

COMP5206 Notes

Weekly Readings

IT Doesn't matter – Nicholas G. Carr

Today Information Technology has become the backbone of commerce. As IT's power and presence has increased, companies have come to view it as a resource critical to their success. Today chief executives routinely talk about the strategic value of information technology and how IT can be used to gain a competitive advantage and how to digitize their organisation.

What makes a resource truly strategic is not ubiquity but scarcity. IT's potency and ubiquity has increased and so has its strategic value but lost the competitive edge it once had. One can have a competitive edge over other only if they don't have what you have. But today, the core functions of IT: data storage, data processing and data transport is available to all. They have become a cost to businesses. As the availability increased and their cost decreased from a strategic standpoint, it became invisible, it just didn't matter anymore.

A distinction needs to be made between proprietary technologies and infrastructural technologies. Proprietary technologies can be owned by a single company thus making its products/services something hard to replicate. If they remain protected, proprietary technologies can be the foundations for long term strategic advantages enabling the company to earn more profits. Infrastructural technologies offer more value when shared. An example could be the mobile phone. In the earlier stages of development of the infrastructural technologies, it can act as a proprietary technology to gain advantage over rivals. Infrastructural technology can enable new, more efficient operating methods and often lead towards broader market changes.

The window of opportunity for taking advantage of the infrastructural property is available only briefly. When the technology's commercial potential begins to be broadly appreciated, the returns come in extremely quickly. This initiative is called as the buildup phase. By the end of the buildup phase the opportunities for the individual advantage are largely gone. It becomes cheap and easily available and hence doesn't continue to influence the competition. But the influence is felt on a macroeconomic level and not at the level of a company.

Although more complex and malleable than its predecessors, IT has all the hallmarks of an infrastructural technology. IT is, first, a transport mechanism, and like any transport mechanism, it is far more valuable when shared than when used in isolation. The history of IT in business has been a history of increased interconnectivity and interoperability. Each stage in that progression has involved greater standardization of the technology. IT is also highly replicable. The arrival of the Internet has accelerated the commoditization of IT by providing a perfect delivery channel for generic applications. Finally, IT is subject to rapid price deflation.

The rapidly increasing affordability of IT functionality has not only democratized the computer revolution, but it has also destroyed one of the most important potential barriers to competitors. Even the most cutting-edge IT capabilities quickly become available to all. But the opportunities for gaining IT-based advantages are already dwindling. Best practices are now quickly built into software or otherwise replicated. And as for IT-spurred industry

transformations, most of the ones that are going to happen have likely already happened or are in the process of happening.

When a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantages it provides. Today, an IT disruption can paralyse a company's ability to make its products, deliver its services, and connect with its customers, not to mention foul its reputation. Given the rapid pace of technology's advance, delaying IT investments can be another powerful way to cut costs. The smartest users of technology stay well back from the cutting edge, waiting to make purchases until standards and best practices solidify. They let their impatient competitors shoulder the high costs of experimentation, and then they sweep past them, spending less and getting more. The key to success, for most companies, is no longer to seek advantage aggressively but to manage costs and risks meticulously.

What is disruptive innovation? – Clayton M. Christensen

The theory of disruptive innovation has proved to be a powerful way of thinking about innovation-driven growth. Despite broad dissemination, the theory's core concepts have been widely misunderstood and its basic tenets frequently misapplied. Disruption describes a process whereby a smaller company with fewer resources can successfully challenge established incumbent businesses.

As incumbents focus on improving their products and services for their most demanding customers, they exceed the needs of some segments and ignore the needs of others. Entrants that prove disruptive begin by successfully targeting those overlooked segments, gaining a foothold by delivering more-suitable functionality—frequently at a lower price. Incumbents, chasing higher profitability in more-demanding segments, tend not to respond vigorously. Entrants then move upmarket, delivering the performance that incumbents' mainstream customers require, while preserving the advantages that drove their early success. When mainstream customers start adopting the entrants' offerings in volume, disruption has occurred.

Uber is clearly transforming the taxi business. According to the disruptive theory, the answer is no. Uber's financial and strategic achievements do not qualify the company as genuinely disruptive—although the company is almost always described that way. Here are two reasons why the label doesn't fit. Disruptive innovations originate in low-end or new-market footholds. Disruptive innovations are made possible because they get started in two types of markets that incumbents overlook. In the case of new-market footholds, disrupters create a market where none existed. A disruptive innovation, by definition, starts from one of those two footholds. But Uber did not originate in either one. Disrupters start by appealing to low-end or unserved consumers and then migrate to the mainstream market. Uber has gone in exactly the opposite direction: building a position in the mainstream market first and subsequently appealing to historically overlooked segments.

Disruptive innovations don't catch on with mainstream customers until quality catches up to their standards. Disruption theory differentiates disruptive innovations from what are called sustaining innovations. The latter make good products better in the eyes of an incumbent's existing customers. Disruptive innovations, on the other hand, are initially considered inferior by most of an incumbent's customers. Most of the elements of Uber's strategy seem to be sustaining innovations. Uber's service has rarely been described as inferior to existing taxis.

Disruption is a process. The term “disruptive innovation” is misleading when it is used to refer to a product or service at one fixed point, rather than to the evolution of that product or service over time. Disrupters tend to focus on getting the business model, rather than merely the product, just right. The fact that disruption can take time helps to explain why incumbents frequently overlook disrupters.

Disrupters often build business models that are very different from those of incumbents. Some disruptive innovations succeed; some don’t. But success is not built into the definition of disruption: Not every disruptive path leads to a triumph, and not every triumphant newcomer follows a disruptive path. The mantra “Disrupt or be disrupted” can misguide us. Incumbent companies do need to respond to disruption if it’s occurring, but they should not overreact by dismantling a still-profitable business. It is rare that a technology or product is inherently sustaining or disruptive. And when new technology is developed, disruption theory does not dictate what managers should do. Instead, it helps them make a strategic choice between taking a sustaining path and taking a disruptive one.

The theory of disruptive innovation was simply a statement about correlation. Smart disrupters improve their products and drive upmarket. Additional refinements to the theory have been made to address certain anomalies, or unexpected scenarios, that the theory could not explain. For example, we originally assumed that any disruptive innovation took root in the lowest tiers of an established market—yet sometimes new entrants seemed to be competing in entirely new markets. This led to the distinction we discussed earlier between low-end and new-market footholds. Understanding what drives the rate of disruption is helpful for predicting outcomes, but it doesn’t alter the way disruptions should be managed. Disruption theory does not, and never will, explain everything about innovation specifically or business success generally.

A view of Cloud Computing

Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services. The data centre hardware and software are what we will call a cloud. When a cloud is made available in a pay-as you-go manner to the public, we call it a public cloud; the service being sold is utility computing. We use the term private cloud to refer to internal data centres of a business or other organization, not made available to the public.

Cloud computing is the sum of SaaS and utility computing but does not include small or medium sized data centres, even if these rely on virtualization for management. From a hardware provisioning and pricing point of view, three aspects are new in cloud computing:

- The appearance of infinite computing resources available on demand eliminating the need for cloud computing users to plan far ahead for provisioning.
- The elimination of an up-front commitment by cloud users, thereby allowing companies to start small and increase hardware resources only when there is an increase in their needs.
- The ability to pay for use of computing resources on a short-term basis as needed and release them as needed, thereby rewarding conservation by letting machines and storage go when they are no longer useful.

We see three particularly compelling use cases that favour utility computing over conventional hosting.

- When demand for a service varies with time.
- When demand is unknown in advance.
- Organizations that perform batch analytics can use the “cost associativity” of cloud computing to finish computations faster.

The following are the top 10 obstacles and opportunities for cloud computing:

- Business Continuity and Service Availability

Business continuity is a proactive way to ensure mission-critical operations proceed during a disruption. Service availability is simply the measure of the service being available and accessible to the customers during the time you promised to keep the service available. It's usually calculated as a percentage.
- Data lock in

Software stacks have improved interoperability among platforms, but the storage APIs for cloud computing are still essentially proprietary, or at least have not been the subject of active standardization. Thus, customers cannot easily extract their data and programs from one site to run on another. Customer lock-in may be attractive to cloud computing providers, but their users are vulnerable to price increases, to reliability problems, or even to providers going out of business.
- Data confidentiality/auditability

Security is one of the most often-cited objections to cloud computing. Cloud users face security threats both from outside and inside the cloud. Many of the security issues involved in protecting clouds from outside threats are like those already facing large data centres. In the cloud, however, this responsibility is divided among potentially many parties, including the cloud user, the cloud vendor, and any third-party vendors that users rely on for security-sensitive software or configurations.
- Data transfer bottlenecks

Applications continue to become more data intensive. One opportunity to overcome the high cost of Internet transfers is to ship disks.
- Performance unpredictability

Multiple virtual machines (VMs) can share CPUs and main memory surprisingly well in cloud computing, but that network and disk I/O sharing is more problematic. One opportunity is to improve architectures and operating systems to efficiently virtualize interrupts and I/O channels. Another possibility is that flash memory will decrease I/O interference. Another unpredictability obstacle concerns the scheduling of virtual machines for some classes of batch processing programs, specifically for high performance computing.
- Scalable storage

The opportunity is to create a storage system that would not only meet existing programmer expectations regarding durability, high availability, and the ability to manage and query data, but combine them with the cloud advantages of scaling arbitrarily up and down on demand.
- Bugs in large scale distributed systems

One of the difficult challenges in cloud computing is removing errors in these very large-scale distributed systems. One opportunity may be the reliance on virtual machines in cloud computing.

- Scaling quickly
The opportunity is to automatically scale quickly up and down in response to load to save money, but without violating service level agreements.
- Reputation fate sharing
One customer's bad behaviour can affect the reputation of others using the same cloud. Another legal issue is the question of transfer of legal liability.
- Software licensing
Current software licenses commonly restrict the computers on which the software can run. The primary opportunity is either for open source to remain popular or simply for commercial software companies to change their licensing structure to better fit cloud computing.

Cloud computing will grow. Regardless of whether a cloud provider sells services at a low-level abstraction or higher level, computing, storage, and networking must all focus on the horizontal scalability of virtualized resources rather than on a single node performance. Moreover:

- Applications software needs to both scale down rapidly as well as scale up, which is a new requirement.
- Infrastructure software must be aware that it is no longer running on bare metal but on VMs.
- Hardware systems should be designed at the scale of a container, which will be the minimum purchase size.

How Cloud Computing Is Changing Management

Cloud computing is changing how products are designed; enabling closer collaboration between the corporate IT department and other business units, including sales, finance, and forecasting; and fostering more customer interaction, even to a point of jointly developing products with their consumers. New ways of writing and deploying software will encourage new types of faster-acting organizational designs. “Cloud native” software approaches stresses ease of use and low-impact alteration of components of any given software application. Massive applications are subdivided into a series of “microservices” that can be tweaked with little effect on a running piece of software.

With cloud, information travels rapidly in both directions, across computing systems that, with attributes like virtualization, scaling up or down to handle bigger workloads, or automated security patching across thousands of machines, are far more flexible. This will likely mean a more flexible work structure as well, in the interest of products and services that ideally can be adjusted to anticipate customer needs. As cloud technology improves, however, it is becoming easier for companies to create products and services within the cloud, or model new products or marketing campaigns as cloud-based software prototypes. The cloud is also a common repository for the collection and analysis of new data, and the place where an increasing number of artificial intelligence operations, like image and speech recognition, are conducted.

It is possible to deploy and manage an application globally, from a single location, with relatively little hassle. Fixed job roles, like software engineering or financial planning, may evolve towards domain knowledge, which is shared in collaborative teams, brought together, and disassembled for some part of a product life cycle. Companies may partner more deeply, taking advantage of each other's comparative advantage to meet a new market need. Managers will need to concentrate more than ever on skills such as collaboration, empathy, learning, and

novel rewards to create an organization hopefully even more adaptive than the cloud computing IT tool it beholds.

Should You Invest in the Long Tail?

Blockbuster is a time-honoured approach, particularly in the media and entertainment sector. In this method, producers focus their market resources on a small number of likely best sellers. This approach involves a substantial risk but the occasional hit's huge pay-off will cover the losses of many misses, and that a few big sellers will bring in the lion's share of revenues and profits.

One school of thought thinks that the blockbuster method is still effective. According to them broad, fast communication and easy replication create a situation wherein popular products becomes disproportionately profitable. This makes the customer tastes and buying habits converge. This idea is supported by 3 reasons:

- Lesser talent is a poor substitute for greater talent.
 - Why would customers purchase the second best if the best is available for cheap?
 - Thus, even a tiny advantage over competitors can be rewarded by an avalanche of market share.
- People are inherently social
 - This makes people find value in listening to the same music and watching the same movies that others do.
- When the marginal cost of reproducing and distributing products is low, the cost advantage of a brisk seller is huge.

The other school of thought is the long tail theory which theorizes that customers will migrate away from similar products and drift towards products that are easily customizable to them. Thus, the school of thought proposes to focus on the profits from long tail, those are the niche offerings that cannot be profitably provided through brick-and-mortar channels.

According to the research conducted by the author, Anita Elberse, many customers occasionally select obscure offerings that are probably not available in brick-and-mortar stores. Meanwhile, consumers of the most obscure content are also buying the hits. A balanced picture emerges of the impact of online channels on market demand. The research showed how difficult it is to derive profits from the long tail. Hence the author provides the following advice:

Advice to the producers:

- Do not change the blockbuster strategy, let the amount of resource allotted for this remain the same or have little changes but not major ones. This is because of the very limited profits derived from the long tail strategy.
- When producing niche products for the long tail, make sure to keep the costs as low as possible, this is because the profit margins aren't as profitable as one might think.
- When trying to strengthen the company's presence in an online platform, focus on marketing the most popular products.
- Leverage the scale of the company to improve online exposure and demand for the products across the product portfolio.

Advice to the retailers

- If the goal is to cater to those customers who pay the most, diversify the number of niche products on sale.

- Strictly manage the cost of offering products that will rarely sell. If possible, construct online models through which you incur no costs until the customer initiates contract.
- Acquire and manage customers through the most popular products.
- Even though obscure products have huge profit margins, resist the temptation to direct the customers to the long tail otherwise one may face the risk of dissatisfaction of the customers.

Today's consumers have advantages that no prior generation had. Online commerce has done away with the constraints of the physical store; selections are now vast and supported by rich information.

Competing in the Age of Omnichannel Retailing

Technology is changing the retail landscape through the following points:

- The distinctions between physical and online retailing are vanishing.
- Advanced technologies on smartphones and other devices are merging touch and-feel information in the physical world with online content, creating an omnichannel environment.
- Online and offline retailers may need to compete in new and innovative ways.

