the impact of positive ones.

Indicators of competitive dynamics Modern commercial firms have to use IT. It is not simply an option anymore for such firms. The competition has evolved in such a manner that firms have to use IT. Use it effectively or face severe negative consequences. And, why is this so? To understand why, we will have to turn to something called competitive dynamics. Competition in markets refers to how different firms try different things to attract customers. So, airlines may offer lower fares to attract customers away from their rivals. Phone makers may offer new and fancy features to pull customers away from their rivals. There are many such examples. Competitive dynamics refers to the manner in which competition itself has changed. Professors McAfee and Brynjolfsson from Harvard and MIT respectively, say that since about the mid-90s the nature of competition in U.S. firms has changed and a new dynamic has emerged. They found that there is a greater difference in the market shares of firms competing in the same industry than they use to be before. This difference is between the leading firms in the industry, those with highest relative market share, and the laggards, those with lowest market share. They found that this change in dynamics can be mainly attributed to more firms using IT to compete effectively. The change in competition is more complicated, though. Let us look at some scenarios. The most prominent third order effect of use of IT by firms is that of industry concentration. This means that the leading firms tend to take more and more of the market share which are known as the Winner-take-all markets. In practically every industry, a few firms with larger market shares consolidate their position and gain more at the cost of the others. Now, if we see this on a graph and I am plotting a graph here of market share which is on the vertical axis, so I will call this market share of top twenty largest firms. And this if we plot and in market share terms, we will just call this, say, hundred percent market share, which means, say one firm has the entire market and then we can break this down into 80, 60, 40 and so on. And, here if we look at the dates, let's say we are starting at 1965 and we look at the period from 1995 to say about 2005 what we will find basically is that the market share of these firms may have remained relatively stable across 30 years or so and then post 1995, owing to the massive investments in IT, this share of the market for the top twenty largest firms has increased significantly. This is what we are calling industry concentration. Another prominent third order effect is an increase in turbulence. Turbulence means the change in ranks of firms as they compete for market share. Increased turbulence means that firms that are rank one in a given year may have rank 10 in the next. In less turbulent industries ranks will not change so dramatically from year to year. The turbulence happens mainly because of the use of IT. Now, if you want to see this, an example of this is in the mobile phone industry. Great brands such as Blackberry and Nokia lost ground significantly to brands such as Apple and Samsung all within a short span of time. Now, if we have to see this on a graph, one can simply plot the ranks on the vertical axis and the change in ranks across the years. So, if I have here 1995, 96, 97, 98 all the way let's say to say 2005 and out here I am just plotting the ranks 1,2,3,4,5,6,7,8,9 and 10. And, ranks means that first rank company will have the highest market share. So, it may be possible

that you will see a company which has let's say 1995 rank near 1 it drops a little bit in maybe 1996 but it may drop significantly by 1998 to be 9th ranked and then stay here and then maybe recover in 2005. You may find another company which does something different which is low ranked for a few years but in 1995 may grab market share and dominate the rankings till 2005. This is the illustration of turbulence in the markets. A third effect of IT is that of the increase in the spread or difference between the profits of the best and worst firms. If we look at the profit margins of firms in the top 25 percent and those in the bottom 25 percent the gap is widening since the mid-nineties owing to the increased use of IT. Again, we can draw this on a graph and show what this effectively means. Now, I have here on the vertical axis the percentage gap between best and worst performing firms. So, we have this graph showing the percentage. This is the highest percentage. This is low. So, maybe I will put 10 percent here and maybe 100 percent here. And, if we have this as our marking point 1995, what we will find is that the percentage gap between the best and worst performers would maybe look something like this till about 1995 and then swing significantly post 1995 mainly because of the use of IT. Guru: All this is fine, for US companies. Does all this matter anywhere else in the world? Sure it does. This study focuses on U.S. firms but this is true for industries anywhere. Similar competitive dynamics are visible in Europe, India and other countries. Particularly in industries where there is a high use of IT.