In the past, brick-and-mortar retail stores were unique in allowing consumers to touch and feel merchandise and provide instant gratification. As the retailing industry evolves toward a seamless “omnichannel retailing” experience, the distinctions between physical and online will vanish, turning the world into a showroom without walls. The retail industry is shifting toward a concierge model geared toward helping consumers, rather than focusing only on transactions and deliveries. Mobile applications themselves are becoming increasingly advanced. Augmented reality technologies involving smartphones and devices are merging touch-and-feel information in the physical world with online content in the digital world.

The opportunity of mobile technology is in the multitudes. Mobile technology is well on its way to changing consumer behaviour and expectations. Apps from retailers allow consumers to search for products and prices available locally. By giving consumers more accurate information about product availability in local stores, retailers can draw in people who might otherwise have only looked for products online. Certain apps can make recommendations (based on location and other factors) that consumers may not have even heard of. Meanwhile, the availability of product price and availability information, the ability of consumers to shop online and pick up products in local stores, and the aggregation of offline information and online content have combined to make the retailing landscape increasingly competitive. Retailers used to rely on barriers such as geography and customer ignorance to advance their positions in traditional markets. However, technology removes these barriers. Location-based apps open new selling opportunities. Smartphones enable tracking of consumers that previously was possible only via fixed connections to the Internet.

Although omnichannel retailing has some features that are related to e-commerce. Retailers should begin by adapting best practices from both the offline and online worlds in areas including pricing, designing the shopping experience, and building relationships with customers. Some successful strategies for omnichannel retailing are given below:

- Provide attractive pricing and curated content.
 - Consumers come to Amazon for good prices, but they also expect Amazon to curate merchandise, so they won't get lost in a sea of products. Amazon is known for its neat and systematic presentation. In addition, Amazon's well-

curated consumer-generated content and reviews makes it easy for consumers to interact with Amazon while going through their purchase decision process.

- Harness the power of data and analytics.
 - Part of the promise of omnichannel retailing is an explosion of new data from social, mobile, and local channels. This provides an unprecedented opportunity to understand not just customer transactions but also customer interactions.
- Avoid direct price comparisons.
 - While consumers benefit from easy search, such capabilities can be damaging to sellers. Taking steps to make direct comparisons difficult can protect retailers from poaching by competitors and mitigate the effects of price competition. Consider the following options:
 - Offer distinctive features for the products.
 - Focus on product development to create exclusive products that are not available to the competitors.
 - Bundling products can make it difficult for consumers to do a direct comparison of the value of your offering with those of competitors.
- Learn to sell niche products.
 - Online retailers will still have advantages over physical stores in selling narrowly focused “Long Tail” products that are not economical for stores to carry.
- Emphasize on product knowledge.
 - The shift toward omnichannel retailing allows consumers to accumulate product knowledge in one channel and then purchase from another channel. Therefore, retailers need to do a better job of sharing product knowledge across their entire platform. Doing so will facilitate channel integration and attract shoppers who prefer shopping in multiple channels.
- Establish switching costs.
 - Retailers can reduce the amount of competition they face by creating switching costs.
- Embrace competition.
 - Retailers selling high-quality products or featuring low prices will do well in a world with lower search costs and more transparency.

As retailers adapt their selling strategies to an omnichannel environment, the changes will be felt by players both upstream and downstream. These are:

- The manufacturers who supply products to retailers may no longer be able to produce large volumes of the same product for different retailers. Manufacturers will need to become agile at producing smaller and more customized batches of products.
- The boundaries between manufacturing and retailing will blur.
- Retailers may decide to backward-integrate into manufacturing.

Technology is making omnichannel retailing inevitable and is reducing the ability of geography and ignorance to shield retailers from competition. It is breaking down the barriers between different retail channels as well as the divisions that separate retailers and their suppliers.

Two hearts in three-quarter time: How to waltz the social media/viral marketing dance

The concept of viral marketing has been discussed in literature for over 15 years, in this article the insight into the relationship between social media and viral marketing has been given. Certain question has been answered through the article and the answers are as follows:

- Viral marketing goes social media.

A simple equation for Viral Marketing can be given as:

$$Viral\ Marketing = Word\ of\ Mouth + Exponential\ Growth\ through\ Social\ Media$$

- Word of Mouth and Viral marketing.

Word of mouth (WoM) can be loosely defined as the sharing of information about a product, service, promotion, etc. between a consumer and a friend, colleague, acquaintance, etc. WoM has been shown to substantially influence consumer attitudes and behaviours and is said to be up to 7 times more effective than print advertising in brand switching decisions.

Viral marketing is defined as the electronic word of mouth whereby some form of marketing message of a company, brand, product, etc. is transmitted in an exponentially growing way often using social media.

- How to create an epidemic.

- To make viral marketing work, three basic criteria need to be met:

- The right people - There needs to be 3 groups of messengers who are required to ensure the transformation of an ordinary message into a viral phenomenon:
 - Market mavens: These are defined as individuals who have access to a large amount of marketplace information and proactively engage in discussions with other consumers to diffuse and spread this information. These people are the first to receive the message and transmit it to their immediate social network.
 - Social hubs: These are the people who are given information from the market mavens. These people are defined as people with an exceptionally large number of social connections who often know hundreds of different people and can serve as connectors or bridges between different sub-cultures. The social hubs have an exceptional network and can diffuse information to hundreds, if not thousands of other consumers.
 - Salespeople: These people also receive information from the market mavens. They amplify the message by making it more relevant and persuasive and then transmit it to the social hub for further distribution.

- The right message

- Messages need to be both memorable and sufficiently interesting to be passed on to others. Only when this criterion is satisfied can the message have the potential to spur a viral marketing phenomenon. Making a message more memorable and interesting can be done by the following few methods:
 - Information relies on true stories about real people. These are more persuasive than corporate advertising.
 - Use rumours, especially positive ones. These have a high chance of transmitting others.
 - Obvious safe bets like practical short lists, humorous, hilarious, or even sex-based messages which can trigger an emotional response in the receiver.

- Right circumstances

- In addition to the people and the message, the environment also plays an important role in the success or failure of viral

marketing. Firstly, messengers will pass the message only if the message is something which consumers do not know about. Secondly, good luck.

- Social media viral marketing campaigns.
 - Viral marketing campaigns emerge from an interaction between the firm and its customer base. Like any other marketing campaigns, the result can be either positive or negative. Combining the 2 dimensions there are 4 different types of viral marketing campaigns:
 - Nightmares – Negative outcomes due to initiation by customers.
 - Strokes of luck – Positive outcomes due to initiation by customers.
 - Homemade issues – Negative outcomes due to initiation by company.
 - Triumphs – Positive outcomes due to initiation by company.
- Spreading the virus.
 - There are some basic rules to follow when spreading the virus.
 - Viral marketing is as good as the remaining market mix.
 - Viral marketing needs to be backed up by traditional forms of communication.
 - Excessive planning and intervention will kill any viral marketing campaign.
 - Highly proactive and edgy messages are a tricky business.
 - Successful viral marketing requires a little bit of luck and gut feeling.
- From epidemics to immunity.
 - The small world experiment illustrates very well the tremendous reach that can be achieved through interpersonal communication. On a more abstract level it also shows how viral marketing can lose its potency in sometime in the future. It might become something like telemarketing and television advertising which have become increasingly ineffective over the recent years.

Increasing the ROI of Social Media Marketing

Many companies today are investing in social media channels to rapidly create or propagate their brand through viral content, social media contests, and other such consumer engagement efforts. An effective social media strategy should clearly define the marketing objectives, evaluate the opportunities, and select an appropriate form of social media to communicate. Following is a 7-step framework for social media marketing:

- Monitor the brand-related conversations that are happening in the social media platforms. This way businesses can gain access to valuable information, influential people and relevant conversations that already show engagement with the brand.
- Identify influential individuals who can spread messages.
- Identify the factors shared by influential individuals.
- Locate those potential influencers who have interests relevant to the campaign.
- Recruit those influencers with interests relevant to the campaign to talk about the company's product or service.
- Incentivize those influencers to spread positive Word of Mouth (WoM) about the product/service.
- Reap the rewards from increasingly effective social media campaigns.

Hokey Pokey ice cream creations is an upscale ice-cream retailer with more than a dozen outlets across India, offering a unique selection of super-premium ice-cream. The

company implemented the above 7 step process over a 30-month period. 6 months for the first step. For the second step, influencers were identified based on 3 parameters:

- The number of times an individual's messages were forwarded by recipients.
- The number of connections that those messages jumped.
- The number of comments and replies the users received on each message.

The third step allowed to categorize the individuals based on the following characteristics:

- Activeness as the number of times the influencer and their network see or share messages.
- Clout as the number of connections and followers the influencer has.
- Talkativeness of the receiver as how often the influencer's message was retweeted, reshared, etc.
- Like-mindedness as how much similarities were shared between the influencer and their network.

The fourth step was to locate the potential influencers with interests aligned to the campaign. Following the fourth step, in the fifth step, influencers already engaged in social media discussions related to the campaign category were recruited. In the sixth step the campaign was implemented in 2 stages: creations on the wall and share your brownies. In the final step, the results of the campaign were measured.

The campaign results had effects at both company and customer level. At the company level, the main impact was in social media accountability. At the customer level, being able to calculate certain variables allowed the company to greatly enhance their efficacy of their social media campaign. This campaign style could be extended to larger global enterprises as well. This methodology is focused on brick-and-mortar retailers, but the same methodology would also work for online retailers. However, the changes in privacy policy of social medias can make it increasingly difficult to collect data.

Digital Ubiquity: How Connections, Sensors, and Data Are Revolutionizing Business

For more than a century General Electric (GE) made most of its revenue by selling industrial hardware and repair services. But in recent years, GE was at a risk of losing many of its top customers to its competitors. These competitors aimed to shift the customer value proposition away from acquiring reliable industrial equipment to deriving new efficiencies and other benefits through advanced analytics and algorithms based on the data generated from that equipment. The threat was the conversion of GE into a commodity equipment provider.

GE responded by adding digital sensors to its machines and connecting them to a common cloud-based software platform. It invested in modern software development capabilities, building advanced analytics capabilities, and embracing crowdsourced product development. This transformed their business model. This made the profits derived from simple sales transactions to performance improvements.

Some fundamental properties of digital technology:

- Unlike analogue signals, digital signals can be transmitted perfectly without error.
- Digital signals can be replicated indefinitely without any degradation.
- Once the investment in network infrastructure has been made, there are rarely any marginal

These properties improve the scalability of operations and make it easy to combine new and old business processes and connect industries and communities to generate new opportunities. These 3 fundamental properties drive the transformation enabled by ubiquitous digital technology. Digital ubiquity started with the transformation of software companies who switched from product to service revenue. Adapting to ubiquitous digital connectivity is now essential to competitiveness in most sectors of the economy.

A business model is defined by 2 things: how the organisation creates value for its customers and how it captures the value. Digital transformation changes both. For example, GE would have tried to sell more equipment in the past, but now it would use analytics for some performance optimization and efficiency increase to create more value. Although GE sells less hardware now, it has developed a long term mutually profitable partnership. Customer engagement has become a far more complex process. It requires an approach to solution development that integrates technology, connectivity, and analytics with the client's proprietary financial and operational data.

Over time digital technology and the internet of things will transform virtually every sector and every business. Through the following tips, one can embrace these changes:

- Apply the digital lens to existing products and services.
- Connect your existing assets across companies.
- Examine new modes of value creation.
- Consider new value capture modes.
- Use software to extend the boundaries of what you do.
- New structure will cause new risks, face them.

The truth about blockchain

Contracts, transactions, and records of them provide a critical structure to the economic system but they haven't kept up with the world's digital transformation. Blockchain promises to solve this problem. Blockchain is an open, distributed ledger that records transactions safely, permanently, and very efficiently.

Blockchain is not a disruptive technology which would attack traditional business models but a foundational technology which has the potential to create new foundations for the economic and social systems. Blockchain is a peer-to-peer network that sits on top of the internet. It enables bilateral financial transactions and Bitcoin is the first application of blockchain technology. It has the potential to become the system of record for all transactions and this would make the economy undergo radical shifts. In blockchain, the ledger is replicated in many identical databases, each hosted and maintained by an interested party. When changes are made on one copy, all other copies are simultaneously updated.

History suggest that 2 dimensions affect how a foundational technology, and its business use cases evolve. These dimensions are:

- Novelty
 - The degree of newness of the technology to the world.
 - The more novel it is, the more effort is required to ensure users understand it.
- Complexity
 - Represented by the level of ecosystem coordination involved to produce value with the technology.

These 2 dimensions create 4 stages of development of the technology:

- Low novelty low complexity – Single use case.
 - These create applications which are better, less costly, and highly focussed.
- Low novelty high complexity – Substitution with existing product case.
 - Built on existing single use and localized applications but require high coordination needs as they involve broader and public uses. They face high barriers to adoption and may take years of consistent effort.
- High novelty low complexity – Localization of product.
 - Needs only a limited number of people to make value and hence is easily adoptable.
- High novelty high complexity – Transformation of current products.
 - If anything falls in this stage, it has the potential to transform the economic, social, and political systems if successful. Their adoption will require major social, legal, and political change.

Understanding which quadrant, the blockchain innovation falls into will help executives understand the types of challenges it presents, level of collaboration, consensus it needs, etc. The easiest place to start approaching blockchain investment is single use applications. Another low-risk approach is to use blockchain internally as a database for applications. Localized applications are a natural next step for companies.

Transformative applications are still far away but they would have the most impact. They will be the most powerful when tied to a business model in which the logic of value creation and capture departs from existing approaches. Two areas it could have the greatest impact:

- Large scale public identity systems such as passport control, etc.
- Algorithm driven decision making applications.

Putting the Enterprise into the Enterprise System

Enterprise systems are commercial software packages that promise seamless integration of all the information flowing through the company. Companies fail to reconcile the business problems with the technological imperatives of the enterprise system. An Enterprise Resource Planning (ERP) system enables a company to integrate the data used throughout its entire organisation. This data can span across all the departments including financials, human resources, operations and logistics, sales, and marketing, etc.

ERP systems can deliver great rewards but also have great risks associated with them. An ERP system at its core is a single comprehensive database. The database collects data from and feeds data into modular applications supporting virtually all the company's business activities. An Enterprise System streamlines a company's data flows and provides management with direct access to a wealth of real time operating information.

Initially the software was modified to fit the business model, but today, the business model needs to be changed to fit the ERP requirements. In addition to having important strategic implications, enterprise systems also have a direct and often paradoxical impact on a company's organization and culture. On one hand it eases business processes by providing real time data but on the other hand it centralizes the control over information and standardizes the processes. Each company has a different balance between commonality and variability. The companies that stressed on the enterprise and not on the system gained the greatest benefits.

Every company that installs an enterprise system struggles with its costs and complexity but the companies that have the biggest problems are those which install an enterprise system without thinking through its full business implications.

The Bullwhip Effect in Supply Chains

Distorted information from one end of the supply chain to the other can lead to tremendous inefficiencies. The bullwhip effect is a supply chain phenomenon where orders to suppliers tend to have a larger variability than sales to buyers, which results in an amplified demand variability upstream. The common symptoms of a supply chain afflicted with the bullwhip effect can be excessive inventory, poor product forecasts, poor customer service due to unavailable products, etc. There are 4 major causes of the bullwhip effect, these are:

- Demand forecast updating
 - This is done for production scheduling, capacity planning, inventory control, and material requirements planning. Forecasting is usually done on the order history from the company's immediate customers.
- Order batching
 - Each company places an order with its supplier in batches or accumulates demands before placing the order. There are 2 forms of order batching:
 - Periodic ordering
 - Orders are placed periodically based on the order cycles. It can be weekly, monthly, quarterly, or even yearly.
 - Push ordering
 - A company experiences regular surges in demand. Push ordering is an arrangement that is made to replenish the stock after it has been sold. The stock will come from a central distribution centre that distributes to various centres for sale.
- Price fluctuations
 - Forward buying occurs when retailers purchase units during a particular period, hold some of them in inventory, and then sell them in subsequent periods. This results from price fluctuations in the market. When the cost of holding inventory is less than the price differential, then forward buying makes sense.
- Rationing and shortage gaming
 - When product demand exceeds supply, the manufacturer may often ration its products to customers. There are multiple schemes, one being that the manufacturer allocated the number of products in proportion of the amount ordered.
 - Gaming is when customers order more than they need during a period of short supply hoping that the partial shipment they receive will be sufficient.

Understanding the causes of the bullwhip effect can help managers strategize to mitigate it. A few ways to mitigate it are given below:

- Avoid multiple demand forecasts.
 - Ordinarily every member of the supply chain conducts some sort of forecasting in connection with its planning. One remedy to these numerous forecasts is to make demand data at a downstream site available to the upstream site hence making the forecasts based on the same raw data. Supply chain partners can use electronic data interchange (EDI) to share data.
- Break order batches.
 - Since order batching contributes to the bullwhip effect, companies need to devise strategies that lead to smaller batches or more frequent resupply. One

reason why order batches are large, and frequency is low is due to the cost of placing order. This can be reduced by using EDI (Electronic Data Interchange). Another reason is due to transportation costs of the products, this can be minimized using third party logistics companies.

- Stabilize prices.
 - Simplest way to control bullwhip effect caused by forward buying is to reduce both the frequency and the level of wholesale price discounting.
- Eliminate gaming in shortage situations.
 - When a supplier faces a shortage, instead of allocating products based on orders, it can allocate in proportion to past sales records. Gaming during shortages peaks when customers have little information on the manufacturers' supply situation. The sharing of capacity and inventory information helps to alleviate customer's anxiety and consequently lessen their need to engage in gaming.

Competing on Analytics

Over the years there have been many applications that have amassed and applied data in ways that upended customer expectations and optimized operations to unprecedented degrees. They transformed technology from a supporting tool into a strategic weapon. Now that many companies use the same standardized products, it's the business processes which are the last remaining points of differentiation. There are 3 key attributes among analytics competitors:

- Widespread use of modelling and optimization
 - Any company can generate simple descriptive statistics about aspects of its business, but analytics competitors look well beyond statistics. These companies use predictive modelling to identify the most profitable customers, the most profit potentials, most likely to cancel their accounts, etc. They optimize their supply chain and can establish prices real time to get the highest yield possible.
- An enterprise approaches
 - Analytics competitors understand that most business functions can be improved with sophisticated quantitative techniques. These organisations don't gain advantage from one application but multiple applications supporting many parts of the business.
- Senior executive advocates
 - A company which wants to embrace the quantitative approach, needs to have the support of the top executives, usually the CEO. CEOs leading the analytics charge require both an appreciation of and a familiarity with the subject.

Analytics competitors direct their energy towards finding the right focus, building the right culture, hiring the right people, etc. As such there are sources of strengths for the analytics competitors. These are:

- The right focus
 - Although analytics competitors encourage universal fact-based decision, they need to choose where to direct resource intensive efforts.
- The right culture
 - Analytics competitors must instil a companywide respect for measuring, testing, and evaluating quantitative evidence.
- The right people
 - Analytical firms hire analytical people and hence all companies compete on talent.

- The right technology
 - Competing on analytics means competing on technology. While they investigate the latest statistical algorithms and decision science approaches, they push the IT frontier simultaneously. Serious analytics requires the following:
 - A data strategy
 - Business Intelligence software
 - Computing hardware

The productivity paradox of information technology

The productivity paradox is the peculiar observation made in business process analysis that, as more investment is made in information technology, worker productivity may go down instead of up. Productivity is the fundamental economic measure of a technology's contribution. One of the core issues for economists in the past decade has been the productivity slowdown that began in the early 1970s. On closer examination, an extremely alarming correlation between higher IT spending and lower productivity was found. Here are some findings about productivity in certain departments:

- Productivity in manufacturing
 - Research found that despite the rapidly evolving technology the productivity gains were insignificant.
- Productivity in services
 - It has been widely reported that most of the productivity slowdown is concentrated in the service sector. Service productivity growth was insignificant compared to the total IT investment.

There are 4 explanations for the paradox. These are grouped in the following 4 categories:

- Mismeasurement of outputs and inputs
 - The easiest explanation is that the output is not being measured correctly. The closer one would examine the data behind the studies of IT performance, the more it looks like mismeasurement is at the core of productivity paradox.
- Lags due to learning and adjustment
 - Another reason for the paradox might be that it might take several years to show results for the IT investment. This explanation might be very optimistic.
- Redistribution and dissipation of profits
 - Another explanation is that IT may be beneficial to individual firms but unproductive from the standpoint of the industry as a whole or economy. Unlike another possible explanations this one would not explain any shortfall in IT productivity at the firm level.
- Mismanagement of information and technology
 - A fourth possibility is that IT is not productive at firm level at all. The investments are increasing slack, building inefficient systems, etc.

Lectures

Lecture 1

Domino's is a very successful IT company. They are not famous because of their pizzas but because they have very aptly applied IT into their business operations. They use AI and Data analytics for predictive analytics and hence deliver pizzas earlier and exceed customer expectations. There are many ways Domino's has been stepping up the game, using AI to make sure the pizzas look consistent, Voice Automation to take orders, etc. McDonald's is also another business which has implanted AI successfully in their business operations. They

invested around \$300 million to buy an IT company which makes them use AI to optimize their sales based on various factors.

These examples show that IT is very important in today's world to make the business progress. According to Peter Drucker, information and IT would become increasingly important in the business operations. According to him, processing the knowledge would be as important as any other resources in the digital era. In today's digital era, it would be about who has the knowledge more than who has the best product. People who would be able to synthesis this knowledge and use it would be the major players of the industry.

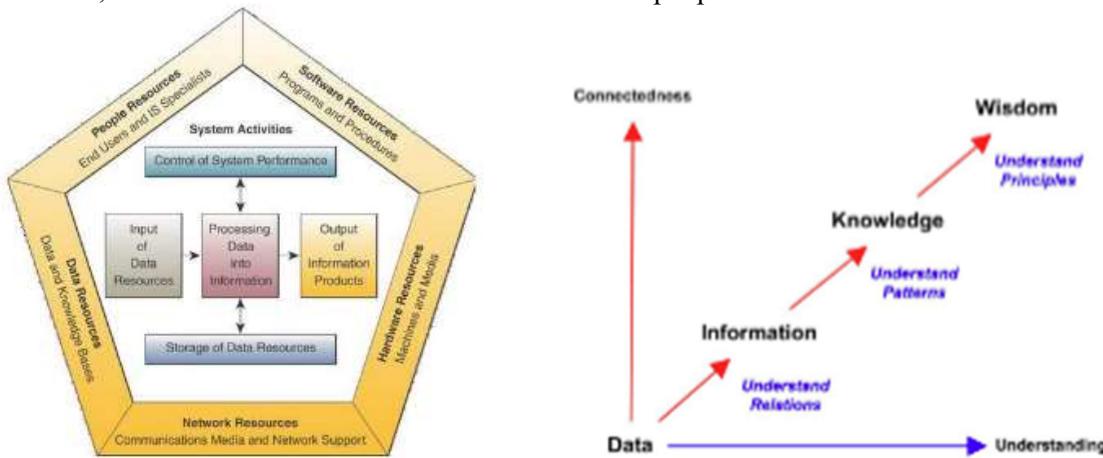
There are 5 megatrends which would shape the digital future. These 5 megatrends would be Mobile Computing, social media, Internet of Things, Cloud Computing and Big Data. A bit about each of these 5 megatrends are given below:

- Mobile Computing
 - Most people have their mobile phone within their reach 24/7 in the developing world. The applications, simple services, etc. have made it easier for the people to live in the world. Mobile computing is something which has made it very easy for people to make payments at any given time. The developing countries have seen rapid developments in the field of mobile computing through the years. It changes the way customers can be reached, increases collaboration, gives the ability to manage business in real time from anywhere at any time. Today the employees bring their own device to work, many technological innovations are first introduced to the customer marketplace which then makes its way into the organizations. This has advantages as well as disadvantages. Advantages include increased productivity, higher retention rates of talented employees and higher customer satisfaction whereas disadvantages span over security breaches, increasing need to support employee devices and the constant need to evaluate how new technologies can influence their business processes.
- Social media
 - The value of a network increases with the number of people using it. This is called the network effect. The classic example of this would be the telephone, the more people have it, the more beneficial it would be. Business organisations can harness the power of the masses to get people to participate. Users are not just mere consumers but have become important creators and contributors of data.
- Internet of Things
 - It is a network of physical objects that are connected over a network that can automatically share data over the internet. The potential for gathering useful data through these devices is limitless. Certain applications include home automation, smart cities, smart farming, e-health, etc. IoT can also be used in industrial areas such as manufacturing, operations, increasing efficiency, etc.
- Cloud Computing
 - Web technologies enable using the internet as the platform for applications and data. This is done using cloud computing. There are multiple types of services available using cloud computing, these include SaaS, PaaS, IaaS, etc. Cloud computing has been able to enable advanced analytics of massive amounts of big data generated by mobile devices, sensors, or users of social networks.
- Big Data
 - These mean extremely large and complex datasets that are characterized as being high volume, variety, and velocity. Organisations today face the challenge

of processing this data as there is a tremendous amount of treasure trove of data available but has a lot of “noise” in it which needs to be processed and made sense of.

Information Technology is something which enables various business model innovations that can disrupt established industries. Mobile devices, shared networks, cloud computing, etc. fuel innovative business models based on the concept of sharing economy. IoT and massive amounts of data generated enable the creation of service-oriented business models which is called servitization.

Information systems is a combination of people and information technologies that create, collect, process, and distribute useful data. Information System consists of IT resources and non-IT resources. IT resources covers the hardware, software, telecommunication networks, etc. Non-IT resources cover the data and the people.



Data is basically the raw symbols, such as the words and numbers. They have no meaning themselves and are of no value until processed. Information on the other hand is the data that is formatted, organized, and processed. It is the representation of reality and can help answer questions. Knowledge is the ability to understand information from the opinions and make decisions or predictions based on the information.

Lecture 2

IT is something which has strategic advantage. Infrastructural technology is better when shared. Proprietary technology is something which would be beneficial to the company when hidden and not shared with others. If everyone has the advantage, it doesn't remain an advantage anymore. Hence, IT can no longer be called an advantage. Scarcity and not ubiquity makes a business resource truly strategic. IT has become a commodity, it has become affordable and accessible to anyone like many broadly adopted infrastructural technologies which is far more valuable when shared, highly replicable and subject to rapid price deflation. IT is now essential to competition but inconsequential to strategy.

The business value of Information systems is tremendous. It can automate things which basically means fasten the process while reducing the costs with perhaps more accuracy and consistency. IT can enable organisations to use its past behaviour and improve business processes using analytics. Hence IT can boost organisational learnings. IT can support organisational strategy by doing the things in a smarter way as compared to the competitors. IT can also provide a strategic advantage, an edge over rivals to control the market just like how Dominos does with its predictive analytics-based software. But this strategic advantage

can become a strategic necessity which means that the company will have to do something to survive in the market. Something like providing online payments. If an ecommerce company does not avail its customers online payments and only accept Cash, then it will not be able to survive for long in the market.

Following are a few sources of competitive advantages:

- Being the first to enter the market. (E.g., Amazon)
- Having the best product in the market. (E.g., Patek Phillippe watches)
- Delivering superior customer service as opposed to competitors. (E.g.: Uber)
- Achieving lower costs than rivals.
- Having a proprietary manufacturing technology, formula, or algorithm. (E.g., Medicine company)
- Having a well-known brand name and reputation. (E.g., Apple)
- Giving customers more value for their money.

There are 5 strategies to pursue competitive advantage:

- Low-cost leadership
 - Offer best prices for the goods/services.
- Differentiation
 - Provide better products/services than competitors.
- Broad Market
 - Aim broadly at many types of customers.
- Niche Market
 - Focus on a very particular segment of consumers.
- Best cost provider
 - Offer products or services of reasonably good quality at competitive prices.

To analyse which strategy can be used to pursue competitive advantage, one can use the Porter's 5 force model. This is a model for industry level analysis where it can identify where to compete, analyse competitiveness and profitability, and hence aid in strategy formation.

- Threat of new entrants
 - How can companies not in the industry can get in.
 - The threat of the new entrants can be based on the barriers of entry. There are 2 major barriers to the new entrants, these are:
 - Advantages that incumbents have relative to the new entrants.
 - Supply side economies of scale
 - Firms can produce at larger volumes and enjoy lower costs per unit of production. This makes it very difficult for the new entrants as it would be very expensive for them as they don't sell more but expend more.
 - The more the company produce, the cheaper the products get.
 - Network effects (Demand side benefits of scale)
 - A buyer's willingness to pay for a company's products/services increases with the number of other buyers of the same products/services.
 - The more the users use, the more the users are willing to pay.