The article from Harvard Business Review titled "Investing in the IT That Makes a Competitive Difference" by Andrew McAfee and Erik Brynjolfsson discusses the growing link between certain kinds of technology investments and intensifying competitiveness. Here's a summary of the key points related to the indicators of competitive dynamics and the principles of competing in the digital age:

Indicators of Competitive Dynamics:

1. ****Clear Correlation Between IT Spending and Competitive Dynamic****: Since the mid-1990s, there has been a clear correlation between levels of IT spending and a new competitive dynamic. The spread between the leaders and laggards in an industry has widened, leading to more winner-take-all markets.
2. ****Increased Churn Among Players****: Despite the increased concentration in industries, there's more churn among the remaining players, especially in IT-intensive industries.
3. ****Digitalization of Processes****: More processes are becoming digital, not just products. Enterprise software like ERP and CRM systems, along with cheap networks, allow companies to replicate their unique business processes quickly and consistently.
4. ****Hypercompetition****: Since the mid-1990s, competition in the U.S. economy has accelerated due to IT. Companies are rapidly replicating business-process innovations throughout their organizations using tools like ERP and CRM.

Principles of Competing in the Digital Age:

1. ****Deploy a Consistent Technology Platform****: Instead of using a mix of legacy systems, companies should deploy a consistent technology platform across the organization. For instance, Cisco reconfigured its IT systems for consistent execution of key business processes, leading to strong performance.
2. ****Innovate Better Ways of Working****: Companies should design better ways of doing work. The best candidates for innovation are processes that can be applied across a large part of the company, produce immediate results, require precise instructions, can be executed consistently, and can be tracked in real-time.
3. ****Propagate Process Innovations****: Use IT to replicate process innovations throughout the company. An example is CVS pharmacies, which embedded a process change in their information systems across all their locations, leading to improved performance and customer satisfaction.

The article emphasizes that the link between technology and competition has strengthened since the mid-1990s. Companies that can adapt and compete at high speeds in this new environment stand to gain improved business processes, higher market share, and increased market value.

Note: The provided content is not complete. If you'd like more detailed information or further insights from the article, please let me know, and I can fetch the remaining data for you.

Competing with IT in the digital age. Now, let us return to the question of how IT is doing all this. How is it changing competitive dynamics? It turns out that firms that are competing successfully and are the winners are using a simple method. The first thing they do is find out what process should be done consistently across the organisation. Once these are identified, they are replicated or copied in different departments of the organisation and worldwide if need be by using the underlying IT infrastructure. This is the deployment step. The next thing they do is look at all the data they have gathered within their IT infrastructure, and see how they can innovate. This is known as analytics, where firms analyse their internal data to look for opportunities to serve customers better or improve their products. The third thing to do is find the best processes or best practices and also replicate them across the organisation. This is the step of propagation of the best ideas throughout the firm. It enables doing this rapidly. Guru: What if people don't agree that something is a best practice? Good question again! Management has to assure itself that a best practice is indeed a best practice. This is where analytics comes in. Once they are assured of the claim, the processes can be propagated.

Decision Junction

After going through the video and the reading material, you would have learnt the three indicators of competitive dynamics, i.e.

- Industry concentration
- Turbulence
- Performance spread

These indicators have demonstrated that organisations using IT to innovate have been able to win over competition, not so much because of the technology itself, but because technology has given them the tool to compete in the digital age.

The decision making here involves :

- what are the processes that should be deployed consistently across the organisation, and how IT is used for this deployment
- how to use the insights gained from data within the IT infrastructure to innovate
- how to leverage technology to propagate the best ideas across the firm.