- High customer switching costs
 - Difficulty for the customer to switch to another company's products and services. This is based on the fixed costs that buyers face when they change suppliers.
 - Capital Requirements
 - The financial resources needed to invest to compete. Incumbents have higher capital as compared to the new entrants.
 - Incumbency advantages independent of size
 - The cost or quality advantages of the products and services which are not available to the potential rivals.
 - Unequal access to distribution channels
 - Sometimes access to distribution is so high a barrier that new entrants must create their own distribution channels or bypass the existing ones.
 - Restrictive government policy
 - Licensing requirements, restriction of foreign investments, etc.
 - How much would incumbents fight back with the new entrants.
 - Incumbents have previously responded vigorously to new entrants in the past.
 - Incumbents possess substantial resources to fight back.
 - Incumbents seem likely to cut prices to fight with the new entrants.
 - Industry growth is slowly makes it so that the market share is very less for everyone hence the incumbents push the new entrants out.
 - Bargaining power of the suppliers
 - Can the suppliers charge the company how much ever they want
 - A supplier group is more powerful if:
 - It is more concentrated than the industry it sells to.
 - The supplier group does not depend heavily on the industry for its revenues.
 - Industry participants face switching costs in changing suppliers.
 - Suppliers offer products that are differentiated.
 - There is no substitute for what supplier group provides.
 - The supplier group can credibly threaten to integrate into the industry if the industry participants are too profitable.
 - Bargaining power of the buyers
 - Do the buyers have multiple options and hence have more buying power.
 - The buyer group is more powerful if:
 - There are few buyers for the products/services.
 - The buyers purchase in large volumes.
 - Products are standardized and undifferentiated.
 - Buyers face few switching costs in changing vendors.
 - Buyers can credibly threaten to integrate backward if the vendors are too profitable.
 - Threat of substitutes

- Are there lots of substitutes for the product/services which the company provides.
- Substitutes performs the same or similar functions as an industry's product by a different means.
- The threat of substitute is high if:
 - It offers an attractive price-performance trade-off to the industry's product.
 - The buyer's cost of switching to the substitute is low.
- Rivalry among existing competitors
 - Are there other competitive companies who are providing the same products and services?
 - The intensity of rivalry is the greatest if:
 - Competitors are numerous and roughly in equal size or power.
 - Industry growth is slow.
 - Exit barriers are high.
 - Rivals are highly committed to the business and aspire for leadership.
 - Firms cannot read each other's signals well.

Being aware of the above 5 can help a company understand the structure of its industry and stake out a position that is more profitable and less vulnerable to attack.

The influence of the internet on the 5 competitive forces:

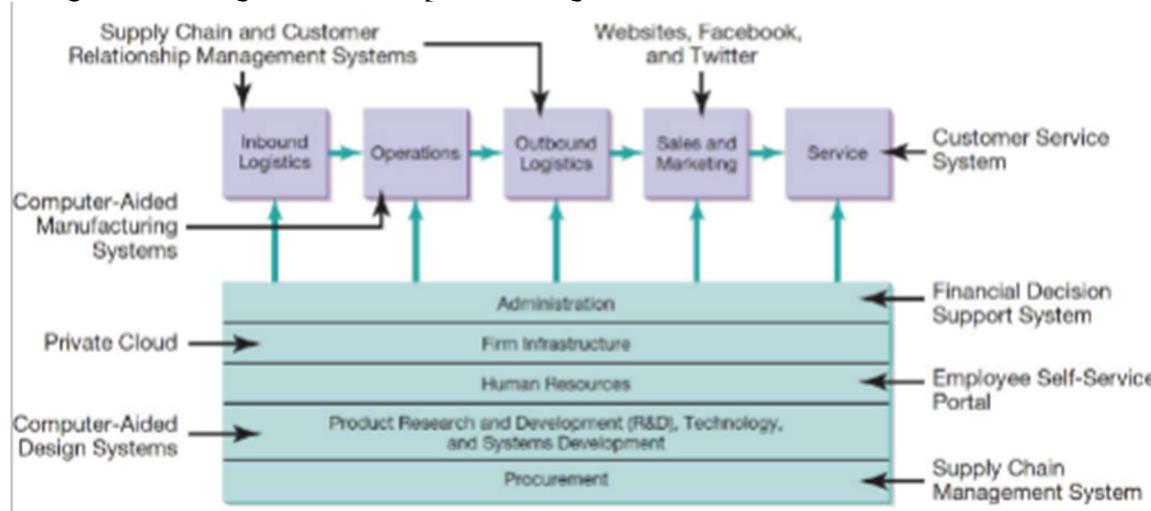
Competitive Force	Implication for Firm	How the Internet Has Influenced Competitive Force
Traditional rivals within your industry	Competition in price, product distribution, and service	Increase of competitors due to wider geographic reach; customers can more easily compare products, so competition focuses more on price.
Threat of new entrants into your market	Increased capacity in the industry, reduced prices, and decreased market share	Reduced barriers to entry, as the Internet reduces the difficulty of obtaining critical resources.
Customers' bargaining power	Reduced prices, need for increased quality, and demand for more services	Wider choices for customers lead to lower switching costs and higher bargaining power of customers.
Suppliers' bargaining power	Increased costs and reduced quality	Companies have equal access to suppliers; at the same time, suppliers have access to more potential buyers.
Threat of substitute products from other industries	Product returns from customers, decreased market share, and losing customers for life	New substitutes are created by the Internet and other information technologies.

The Porter's value chain model helps to the firm on a firm level than the industry level. It identifies how to compete with the competitors, analyses the activities of a firm and identify how information systems can be used to develop a competitive advantage. A value chain is A sequence of activities (processes) through which the organization's inputs are transformed into more valuable outputs. Value chains has 2 major activities:

- Core Activities (primary)
 - Related to the production and distribution of the firm's products and services.
 - The core activities are:
 - Inbound logistics
 - Activities associated with receiving and stock raw materials.
 - Operations and manufacturing
 - Activities such as order processing and/or manufacturing or assembly processes that transform raw materials into products.
 - Outbound logistics
 - Activities associated with the distribution of end products.
 - Marketing and sales

- Activities associated with the presale's activities of the company, including the creation of marketing literature, communication with potential and existing customers, and pricing of goods and services.
- Customer service
 - Activities associated with the post sales activities.
- Support Activities
 - These do not add value to the firm's products and services.
 - Contribute to the firm's competitiveness advantage by supporting the primary activities.
 - The support activities are:
 - Administration
 - Processes and decision making that orchestrate the day-to-day operations of an organization.
 - Firm infrastructure
 - Providing the necessary infrastructure to support the applications that primary activities use.
 - Human resources
 - Employee management, such as hiring, interview scheduling, payroll, and benefits management.
 - Technology development
 - Design and development of applications that support the primary activities.
 - Procurement
 - Purchasing of goods and services that are required as inputs to the primary activities.

Using the following IS one can improve the organisation's value chain:



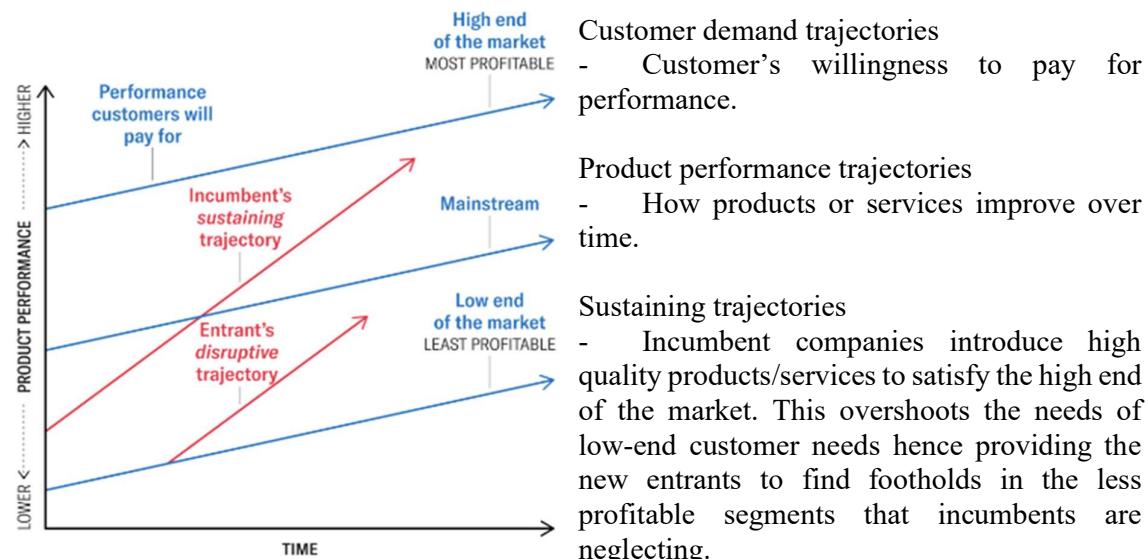
Innovation is key for organizations attempting to gain or sustain competitive advantage. Constant innovation is needed as product innovations are often easily replicated. Organisations must combine various types of innovation in their business models to sustain or gain a competitive advantage in the market. Successful innovation is difficult as innovation is often fleeting or risky and the choices are often very difficult to make. Organisations should

continuously scan the environment for emerging and enabling and potentially disruptive technologies.

The Investor's dilemma is a book which answers questions such as why leading companies fail to make technological investments that customers of the future will demand? One of the innovator's dilemmas is blindly following the maxim that good managers should keep close to their customers can sometimes be a fatal mistake. Sometimes these managers stay too close to the customers and fail to listen to the customer and hence fail.

There are 2 types of innovations:

- Innovations that give customers something more or better in the attributes they already value. This causes the rate of product improvement to remain constant.
- Innovations that introduce a very different package of attributes from the one mainstream customer historically value. The mainstream customers are unwilling to use in applications they know and understand. These new products tend to be valued only in new markets and new applications but generally make possible the emergence of new markets.



Disruptive trajectories

- Entrants improve the performance of their offerings and move upmarket and thus challenge the dominance of the incumbents.

Disruptive innovation means that the new entrants originate in low-end or new-market footholds. They don't catch on with mainstream customers until their quality catches up to their standards. There are 2 types of disruptions:

- Low end disruption
 - Provide low end customers with a good enough product.
- New market disruption
 - Create a market where none existed.

Disruption is a process, a process whereby a smaller company with fewer resources can successfully challenge established incumbent businesses. It is a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors. Disruptors often build

business models that are very different from those of incumbents. Some disruptive innovations succeed, and some don't. One needs to strengthen relationships with core customers by investing in sustaining innovations and create a new division focused solely on the growth opportunities that arise from disruption.

To spot and cultivate disruptive technologies one needs to determine whether the technology is disruptive or sustaining and define the strategic significance of the disruptive technology. Following which one needs to locate the initial market for the disruptive technology. Market research is seldom helpful. One needs to place responsibility for building a disruptive technology business in an independent organisation as it becomes necessary considering disruptive technology at the start has lower profit margin and must serve the unique needs of a new set of customers. Once an independent organisation is created, it needs to maintain its independence as there might be arguments over which group gets access to what resources and the product releases.

A business model is a summary of a business's strategic direction that outlines how the objectives will be achieved. A few questions that can guide the formation of a business model is:

- What does the company do?
- How does a company uniquely do it?
- In what ways does the company get paid for doing it?
- What are the key resources and activities needed?
- What are the costs involved?

In short, these questions target the following sections of the business model:

- Customer segment
- Value proposition
- Channels
- Customer relationships
- Revenue streams – affiliate marketing, advertising, subscription, licensing, traditional sales, brokerage, freemium, etc.
- Key resources
- Key activities
- Key partners
- Cost structure

Lecture 3

There are different types of business models such as:

- Platform based business model
 - It provides a digital platform that enables others to create value.
 - It creates a digital ecosystem where some users create value and other users consume.
 - It gives rise to a sharing economy which is an economic system in which assets or services are shared between private individuals either for free or for a fee, typically by using the internet.
- Service based business model
 - It is enabled by the IoT, mobile services, big data, cloud computing and the likes.
 - It offers the product itself as a service

Some challenges which occur when managing IS infrastructure:

- Rapid development of IT leads to short life value of IT.
 - IT cycles is increasingly becoming faster.
 - As new hardware is created, new software is created, this creates a cycle which keeps going on.
 - As the development keeps progressing, the previous hardware may not be serviceable, or software support may cease just like Windows XP.
- Rapid increase in big data demands increasing storage needs.
 - Organisations collect and analyse vast amounts of data for business intelligence and other processes. These data require more storage space and more powerful computing hardware and DBMS.
- Demand fluctuations.
 - Fluctuating demands for computing resources based on multiple factors such as season or monthly fluctuations.
 - Sometimes there are too few resources at some times or too many idle resources most of the time.
- Increasing energy needs.
 - More powerful hardware consumes more energy and thus generates more heat, and this would lead to more power requirements for cooling.

Cloud computing is a computing model for enabling ubiquitous, convenient, on-demand network access, to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. It uses the utility computing model where computer resources are treated as a utility like electricity. A few characteristics of Cloud Computing are:

- On demand self-service – Resources can be accessed whenever required with no human interaction with the provider.
- Rapid elasticity – Computing resources can be scaled up or down almost instantaneously based on user needs.
- Broad network access – Services are accessed via the internet and hence has a huge network.
- Resource pooling – Resources are physically distributed on multiple machines and dynamically assigned to multiple customers.
- Measured service – Customers pay for how much ever they use.

Cloud computing has 4 different service models. These are:

- On-Premises software
- Infrastructure as a Service
- Platform as a Service
- Software as a Service

There are 2 types of clouds. These are public cloud and private cloud. Public cloud can be used by any interested party and is often used for applications that require rapid scalability. Private cloud is usually internal to an organisation. It can help organisations balance demand and supply of computing resources within the organisation. There are certain advantages of owning a public cloud than a private data centre. These advantages are:

Advantage	Public Cloud	Conventional Data Center
Appearance of infinite computing resources on demand	Yes	No
Elimination of an up-front commitment by Cloud users	Yes	No
Ability to pay for use of computing resources on a short-term basis as needed	Yes	No
Economies of scale due to very large data centers	Yes	Usually not
Higher utilization by multiplexing of workloads from different organizations	Yes	Depends on company size
Simplify operation and increase utilization via resource virtualization	Yes	No

Cloud computing is best used in the following cases:

- When the demand for a service varies with time.
- When demand is unknown in advance.
- Organisations that perform batch analysis

Some benefits of cloud computing are:

- Elasticity.
 - Cloud computing can give the ability to add or remove resources at a fine grain with lead time of just minutes. The scalability can be instantaneous.
- Transference of risks
 - This is the transferring of liability for the expected loss to other parties involved. Risks here include overprovisioning (under-utilisation) and under provisioning (saturation).

Following are the top 10 obstacles and opportunities for growth of cloud computing:

Obstacle	Opportunity
1 Availability/Business Continuity	Use Multiple Cloud Providers
2 Data Lock-In	Standardize APIs; Compatible SW to enable Surge or Hybrid Cloud Computing
3 Data Confidentiality and Auditability	Deploy Encryption, VLANs, Firewalls
4 Data Transfer Bottlenecks	FedExing Disks; Higher BW Switches
5 Performance Unpredictability	Improved VM Support; Flash Memory; Gang Schedule VMs
6 Scalable Storage	Invent Scalable Store
7 Bugs in Large Distributed Systems	Invent Debugger that relies on Distributed VMs
8 Scaling Quickly	Invent Auto-Scaler that relies on ML; Snapshots for Conservation
9 Reputation Fate Sharing	Offer reputation-guarding services like those for email
10 Software Licensing	Pay-for-use licenses

Concerns of CEO today:

- Is cloud storage safe for the data?
- Should the legacy infrastructure be removed for good?
- Which type of cloud service (IaaS, SaaS, PaaS) to be chosen?
- How does shifting to cloud reimagine the business processes?

To evaluate a cloud service provider, one must check the following features:

- Availability/Reliability
- Scalability
- Viability
- Security, privacy, and compliance
- Diversity of offerings
- Openness
- Costs

Lecture 4

As cloud technology is improving a common repository for the collection and analysis of data is being created. As the technology is improving it is becoming easier to create products and services within the cloud and model new products or market campaigns as cloud-based software prototypes. Cloud computing is helping in changing the product design and customer experience by enabling closer collaboration between the corporate IT and the other departments of the business.

The principle that all internet data should be treated the same is called as network neutrality. According to the principal internet backbone carriers should forward all data packets on a first come first serve basis allowing anyone to freely communicate with any application without interference from a third party and prohibiting the network owners from discriminating against applications and content providers. The opponents of network neutrality are the network providers who want to charge differentiated prices based on the amount of bandwidth of the content being delivered over the internet. On the other hand, content providers are proponents of network neutrality as this would guarantee a level playing field for all websites and internet technologies.

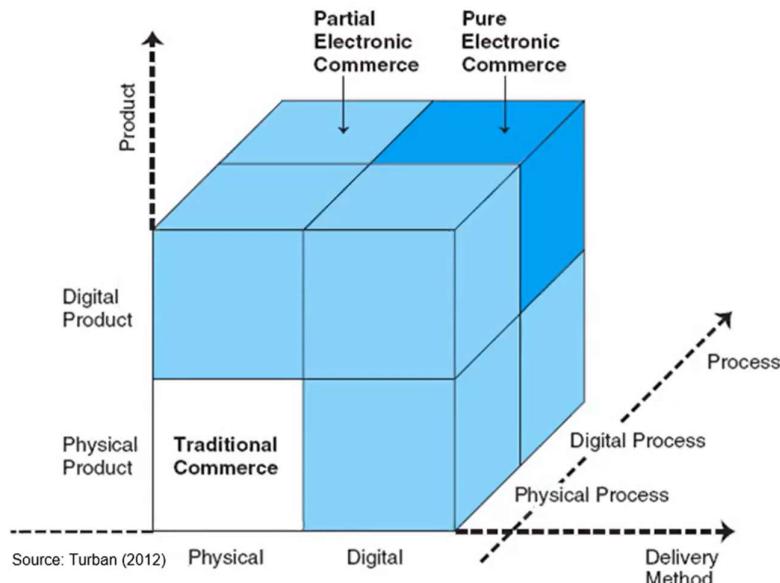
The difference between E-commerce and E-business is given below:

E-commerce	E-business
The exchange of goods and services and money between firms and their customers supported by communication technologies, in particular the internet, is called E-commerce.	The use of information technologies or systems to support every part of the business.
Ecommerce is a part of E-business.	

The difference between E-commerce and Commerce is given below:

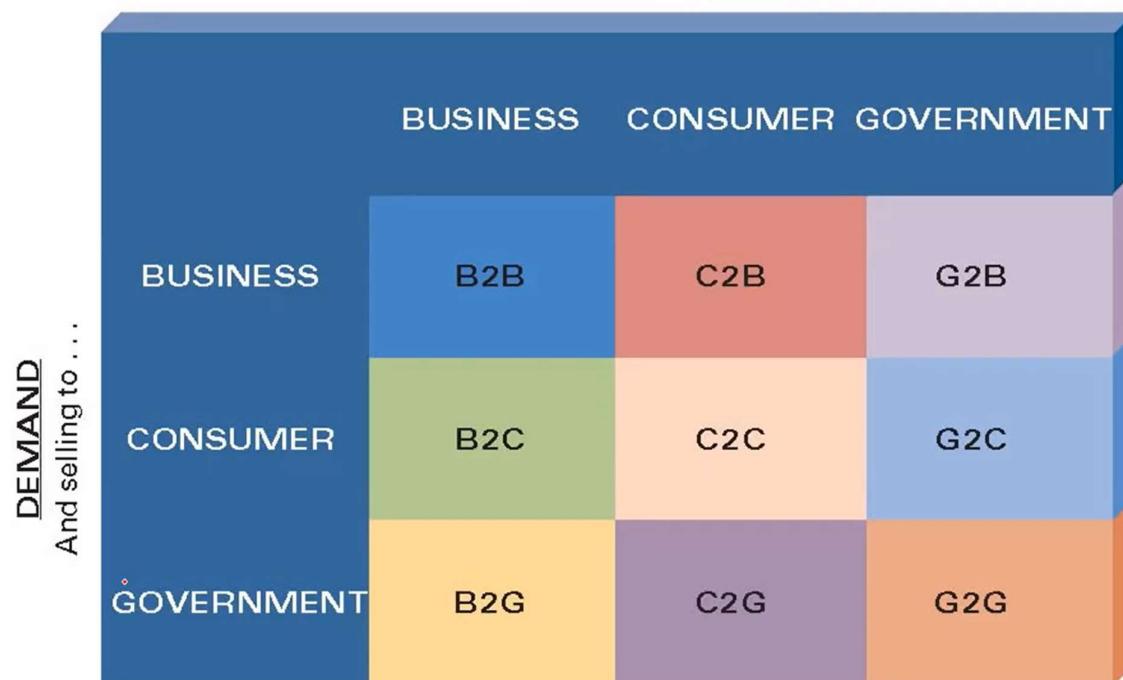
Traditional commerce	E-commerce
Traditional commerce is a branch of business which focuses on the exchange of products and services, and includes all those activities which encourages exchange, in some way or the other.	E-commerce means carrying out commercial transactions or exchange of information, electronically on the internet.
Manual processing of transactions.	Automatic processing of transactions.

Goods can be inspected physically before purchase.	Goods cannot be physically inspected before purchase.
Face to face customer interaction is possible.	Screen to face customer interaction is only possible.
The scope of business is limited to a particular area.	The scope of business is worldwide.
The resource focus is on the supply side.	The resource focus is on the demand side.



The type of E-commerce is given below:

SUPPLY
Business originating from ...



One of the most important business strategies is the B2C E-commerce business strategy.

- B2C E-commerce (E-Tailing)
 - It is the online sales of goods and services from a business to an individual customer. There are 3 different types of business strategies:
 - Click only strategy
 - Conduct business electronically in cyberspace.
 - Brick and mortar strategy
 - Operate solely on traditional physical markets.
 - Click and mortar strategy
 - Utilize the internet to extend traditional offline retail channels.
 - Advantages:
 - Can have virtually unlimited variety of products.
 - Makes it easy for customers to compare products.
 - Conduct business anywhere at any given time.
 - Conduct business of a global scale.
 - Customers are not limited to merchants of the same locality.
 - Higher turnover and lower costs.
 - Reduced costs for the customers.
 - Disadvantages:
 - Lack of trust
 - Lack of direct product experience in the form of sensory information.
 - Additional time and uncertainties surrounding product delivery and returns.
 - Opportunities
 - Cutting off the middlemen (disintermediation).
 - Reintroducing middlemen (reintermediation).
 - Innovative business models.
 - New revenue and pricing models.

The winner takes it all strategy states to focus the marketing resources on a small number of likely best sellers. It is like gambling. If it strikes, it can return massive profits. Popular products become disproportionately profitable for the suppliers and customers become even likelier to converge in their tastes and buying habits. A few key points of the strategy is:

- Lesser talent is a poor substitute of the greater talent.
- People are inherently social
- Cost advantage of a brisk supplier

The long tail theory on the other hand focuses on the profits to be made from niche offerings that cannot be profitably provided through brick-and-mortar channels. Customers can then find and afford products closely tailored to their individual needs. A few points mentioned in the article by Chris Andersen (Long tail theory) are:

- Merchandise assortments are growing.
- Goods don't have to be displayed on store shelves hence the physical and cost constraints disappear.
- Search and recommendation tools can help customers select from an overwhelming number of products.
- Online channels change the shape of the demand curve.
- Consumers value niche products geared to their interests more than products designed for mass usage.
- Internet retailing enables them to discover products better suited for the customers.

- The curve is longer as more obscure products are made available.
- The curve goes flatter as the consumers discover products better suited for their tastes.

The theory of exposure talks about how it is imprudent for companies to upend traditional practice and focus on the demand for obscure products. It talks about 2 things: natural monopoly and double jeopardy. According to the author of this theory, William N. McPhee, no segment is available with a particular taste for the obscure products and are mainly light users who are interested in the popular products. The heavy users tend to choose a mix of hit and obscure products. Natural monopoly of the hit products is that it naturally monopolizes the light consumers. Double jeopardy means the double disadvantage. This double disadvantage is of the niche products which is them being not well known, and when they become well known it is by people who know better and prefer popular products.

Lecture 5

Omnichannel retailing is an integrated sales experience that melds the advantages of physical stores with the information rich experience of online shopping. It provides seamless and simultaneous interactions using different channels such that a customer does not interact with a single channel but with the brand. Traditional retailers must transform their business into something more entertaining if they want to remain in market.

There are multiple advantages to retailing in the physical aspect, as well as the online aspect. These advantages are as follows:

- | | |
|--|--|
| <p>› Advantages of Digital</p> <ul style="list-style-type: none"> - Rich product information - Customer reviews and tips - Editorial content and advice - Social engagement and two-way dialogue - Broadest selection - Convenient and fast checkout - Price comparison and special deals - Convenience of anything, anytime, anywhere access | <p>› Advantages of Physical</p> <ul style="list-style-type: none"> - Edited assortment - Shopping as an event and an experience - Ability to test, try on, or experience products - Personal help from caring associates - Convenient returns - Instant access to products - Help with initial setup or ongoing repairs - Instant gratification of all senses |
|--|--|

There are different types of channels for retailing. These are:

- Single channel
 - Here the customers experience a single type of touch point. The retailers also have only a single type of touch point.
- Multi-channel
 - Here the customers see multiple touchpoints acting independently. The retailers' channel knowledge and operations exist in technical and functional silos.
- Cross-channel
 - Here the customer sees multiple touchpoints as a part of the same brand. The retailers have a single view of the customer but operate in functional silos.
- Omnichannel

- Customers experience a brand than a channel within the brand. Retailers leverage their single view of the customer in coordinated and strategic ways.

Following are the successful strategies for omnichannel retailing:

- Provide attractive pricing and curated content.
 - Avoid price wars and become a merchandise “curator”. An example would be of Amazon and their way of selling products.
- Harness the power of data and analytics
 - Understand not just customer transactions but also customer interactions. Then use the data and the understanding from that to make location- and time-specific offers and recommendations to potential and existing customers.
- Avoid direct price comparisons
 - Retailers offering a distinctive version of a product will see less price competition. Unless the changes in the product add value, the risk is that the retailer will annoy consumers. With continually falling search costs and rich information resources, achieving differentiation can be difficult.
 - Create exclusive products that are not available at competitors as opposed to cost-focused store brands.
 - Make it difficult for consumers to do a direct comparison of the value of your offering with those of competitors by creating bundles or pairing the product with other products. Quite powerful in generating additional sales and profits if it is created by using historical purchase data and finding the meaningful relationships between products from past transactions.
- Learn to sell niche products
 - The focus here should be the middle of the tail products. With inventory information available online, finding the products in nearby local stores has become much easier. Physical retailers here have an upper hand over online retailers because of the trust factor and the availability of in-store pick up and after-sales service
- Emphasize product knowledge
 - Do a better job of sharing product knowledge across their entire platform as consumers accumulate product knowledge in one channel and then purchase from another channel.
 - Facilitate channel integration and attract shoppers who prefer shopping in multiple channels. This increases the likelihood of a cross-brand search and intensifies across-brand competition.
- Establish switching costs
 - Loyalty programs can be important vehicles for retaining customers and maintaining margins and establish privileges and perks for loyal consumers such as express or mobile checkout.
- Embrace competition
 - Retailers that attempt to insulate themselves from competition may only succeed in the short run.

Digital display advertising is online graphic advertising through banners, text, images, video, and audio. The main purpose of digital display advertising is to post company ads on third-party websites. A display ad is usually interactive, which allows brands and advertisers to engage deeper with the users. A few types of display ads are given below:

- Banner Ads
 - Short text or graphical (or even audio and video) promoting message.

- Contextual Advertising
 - Ads placed on a page are in some way related to the content of that page.
- Behavioural Targeting
 - Uses information collected from an individual's web-browsing behaviour to select advertisements to display.

Email advertising is as the name suggests, advertising using email. It is cost effective and has a high conversion rate. This type of advertising combines content and advertising together. The use of articles and news stories of interest to specific market segments, sending content by using hyperlinks inserted in email messages, etc. There are different types of marketing such as:

- Digital Marketing
 - Digital marketing is the component of marketing that uses the Internet and online based digital technologies and other digital media and platforms to promote products and services.
- Permission Marketing
 - Marketers have no right to sell to customers unless they have either given explicit permission or implicit permission. This way, one sends specific information only to people who have indicated interest.
- Interruption Marketing
 - In this type of marketing marketers look for a medium or an environment where a prospective customer is likely to use or frequent, and stop him/her with an ad. This is generally sending a promotional message through mass media.
- Search Marketing
 - It is the marketing that involves promotion of websites by increasing their visibility in Search Engine results pages. Search marketing is done by search advertising which is advertising that is listed in the sponsored (paid) search results for a specific term. It is a pay per click model wherein the advertiser pays the publisher when an ad is clicked. A general tool used in search marketing is Search Engine Optimization which is a method to improve a site's ranking in organic search results. Improving the site's ranking is done by having other pages linked to the site, keeping the content updated, and including key words for which a user might query.

Social Media is a group of internet-based applications that build on the ideological and technological foundations of web 2.0 and that allow the creation and exchange of user generated content. Web 2.0 is a loose collection of information technologies and applications that Web sites use to enrich the user experience by encouraging user participation, social interaction, and collaboration. Social media marketing is creating content that attracts attention and encourages readers to share it with their social networks. A tool which is used for social media marketing is Word of Mouth (WoM). WoM is the sharing of information about a product, promotion, etc., between a consumer and a friend, colleague, or other acquaintance. It is proved to have more effectiveness than traditional print advertising in impacting brand switching decision. Electronic Word of Mouth (EWoM) is the same as WoM but electronically. It has more advantages over traditional WoM. It has a higher diffusion speed for new pieces of information, reaching a much larger group of other customers. EWoM is substantially easy to monitor, allows better analysis of the impact on tangible business outcomes and the calculation of return on marketing measures.