Prof: Let us consider digital goods and their properties. A digital good is anything that can be digitised. That's easy, isn't it? Now a days just about anything can be digitised or made available in digital form. Movies, songs, news, books, movie tickets, photographs, stocks, report cards, degree certificates, birth certificates, digital currencies like Bitcoin. You name it and it is in digital form. Guru: So my car is digital too? Prof: You have a car, Guru? Guru: What do you think? Prof: No. Cars can't be digitised. But then, modern cars have a lot of digital goods in them. Bets you have a music player and touch screen display in your car. Guru: Of course. Prof: Like all other types of goods, digital goods have certain properties. It is important to understand these properties. Why? To ensure that we are able to manage digital goods and innovate with them. We should know how they behave. One of the most important properties of digital goods is cost. Such goods are typically expensive to produce the first time but cheap to reproduce. For example, the popular Indian movie 3 Idiots cost around 8 million dollars to produce in 2009. This movie can be copied in its entirety on to a DVD disk for less than a dollar. This Property is visible in most digital goods. Stock Quotes are expensive to collect from the trading system and display but once produced, they can be copied and spread at very low cost. Related to this property is a fact that digital systems do not have significant capacity constraints. You can make as many copies of the movie as the systems can hold. However, making a movie for the first time does have capacity constraints. As a lot of time and money are required. You must have seen Hardback books. Many publishers release hardback books by popular writers, when first published. A few months later, the paperbacks of the same book is released. These are called versions of the book. The hardback is released earlier and cost more. The paperback is release later and cost less. Those who want to read these – the book – when it is released, buy the hardback version. It is often the case that both the hardback and paperback versions cost about the same to produce. For digital goods too versions can be made quite inexpensively. For example, many apps for mobile phones are released as free versions with some limited functionality. And also as paid versions with better features. Now a days books are released in three versions: Hardback, Paperback and Digital or EBook version. Guru: I only buy hardbacks. Prof: You have expensive tastes. Hardback versions are the most expensive

Properties of digital goods

In this unit you will learn the important properties of digital goods and how to use these properties strategically

Prof: There other examples of versions. Cricket scores are released first on paid channels such as television or radio. Free scores are delayed a little and sent out on mobile phone apps. It is the same with Stock Quotes. The true value of many things is evident only when we use or consume it. For instance, how good a movie is not known when we the buy the ticket. We can only tell after seeing the movie. These are experience goods. Most digital goods are also experienced goods. We can tell if they are value for money only after using them. People who sell such goods provide samples for people to experience the goods briefly to help them buy. Movie trailers, book excerpts are all samples that let a person experience the good. Digital goods are, typically, easier to sample. There is no real difference between a image you capture in your smartphone and a copy of it. This is true for all digital goods. The original and the copy are identical. So, the difference between the original and the copy disappears. You can see a digital picture many times or play an mp3 song endlessly. It will never were out. It will never lose quality. This is another property digital goods do not deteriorate over time. This leads to an interesting question. Can anyone steal a digital good? Guru: Sure they can. Someone stole a lot of software from my friend's company.

Prof: Okay. So the company doesn't have the software anymore? Guru: What do you mean? Of course, they have the software, but this person stole it. Prof: If they still have the software, then why do you say it was stolen? If somebody steals your car, you don't have it anymore, and that is called stealing.

Guru: Hair-splitting! Stealing is stealing. Prof: Somebody made an illegal copy of your friend's company's software. Copyright violation yes, but not stealing. Lock-in to technology happens when use technology, get use to it and cannot work without it anymore. This property is not of digital goods as much as it is a property of information technology that delivers the digital goods. It enhances the value of the information within digital goods but making it available easily for instance. When we get use to this this easy availability, we also get locked into the technology. Lock-in happens with all IT we use. We are locked into our e-mail, the apps we use on our smartphones, the word processor we use and so on. Lock in may be to the brand of the technology or to the type or simply to the way use technology. Organisations too get locked into the technology they buy and invest in.

Once they start using the technology there is a lot of data that is created. People are trained on the system and lot of crucial activities are done with the system. To move away from this system the organisation will have to incur a switching cost. Think of moving from one smartphone to another.

After buying a new smartphone you may have to incur further cost and put in effort to move your contact details, your pictures and documents, and also all the settings that you had on the old phone. Sometimes switching costs can be quite high and so organisations land up using a particular technology for years. A key aspect of managing systems is to try and keep switching costs down while upgrading or changing the system.