Viral marketing is basically EWoM in which some form of marketing message related to a company, brand or product is transmitted in an exponentially growing way, often using social media applications. It has 2 definite elements, the growth rate greater than one and the use of social media applications. Hence one can say that Viral Marketing is made up of EWoM + social media + Exponential Growth.

To increase the ROI of social media marketing, Hokey Pokey followed a 7-step success:

- Monitor the conversations
- Identify the influential individuals
- Identify the factors shared by influential individuals
- Locate the potential influencers who have relevant interests
- Recruit those influencers
- Incentivize the influencers to spread positive word of mouth
- Reap the rewards

The Customer Influence Effect (CIE) is the net influence wielded by a user in a social network in terms of their ability to spread WoM through their connections. Stickiness Index (SI) is the degree to which a user or an instance of WoM is specific to each category of topics. Customer Life Value (CLV) is the value that individual influencer brings to the company through their own purchases. Customer Influence Value.

In Class Readings

IoT roundup: Connected cows, food safety sensors and tracking rent-a-bikes

Agriculture as an industry is an increasingly sophisticated one which has started using IoT. The technology used in agriculture continues to evolve at speed. Certain examples of using IT in agriculture are:

- Track livestock health using IoT ear tags.
- AI tags transmitting behavioural and biometric data to custom gateways installed at farms.
- Regulate temperatures of storage areas using temperature sensors in a network.
- Tracking rental bikes using IoT automated GPS tracking.

How IoT is becoming the pulse of healthcare

The Internet of Things is made up of small computing devices with unique IDs connected through a network and performing specific tasks. In healthcare that can mean monitoring building temperatures, air flow, medical devices or even the health of a patient in or out of a healthcare facility. Because of their ability to independently communicate data, there's potential for eliminating direct human interaction with systems equipped with IoT devices and central data repositories, automating processes, and increasing efficiency and data accuracy.

8 ways big data and analytics will change sports

Analytics and big data have potential in many industries, including sports. Analytics plays a major role in scoring, signing contracts, preventing injuries, etc. Analytics is leading to better precision when umpiring, gives more resources for analysing the gameplay patterns of any player for a game, collect data from wearable technologies to plan better training and conditioning, collect live data on field during events, etc. Through the collected data we can use predictive analytics to provide insights to the game beforehand. This is also leading to multiple job opportunities for people interested in sports but along with technical analytical

skills. Data analysts could help deliver the most important data sets to coaches for better results on the field. Another major reason for analytics changing the sport is by building arguments for the contract negotiations.

CBA taps Google search data to forecast household spending

The Commonwealth Bank of Australia is using Google search activity to help it forecast household spending trends. Combining the bank's data with Google's enable's CBA to predict purchase activity up to four months in advance. This shows that the data can be used to predict anything if you have a good hold on the data.

Behind Netflix's 35 Oscar Nominations: Data, Instinct and Empowerment

The streaming giant, famously known for investing in data analytics, has regularly pointed to its expertise in data-driven programming as a driver of its success. With its vast access to date to track when viewers start, stop, rewind, fast-forward, and pause videos, Netflix has developed the ability to leverage its data in creative ways. And yet despite the prevalence and strategic use of data, the specific ways that the Netflix algorithm is leveraged in making programming decisions is largely black-boxed. Netflix executives take the data available to them and make decisions about what television content to acquire based on their instincts. Perhaps what lies behind Netflix's content success is not only data or pure instinct, but that an entire team has mastered the skill of "informed intuition"-what Hastings describes as "starting with the data but making the final call with the gut." And that there is a cultural working environment that supports and fosters it. This shows that a supportive work culture is necessary for progress of an organisation.

Australian companies suck at data analytics

Australian organisations lag the rest of the world when it comes to extracting value from their data analytics efforts. Chinese companies are leading the world in both maturity and impact. By sector, oil and gas, industrial and technology companies were the most advanced users of analytics.

Further, they said companies that spend too much money on their data ecosystem without strategic leadership tend to have lower profit than firms with this type of leadership guiding the use of technology.

How Spotify migrated everything from on-premises to Google Cloud Platform

The amount of effort it takes to maintain compute, storage, and network capacity is not a small task. None of the data centres contributes to making Spotify the best music service in the world. One of the first things Google and Spotify did was to build a small migration team of Spotify engineers and Googlers and built a live visualisation of the entire migration state so that engineers could self-serve to see the progress of the project.

Priceline takes flight with real-time analytics in the cloud

Open-source container management system Kubernetes offers Priceline efficient horizontal scaling of its platform to minimize hardware and software provisioning, which is key for a business that requires vast flexibility in responding to customer traffic. The crown jewel of Priceline's business — its proprietary pricing engine — relies heavily on real-time data infrastructure and analytics. This real-time setup in the cloud enables the company's homegrown pricing engine to perform a heavy dose of A/B testing, which in turn enables Priceline "to do pricing in a way most advantageous for consumers to maximize savings. Priceline has made several investments toward automating its continuous integration and

continuous delivery (CI/CD) pipeline and has also invested heavily in testing and “chaos engineering” to ensure quality control.

The consumerization of the workplace is changing collaboration

Intuitive and beautiful UIs are now the norm, and emojis, gifs, and memes are all socially accepted forms of communication in the office of 2018. The way to improve the employee engagement with technology is by making it fun and easy to use. Human-like interaction is critical to the success of electronic communications. Embrace consumer tools for productivity and culture. There are naturally some concerns about the consumerization of the workplace. Different cultures have different symbols, and some are not universally nice. It's critical for enterprises to adopt technology that will fuel employee engagement and improve culture.

Is AI judging your personality?

The company owns a patent on technology designed to rate the "personalities" of prospective guests by analysing their social media activity to decide if they're a risky guest who might damage a host's home. The product of their technology is to assign every Airbnb guest customer a "trustworthiness score." This will reportedly be based not only on social media activity, but other data found online, including blog posts and legal records.

Mobile's new frontier: The front line of business

Workers who don't work at a desk are finally starting to see mobile technology become standard tools to improve their work and business results. Companies can now afford to deploy front-line mobile devices more broadly and bring standard office computing tasks to many more front-line workers. Meanwhile, back-end systems are being modernized to better support front-line devices and smartphones. This is happening due to the emergence of E-commerce. Many companies are changing to an integrated, full-service model to satisfy heightened customer expectations and to provide a better customer experience to give customers a reason to come back. Technology wise, the mobile industry has been during a major platform shift as businesses have turned their interests toward mobilizing the front line.

Mobile distracted shoppers buy more, study suggests

A small study suggests people who use their mobiles while shopping is more likely to make unplanned purchases. Australian shopping centre operators like Mirvac and Myer Centre have been rolling out free Wi-Fi to malls in recent years. The free networks provide retailers with the personal data entered by visitors when they sign up for the service, which can feed into a customer database. Through this, the customers start using their mobile phones more and end up purchasing more than required.

CBA sees 400% increase in mobile payments since introducing Apple Pay

Commonwealth Bank of Australia (CBA) has seen a 400 per cent increase in the number of payments made with a mobile since it introduced Apple Pay in January. This made delivering simple, intuitive digital payment solutions that provide choice and convenience.

Why Clayton Christensen is wrong about uber and disruptive innovation

Silicon Valley has disrupted disruptive innovation. Christensen suggests that while Uber is innovative, it's not a disruptive innovation. Instead, it's a sustaining innovation, meaning that Uber represents only an incremental improvement on the existing taxi industry. According to Christensen's theory, a “disruptive” business has to either originate in a low-end market and move upstream to higher value markets, or it has to create a “new market foothold,”

meaning it creates a new market where none existed. Uber clearly took off from a low-market foothold, as Uber's network grew in each city, ride costs fell, wait times declined and its rating system helped keep driver quality relatively consistent. With this improvement in service quality, Uber was able to move upstream to attack taxis directly with UberX — a classic disruptive move.

Does IT matter? An HBR Debate.

Carr's argument was that IT has become a commodity which provides little competitive advantage hence the companies should rethink on the investment in IT based on the reduced ROI. According to the research conducted, IT will continue to evolve in the future. IT investments have been very cost effective as opposed to what is said in Carr's article. The most important thing that the CEO and senior management should understand about IT is its associated economics. As the pace of doing business increases, the CEO and senior management team must be aware of how IT can change rules and assumptions about competition. The economics of conducting business will likewise continue to improve—providing opportunities for businesses to expand the customer value proposition by providing more intangible information-based services.

New technologies will continue to give companies the chance to differentiate themselves by service, product feature, and cost structure for some time to come. The first mover takes a risk and gains a temporary advantage. The fast follower is up against less risk but also has to recover lost ground. One lens should be focused on improving cost savings and efficiencies. Another should be focused on the incremental improvement of organizational structure, products, and services. Still another should be focused on the creation of strategic advantage through extending competitive scope, partnerships (customers and other parties), the changing of the rules of competition, and the provision of new IT-based services to extend the customer value proposition.

Grid computing, standardization of components, and open systems, far from stifling differentiation, provide a stable platform to build on and offer new ways of differentiating, either by cost, structure, product, or service. Outsourcing the commodity infrastructure is a great way to control costs, build competence, and free up resources, which can be used to combine data bits in creative ways to add value. Packages like SAP further help remove commodity maintenance activities and allow firms to better analyse customer information and provide service at the sharp end.

NBN Co's Netflix tax slammed amid growing public outcry over net neutrality

The so-called Netflix tax would see internet users pay more to access video streaming services on the beleaguered national broadband network. The Netflix tax would end net neutrality in Australia, which would be a very detrimental and backwards step. Net neutrality is very important because it ensures all service and application providers are treated equally and means that consumers are not unfairly treated when they're accessing content on the internet.

Net neutrality is the principle that internet service providers must treat all internet use equally, and not discriminate or charge differently based on the content accessed. Net neutrality is not protected by law in Australia as it is in other parts of the world including Europe and Canada. DDoS attacks are a common disruption tactic employed by hackers and was the type of attack that caused Australia's online census to be pulled down on the night when FCC's comment system was to review the rule regarding net neutrality.

Is there a case to be made for net neutrality in Australia?

Net neutrality ensures a completely even playing field for all content creators and services offered over the internet. A net neutrality mandate means internet service providers (ISPs) can't give special treatment to a certain company such as Google or Netflix to prioritise their traffic over others. In the case of the US, there is real fear that the removal of net neutrality would favour entrenched and dominant players and make it harder for online start-ups to compete.

Aussie shoppers shop online but buy in store

Australian shoppers are leveraging digital channels to make purchasing decisions even if the final sale is conducted in-store, a new report claims. Two-thirds of men and nearly three-quarters of women surveyed said they research products online but chose to buy in a store. However, digital platforms are increasingly becoming the pointer to the destination of the final transaction. The report also claimed the two-stage shopping process being adopted by consumers today is pushing the competition for buyer engagement and brand exposure online.

Digital research has become an intrinsic part of the shopping process, as a discovery method, features, and price comparison tool. The multi-layered shopping process means that brands that can engage with consumers online and resonate with their audience across key factors such as price, quality, and availability, can eclipse competitors in the high street.

Amazon opens its first full size cashier less store requiring no check outs.

Amazon has opened its first full-size cashier less grocery store almost three years after it opened its “metro” style Amazon Go store. Shoppers only require their mobile phone and are then able to walk in, scan a QR code from their Amazon mobile app and proceed to grab whatever they need throughout the store and walk out when they are finished. Cameras and sensors track the items as they are removed from the shelves and adds the items to the shopper's virtual cart and when they are finished Amazon automatically takes payment using the card on file. There is zero human interaction required but Amazon confirmed staff would be on hand to not only stock shelves but also answer shoppers' questions.

Can unmanned store reshape Aussie retail?

One reason automated shopping succeeds in places like Shanghai or Tokyo is because they are large commuter cities where space is limited, and people shop on the go anyway. Retail expert Marguerite Bell says this next phase of retail is about curating experiences that show an understanding of the customer's needs. Ms Bell notes that unmanned stores like Amazon Go still require staff behind the scenes, which means this new trend is just a transfer of labour costs and energy. At the end of the day, the experience is what truly matters. The Australian market is a globalisation market — a market that finds things elsewhere and then brings them here.

Alibaba's new retail explained

Shopping usually involves either going to the store or buying online. Today, many people opt for online shopping which is stressing out the traditional brick-and-mortar companies. There are certain products which need to be sold traditionally. Today, the classification shouldn't be between traditional shopping and online shopping, there needs to be a common ground. There are certain models which are being implemented today which falls exactly in this place. These models are:

- Complete digitization of all commerce.
- Automated customer approach.

- Online payments, shopping in offline stores.

The possibility of new retail is endless once the line between online and offline is removed and reimagine it based on how the consumers want to shop. The key to save traditional retail is by forgetting the traditions all together.

Knowledge Test

What exactly does Carr mean by IT doesn't matter? Explain his reasons.

In the current era of technological developments, the internet is at the base of everything. The internet has spread to every domain. Internet technology, similarly, has become very easily available to everyone. In the initial years when the internet had just been released on the market only a few companies had acquired and started utilizing it in their business operations. Such companies, once successfully integrated with the internet started gaining competitive advantage making the information technology a strategic tool to gain that advantage. What makes a resource truly strategic is scarcity and not uniuqity. IT as a resource when scarce provided a strategic advantage to the business which gave them a competitive edge over others. But as IT became increasingly popular and more of an infrastructural technology, it lost its strategic advantage. Infrastructural technology is far more valuable when shared and that is what happened with Information technology. IT became a commodity. It became more valuable when shared and became highly replicable. It became very affordable and in such a way that everyone now has it. If everyone has the advantage, it doesn't remain an advantage anymore. Thus, IT became essential for competition but not a strategic tool. This is what Carr meant by "IT doesn't matter".

Give 2 examples of IT enabled business solutions in a specific industry of your choice. One provides a competitive advantage, and one serves as a competitive necessity in that same industry. Justify your answers.

Give one example of infrastructure as a service and one example of platform as a service. Justify your answers.

Amazon web services is an Infrastructure as a Service and Google Cloud is a Platform as a Service.

Infrastructure as a Service provides end users with cloud-based alternatives to physical infrastructure. IaaS is scalable and offers businesses greater flexibility. IaaS cloud servers are typically offered to businesses over the internet and are hence highly scalable, flexible, accessible by multiple users and cost effective. A few examples of IaaS are Microsoft Azure, Amazon Web Services, etc.

Platform as a Service provides developers with a framework, software and tools needed to build apps and software, all accessible through the internet. Customers cannot access the software online but the platform online. PaaS platform is accessible by many users, scalable, built on virtualization technology and easy to run without excessive system administration knowledge. A few examples of PaaS are AWS Elastic Beanstalk, Google App Engine, Azure App Service, etc.

According to Elberse, should companies focus on the long tail? Justify your answers based on the phenomena of natural monopoly and double jeopardy.

The theory of exposure talks about how it is imprudent for companies to upend traditional practice and focus on the demand for obscure products. It talks about 2 things: natural monopoly and double jeopardy. Natural monopoly of the hit products is that it naturally

monopolizes the light consumers. Double jeopardy means the double disadvantage. This double disadvantage is of the niche products which is them being not well known, and when they become well known it is by people who know better and prefer popular products.

According to Elberse, companies should not focus on the long tail as the demand curve for it is flat and long. The large share of the crowd for renowned products consists of relatively light consumers while another half for obscure products consists of heavy consumers. This means that

Give one example of click and mortar company that is engaged in partial ecommerce and one example of a pure play company that is engaged in pure ecommerce. Justify your answers.

Suppose Hokey Pokey is planning a viral marketing campaign for a new ice-cream flavour. Give one example of market mavens and social hubs for the campaign and explain their roles in the campaign.

Market mavens: These are defined as individuals who have access to a large amount of marketplace information and proactively engage in discussions with other consumers to diffuse and spread this information. These people are the first to receive the message and transmit it to their immediate social network. An example of a market maven for Hokey Pokey would be those individuals who are actively involved in the discussion of the products of Hokey Pokey.

Social hubs: These are the people who are given information from the market mavens. These people are defined as people with an exceptionally large number of social connections who often know hundreds of different people and can serve as connectors or bridges between different sub-cultures. The social hubs have an exceptional network and can diffuse information to hundreds, if not thousands of other consumers. An example of these would be the TikTok stars, actors endorsing Hokey Pokey and many such well known people.

Compare and contrast utilitarian products and hedonistic products. Give one example of a digital product for each to illustrate the differences.

Utilitarian products are functional and kind of necessary products which are practical and of some use to the consumers. An example of a digital utilitarian product would be home security systems or life insurance. These are necessary products for the people and hence can be classified as utilitarian products. Hedonic products are those which are used for pleasure and have no apparent practical use. An example of a digital hedonistic product would be Netflix, Prime or even mobile games such as PUBG, or candy crush.

Explain how connections, sensors, and data transformed the business model of General Electric from the early 2000s to today.

A business model is defined by how the organisation creates value for the customers and how it captures the value. Digital transformation, in this case, that is using connections, sensors, and data, is changing both. GE launched a million-dollar initiative focused on the industrial internet. It made a new model by implementing new technology and shifting its focus from deriving profits through sales to profits through service. This did lead to a drop in the number of sales but led to increase in profits in the long run. GE used cloud computing and invested in software development by collecting all the data and analysing it to improve their products, increase the efficiency of their products and hence build advanced analytical capabilities. They embraced crowd-based product development and used the ubiquitous IT to use data as a tool to transform their business.

Q&A (8m)

What does Carr mean by “IT doesn’t matter”? Why?

What makes a resource truly strategic is scarcity and not unicity. IT as a resource when scarce provided a strategic advantage to the business which gave them a competitive edge over others. But as IT became increasingly popular and more of an infrastructural technology, it lost its strategic advantage. Infrastructural technology is far more valuable when shared and that is what happened with Information technology. IT became a commodity. It became more valuable when shared and became highly replicable. It became very affordable and in such a way that everyone now has it. If everyone has the advantage, it doesn't remain an advantage anymore. Thus, IT became essential for competition but not a strategic tool. This is what Carr meant by “IT doesn’t matter”.

What gives a resource the capacity to be the basis for a sustained competitive advantage?

A resource when proprietary in nature, meaning, it is something unique to only the company who holds it, becomes the resource which gives the company a market advantage. When a resource is not accessible to everyone, it acts as an advantage for the company holding it. The longer it takes for the technology to be available to the public the more it can sustain as a competitive advantage. As soon as the technology starts getting replicated or accessible to everyone, it loses its market advantage. Hence, it is scarcity which gives the resource the capacity to be the basis for sustained competitive advantage.

As IT’s potency and ubiquity increases, how does it affect the strategic value of IT? Why?

IT in its infancy stage was like proprietary technology, it provided a strategic advantage to the company which held it. But as it transitioned and grew, it became an infrastructural property which held more value when shared. As IT became more affordable, it became more accessible, it became highly replicable and subject to rapid price deflation. As IT become more ubiquitous, it loses its strategic advantage. This is because what truly makes a resource strategic, is scarcity and not ubiquity. Hence as the IT develops, it will have less strategic value and will become essential to competition but inconsequential to strategy.

What is the difference between proprietary technologies and infrastructural technologies? Give one example for each.

Proprietary technologies are those technologies which are the property of a business or individual and not available to others thus making its products/services hard to replicate. An example of this would be a unique software owned by a company for their business processes such as the AI and predictive analytics system software of Dominoes. Proprietary technologies are those which provides a strategic advantage to the company that holds it if it remains protected.

Infrastructural technologies on the other hand are those which offer more value when shared rather than used in isolation. An example would be the mobile phone which like any other infrastructural technology is a transport mechanism, in this case, for data. Infrastructural technologies are highly replicable and hence during its lifetime gets standardized. In earlier stages of development Infrastructural technology can act as a proprietary technology to gain a strategic advantage but it can enable new, more efficient operating methods that often lead towards broader market changes.

Can proprietary technologies be the foundations for long term strategic advantages? If yes, how? If not, why not?

Proprietary technologies can be the foundation of long-term strategic advantage only if they remain protected. Proprietary technologies are those technologies which are the property

of a business or individual and not available to others thus making its products/services hard to replicate. When a resource is not accessible to everyone, it acts as an advantage for the company holding it. As soon as the technology starts getting replicated or accessible to everyone, it loses its market advantage. Hence, it is scarcity which gives the resource the capacity to be the basis for sustained competitive advantage. And proprietary technology fits the scarcity model.

Can infrastructural technologies be the foundations for long term strategic advantages? If yes, how? If not, why not?

Infrastructural technologies can not be the foundation for long term strategic advantage. When a resource is not accessible to everyone, it acts as an advantage for the company holding it. As soon as the technology starts getting replicated or accessible to everyone, it loses its market advantage. Infrastructural technologies on the other hand are those which offer more value when shared rather than used in isolation. Infrastructural technologies are highly replicable and hence during its lifetime gets standardized. Hence, it is scarcity which gives the resource the capacity to be strategically advantageous.

What should companies do when a resource becomes essential to competition but inconsequential to strategy?

The resource in question is a proprietary technology which has transitioned to become an infrastructural technology. An example of this would be Information Technology itself. When a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantages it provides. Making the technology available to all and sharing it becomes the norm. Through sharing the resource, the benefits one can receive becomes the norm. Another thing to note is that if one does not invest in these resources, they may face a tremendous loss and other companies might get a market advantage over them. Hence investing in the resource becomes necessary but should not be involved in strategic planning of the business.

What should companies do to avoid overspending in IT?

The greatest IT risk is overspending. A few techniques to avoid overspending in IT would be to spend less on IT. One needs to rigorously evaluate the expected returns from IT investments and classify investments according to its necessity and essentiality. Once the classification is done, one can explore cheaper alternatives and eliminate unnecessary and non-essential IT investments. Another technique is to delay the IT investment significantly and let other companies take the lead in IT research and development. Once the standards and best practices solidify, sweep in fast and adopt the technology smartly. Through this the impatient rivals shoulder the high costs of experimentation, and the patient companies can reap the benefits. Another way to eliminate the risk of overspending is to outsource the IT department all together to trustworthy vendors and there by focus on risks than opportunities. Rolls Royce is one such company which outsourced its entire IT department to another vendor, EDS.

According to the Christensen, is Uber a disruptive innovation? Why or why not?

According to Christensen, Uber is not a disruptive business. The financial and strategic achievements of Uber do not qualify it to be a disruptive technology. The requirement for being a disruptive technology is that disruptive innovation should originate from either low-end or new market footholds, but Uber did from neither. Both these markets are those which are greatly overlooked by the incumbents and hence allows a break for the new entrants. In the case of new-market footholds, disrupters create a market where none existed. Disrupters start by appealing to low-end or unserved consumers and then migrate to the mainstream market. Uber has gone in exactly the opposite direction: building a position in the mainstream market

first and subsequently appealing to historically overlooked segments. Another thing is that Uber is not an idea that is new, it has a business model like other companies. Furthermore, most of the disruptive tech is not used initially because its quality is low as it is a new product, but it captures attention as it develops in quality slowly whereas Uber has rarely given an unsatisfactory quality.

Describe the disruption process.

Disruption is a process. Disruption describes a process whereby a smaller company with fewer resources can successfully challenge established incumbent businesses. It is a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors. Disrupters often build business models that are very different from those of incumbents as they tend to focus on getting the business model, rather than merely the product, just right. The fact that disruption can take time helps to explain why incumbents frequently overlook disrupters. Disrupters often build business models that are very different from those of incumbents.

What is the difference between disruptive and sustaining innovations?

In business theory, disruptive innovation is innovation that creates a new market and value network or enters at the bottom of an existing market and eventually displaces established market-leading firms, products, and alliances. This means that disruptive innovations originate in low-end or new-market footholds. Disruptive innovations don't catch on with mainstream customers until quality catches up to their standards.

Sustaining innovation occurs when a company creates better-performing products to sell for higher profits to its best customers. An example of sustaining innovation is the smartphone market – every year, cell phone manufacturers release updated and improved products to meet consumer demand and to integrate new technology.

Disruption theory differentiates disruptive innovations from what are called sustaining innovations. The latter make good products better in the eyes of an incumbent's existing customers. Disruptive innovations, on the other hand, are initially considered inferior by most of an incumbent's customers.

What is the difference between low-end disruption and new-market disruption?

Disruption is a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors. Low-end disruption occurs when a company uses a low-cost business model to enter at the bottom of an existing market and claim a segment. As the entrant company claims the lowest market segment, the incumbent company typically retreats upmarket where profit margins are higher. New-market disruption occurs when a company creates a new segment in an existing market to reach unserved or underserved customers.

What is cloud computing?

Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services. The data centre hardware and software are what we will call a cloud. Cloud computing is the cause of the appearance of infinite computing resources available on demand eliminating the need for cloud computing users to plan far ahead for provisioning. Cloud computing makes it easy for companies to start small and increase hardware resources when necessary. This way the company needs to pay for the computing resources only when they need. Web technologies enable using the internet as the platform for applications and data. This is done using cloud

computing. There are multiple types of services available using cloud computing, these include SaaS, PaaS, IaaS, etc. Cloud computing has been able to enable advanced analytics of massive amounts of big data generated by mobile devices, sensors, or users of social networks. These are just a few applications of cloud computing.

What is the relationship between cloud computing and utility computing?

Utility computing is a service provisioning model in which a service provider makes computing resources and infrastructure management available to the customer as needed, and charges them for specific usage rather than a flat rate. Cloud computing is the sum of SaaS and utility computing but does not include small or medium sized data centres, even if these rely on virtualization for management. Cloud computing is a computing model for enabling ubiquitous, convenient, on-demand network access, to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. It uses the utility computing model where computer resources are treated as a utility like electricity.

Describe the three models of cloud service. What are the differences among them?

Cloud service provides for 3 distinct types of models. These are called Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Through either of these 3 services one can enable the usage of cloud computing for the organisation.

Infrastructure as a Service provides end users with cloud-based alternatives to physical infrastructure. IaaS is scalable and offers businesses greater flexibility. IaaS cloud servers are typically offered to businesses over the internet and are hence highly scalable, flexible, accessible by multiple users and cost effective. A few examples of IaaS are Microsoft Azure, Amazon Web Services, etc.

Platform as a Service provides developers with a framework, software and tools needed to build apps and software, all accessible through the internet. Customers cannot access the software online but the platform online. PaaS platform is accessible by many users, scalable, built on virtualization technology and easy to run without excessive system administration knowledge. A few examples of PaaS are AWS Elastic Beanstalk, Google App Engine, Azure App Service, etc.

Software as a Service is the most used service within the cloud market. SaaS platforms make software available to users over the internet, usually for a monthly subscription fee. The SaaS software is made accessible from any device as long you have an internet connection. With SaaS, you do not incur the capital cost of buying servers or software. SaaS is available over the internet and hosted on a remote server by a third-party provider. It is ideal for small start-ups. It is also scalable. A few examples of SaaS are Microsoft Office 365, Salesforce CRM, Zoom, Google Apps, etc.

What is the difference between public cloud and private cloud?

Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services. The data centre hardware and software are what we will call a cloud. When a cloud is made available in a pay-as you-go manner to the public, we call it a public cloud. We use the term private cloud to refer to internal data centres of a business or other organization, not made available to the public. A public cloud will have no maintenance costs, is highly scalable and flexible, has reduced complexity, flexible pricing and agile for innovation. Private cloud on the other hand

is a dedicated cloud to a company and hence secured and inaccessible to the public. It is regulation compliant, customizable, has high scalability and very efficient.

What are the advantages of public cloud over private data centres?

Public clouds are the most common type of cloud computing deployment. The cloud resources are owned and operated by a third-party cloud service provider and delivered over the internet. With a public cloud, all hardware, software, and other supporting infrastructure are owned and managed by the cloud provider. Microsoft Azure is an example of a public cloud. Public clouds are usually less expensive compared to private clouds which are customized according to the needs of the organization making it more expensive. It has no maintenance costs as it is maintained by a third-party cloud provider. On the contrary, the private cloud needs to be maintained by the organization holding it. The public cloud is highly scalable, one can use it as much as needed or as little as needed. Private cloud on the other hand has a fixed scale based on the regulations predefined. Finally, a public cloud has a high number of network servers to ensure against failure whereas a private cloud has limited number of network servers based on the size of the organisation and hence has limited protection against failures.

Describe three particularly compelling use cases that favour utility computing over conventional hosting.

We see three particularly compelling use cases that favour utility computing over conventional hosting.

Cloud computing lets an organisation pay by an hour for the services rather than a fixed contractual sum. This gives a high potential of cost savings as the organisation will have to pay for only those services being used if they are able to scale the resources appropriately. An example for this could be provisioning a data centre for the peak load it must sustain for a few days per month which is underutilized rest of the month. This use case is when demand for the service varies with time. An organisation would never know when it would have a spike in demand for its products and hence will have to vary their IT resources based on the fluctuations of the number of customers. This is where cloud computing helps wherein one can scale the service as and when needed. This use case is for when the demand is unknown in advance. An example of this would be an E-commerce website which is newly established and doesn't know when they would have a peak time and when not. The final use case is when organisations perform batch performance. The cost for using 1000 machines for an hour is equivalent to the cost of using 1 machine for 1000 years.

What are the costs associated with overprovisioning and under provisioning?

Overprovisioning or underutilization is a function that provides extra IT resources for the same task without interrupting the system performance. When overprovisioning occurs, it is easier to measure the risk and is generally less serious as the system has extra unallocated resources, but the work is being completed. The cost associated with overprovisioning might exceed the required budget and would go wasted but there are no other costs involved other than the cost of the IT resources.

Under provisioning or saturation is a scenario when there are a smaller number of IT resources allocated than required. This results in poor service to the customers. It is more difficult to measure and are potentially more serious as the customers who did not receive the IT resources on time would become the rejected customers who generate 0 revenue. Along with which it is also a loss of prospective customers who might not return after having a terrible

experience. Due to this, other than the fact that the cost of IT resources matter, the loss of potential customers and the immediate 0 value generation of customers who were rejected is a loss for the company.

Describe three obstacles that affect the adoption of cloud computing. Suggest a solution to each obstacle.

The article “A view of Cloud Computing” has given a list of top 10 obstacles for the adoption of cloud computing. A few of them are as follows:

Businesses are worried about the data lock in of cloud computing. Meaning that the storage APIs for cloud computing is proprietary and hence customers can not easily extract their data and programs from one site to run on another. This leads the customers to be vulnerable to price increases, reliability problems, etc. A solution to tackle this problem would be to standardize the APIs in a way that would be able to make the software compatible to hybrid cloud computing.

Another worry for the businesses is the data confidentiality. The data is the most valued tool of an organisation, and its protection is very important for certain types of companies. Cloud users face security threats both from outside and inside the cloud. The cloud user is responsible for application-level security. The cloud provider is responsible for physical security. Security for intermediate layers of the software stack is shared between the user and the operator. A good solution to this problem would be to deploy encryptions, VLANS and firewalls to protect the data.

Continuing data, another obstacle is the data transfer bottleneck. As applications continue to become more data-intensive data transfer costs become an important issue. One opportunity to overcome the high cost of Internet transfers is to ship disks. Another solution would be to implement higher bandwidth switches.

Describe five obstacles that affect the growth of cloud computing. Suggest a solution to each obstacle.

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There are times when the company must scale their cloud computing resources at a moment of notice. Another reason for scaling is to conserve resources as well as money. A good solution would be to automatically scale the cloud resources that relies on Machine learning algorithms and provide snapshots for the scaling to maintain records of it.

Current software licenses commonly restrict the computers on which the software can run. Users pay for the software and then pay an annual maintenance fee. Hence, many cloud computing providers originally relied on open-source software in part because the licensing model for commercial software is not a good match to utility computing. A solution for this would be to introduce pay-for-use licenses.

Describe two policy and business obstacles to cloud computing. Suggest a solution to each obstacle.

The article “A view of Cloud Computing” has given a list of top 10 obstacles for the adoption of cloud computing. In specifics, 2 policies which are also business obstacles would be the reputation fate sharing and the software licensing.

One customer’s bad behaviour can affect the reputation of others using the same cloud. Another legal issue is the question of transfer of legal liability. An opportunity or solution to this would be for the cloud service providers to offer reputation guarding services like those for email.

Current software licenses commonly restrict the computers on which the software can run. Users pay for the software and then pay an annual maintenance fee. Hence, many cloud computing providers originally relied on open-source software in part because the licensing model for commercial software is not a good match to utility computing. A solution for this would be to introduce pay-for-use licenses.

Suppose a company’s computing service has a predictable demand where the peak requires 750 servers, but the trough requires only 300 servers. The average utilization over a whole day is 450 servers. Assume that the company must provision to the peak at any time of the day. Suppose it costs the company \$1.4 per server hour to own the servers, and \$2.2 per server hour to rent from a cloud provider. Should the company buy its own servers or rent them from the cloud provider? Why?

$$\text{Demand at peak} = 750 \text{ servers}$$

$$\text{Average demand} = 450 \text{ servers}$$

$$\text{Actual cost per day} = 450 * 24 = 10,800 \text{ server hours}$$

$$\text{Cost of overprovisioning} = (750 * 24) - (450 * 24) = 7200 \text{ server hours}$$

$$\frac{\text{Peak workload}}{\text{Actual workload}} = \frac{750 * 24}{450 * 24} = 1.7$$

$$\text{Renting cost per server hour} = \$2.20$$

$$\text{Owning cost per server hour} = \$1.40$$

Based on the calculations a hybrid model would be the best-case scenario. In this case the company can purchase 450 servers as it is the average demand. This way it would be able

to curtail the overprovisioning costs and in case it is under provisioned, can rent servers on an hourly basis.

How does cloud computing change product design and customer experience? Why?

As cloud technology is improving a common repository for the collection and analysis of data is being created. As the technology is improving it is becoming easier to create products and services within the cloud and model new products or market campaigns as cloud-based software prototypes. Cloud computing is helping in changing the product design and customer experience by enabling closer collaboration between the corporate IT and the other departments of the business.

Product development organizations today can save themselves the pain of managing and maintaining complicated and time-consuming tools and technologies. The lengthy software development life cycles have been crunched as the cloud makes the software development cycle more efficient as developers can just focus on building, testing, and deploying the application and do not have to worry about the infrastructure demands. While traditional software development used testing at the end of the development cycle, cloud product development places testing at the core of development. Such radical changes have been brought about by cloud computing in product design.

Digitalization and cloud are valuable tools for improving CX and internal processes. The cloud enables the merger of (customer) data from different sources, even across companies. Cloud-based CRM applications enable them to keep track of every detail regarding the customer relationship. Connecting machines wirelessly allows for predictive maintenance, minimizing downtime. If AI, ML, and data analytics are provided via the cloud, companies can automatically make the most out of their data. Through the customization of the service using the data collected by the cloud for the customer, one can exponentially increase the customer experience and satisfy customer demands. This is how cloud computing is changing the customer experience.

How is cloud computing changing organizational designs?

Cloud computing is enabling closer collaboration between the corporate IT department and other business units, including sales, finance, and forecasting; and fostering more customer interaction, even to a point of jointly developing products with their consumers. New ways of writing and deploying software will encourage new types of faster-acting organizational designs. “Cloud native” software approaches stresses ease of use and low-impact alteration of components of any given software application. Massive applications are subdivided into a series of “microservices” that can be tweaked with little effect on a running piece of software. With cloud, information travels rapidly in both directions, across computing systems that, with attributes like virtualization, scaling up or down to handle bigger workloads, or automated security patching across thousands of machines, are far more flexible. This will likely mean a more flexible work structure as well. Fixed job roles, like software engineering or financial planning, may evolve towards domain knowledge, which is shared in collaborative teams, brought together. Companies may partner more deeply, taking advantage of each other’s comparative advantage to meet a new market need. Managers will need to concentrate more than ever on skills such as collaboration, empathy, learning, and novel rewards to create an organization hopefully even more adaptive than the cloud computing IT tool it beholds.

Compare and contrast the “cloud native” vs. traditional software approaches.

Cloud computing is enabling closer collaboration between the corporate IT department and other business units. New ways of writing and deploying software will encourage new types of faster-acting organizational designs. “Cloud native” software approaches stresses ease of use and low-impact alteration of components of any given software application. With cloud, information travels rapidly in both directions, across computing systems that, with attributes like virtualization, scaling up or down to handle bigger workloads, or automated security patching across thousands of machines, are far more flexible. The lengthy software development life cycles have been crunched as the cloud makes the software development cycle more efficient as developers can just focus on building, testing, and deploying the application and do not have to worry about the infrastructure demands. While traditional software development used testing at the end of the development cycle, cloud product development places testing at the core of development. Such radical changes have been brought about by cloud computing in product design.

According to the author, should online retailers focus on the long tail? Why or why not?

The other school of thought is the long tail theory which theorizes that customers will migrate away from similar products and drift towards products that are easily customizable to them. Thus, the school of thought proposes to focus on the profits from long tail, those are the niche offerings that cannot be profitably provided through brick-and-mortar channels. According to the research conducted by the author, Anita Elberse, many customers occasionally select obscure offerings that are probably not available in brick-and-mortar stores. Meanwhile, consumers of the most obscure content are also buying the hits. A balanced picture emerges of the impact of online channels on market demand. The research showed how difficult it is to derive profits from the long tail. Hence the author suggests to not focus on the long tail but in case they do, she has provided some suggestions for the producers as well as the retailers.

Explain the difference between the blockbuster strategy and the long tail strategy.

Blockbuster is a time-honoured approach, particularly in the media and entertainment sector. In this method, producers focus their market resources on a small number of likely best sellers. This approach involves a substantial risk but the occasional hit's huge pay-off will cover the losses of many misses, and that a few big sellers will bring in the lion's share of revenues and profits.

The other school of thought is the long tail theory which theorizes that customers will migrate away from similar products and drift towards products that are easily customizable to them. Thus, the school of thought proposes to focus on the profits from long tail, those are the niche offerings that cannot be profitably provided through brick-and-mortar channels.

According to the following scholars, should companies invest in long tail? Why or why not?

• **Robert Frank and Philip Cook**

According to Robert Frank and Philip Cook, Blockbuster is a time-honoured approach, particularly in the media and entertainment sector. In this method, producers focus their market resources on a small number of likely best sellers. This approach involves a substantial risk but the occasional hit's huge pay-off will cover the losses of many misses, and that a few big sellers will bring in the lion's share of revenues and profits. Hence, they do not support the long tail theory but the opposite.

• **Chris Anderson**

According to Chris Andersen, the Merchandise assortments are growing. Goods don't have to be displayed on store shelves hence the physical and cost constraints disappear. This is causing a change in the shape of the demand curve. The curve is longer as more obscure products are made available. The curve goes flatter as the consumers discover products better suited for their tastes. Thus, companies should focus on the long tail and come up with products which would appeal to the customers.

- **William McPhee and Anita Elberse**

The theory of exposure talks about how it is imprudent for companies to upend traditional practice and focus on the demand for obscure products. According to the author there is no segment available with a particular taste for the obscure products and are mainly light users who are interested in the popular products. The heavy users tend to choose a mix of hit and obscure products. Through this we can see that the author suggests against the investment in long tail by the companies.

Explain the “superstars” effect. What are the implications to online retailers?

The "Superstar phenomenon" is where a relatively small number of people dominate the activities in which they are engaged and earn enormous amounts of money. According to this line of thought, hits will keep coming

Products referred to the standout products. Follow blockbuster, following niche doesn't give profits/ blockbuster suppresses niche, products that go beyond blockbuster are superstar.

How do online channels change the shape of the demand curve? What are the implications to online retailers?

The long tail theory on the other hand focuses on the profits to be made from niche offerings that cannot be profitably provided through brick-and-mortar channels. Customers can then find and afford products closely tailored to their individual needs. One of the key points the author mentioned is how online channels will change the shape of the demand curve. According to Chris Andersen, the Merchandise assortments are growing. Goods don't have to be displayed on store shelves hence the physical and cost constraints disappear. This is causing a change in the shape of the demand curve. The curve is longer as more obscure products are made available. The curve goes flatter as the consumers discover products better suited for their tastes. Thus, online retailers should focus on the long tail and come up with products which would appeal to the customers.

Describe the two phenomena of distribution. What are the implications to online retailers?

There are 2 phenomena of distribution, the Blockbuster, and the long tail. Blockbuster is a time-honoured approach, particularly in the media and entertainment sector. In this method, producers focus their market resources on a small number of likely best sellers. This approach involves a substantial risk but the occasional hit's huge pay-off will cover the losses of many misses, and that a few big sellers will bring in the lion's share of revenues and profits. The other school of thought is the long tail theory which theorizes that customers will migrate away from similar products and drift towards products that are easily customizable to them. Thus, the school of thought proposes to focus on the profits from long tail, those are the niche offerings that cannot be profitably provided through brick-and-mortar channels.

How does omnichannel retailing affect the across-brand competition among “search goods”? Why?

What are search goods

Omnichannel enables us to do what

What is across brand competition
Product knowledge

What is omnichannel retailing?
Reading 3rd page + page 3

What are some of the enabling technologies of omnichannel retailing? Give some examples.

Summary of all the things under enabling technologies

Location and mobile phone

Give example of app and further DOOT and stuff

Explain the advantages of dual-channel retailers over traditional retailers and online retailers in selling “middle of tail” products.

Physical and online mix = dual channel

Successful strategies for omnichannel table of advantages

Page 6 of the reading

How does omnichannel retailing affect the competition among “experience goods” and “search goods” of different brands. Why?

Define these goods

Successful strategies for omnichannel retailing

What are some of the strategies that physical retailers can adopt to provide an omnichannel retailing experience to the customers? Give some examples.

What Alibaba is doing

Digitize the physical space

What are some of the strategies that online retailers can adopt to provide an omnichannel retailing experience to the customers? Give some examples.

Physical – learn to sell niche products,

Table on page 4

Suppose Apple is planning a viral marketing campaign for the upcoming iPhone 14. Give one example of “market mavens” and “social hubs” for the campaign and explain their roles in the campaign.

What is the relationship between word-of-mouth and viral marketing?

What are the advantages of electronic WoM over traditional WoM?

Describe the three basic conditions for creating a viral marketing epidemic.

Describe the three groups of messengers that are required to ensure the transformation of an ordinary message into a viral phenomenon.

What makes an effective viral message that is memorable and interesting?

What is the “Dunbar’s number”? What are its implications to viral marketing?

Describe the characteristics a Twitter user that has a high Customer Influence Effect (CIE), a high Stickiness Index (SI) and a low Customer Influence Value (CIV) to Hokey Pokey.

Describe how a company can use the messages monitored from a social media platform to identify the kind of influential individuals in that platform.

Describe the ideal, generalizable characteristics of key influencers.

Name a metric that can be used to identify key influencers. Explain what the metric measures.

Name a metric that can be used to identify the number of social media users who actively discuss a topic. Explain what the metric measures.

Name a metric that can be used to measure the tangible contribution of an influencer in a social media platform. Explain what the metric measures.

#Some topics of week 10

Web mining:

Web content mining: Focuses on analysing contents of web document. With sentiment analysis we can understand if customers are happy or sad about the services/products. Topic modelling tries to figure out topic in a document. For ex, topic modelling could be used to understand the topic from numerous reviews of the customers.

Web structure mining: Understanding the underlying link or structure of web documents. Eg: 1. Link analysis on web pages and hyperlinks: Google was the first commercial search engine that went beyond the contents of the document, it checked if the searched item is present in the document or at least for the related data. 2. Social network analysis on friends: Explains the hidden influence of an individual's social network. It analyzes your obesity chances if all people in your social circle are obese. Helps in studying common problems like public health problems. It can analyse your location, based on your friend's locations without using your IP address. Key influencers are important in a social group.

Web Usage mining: Analyse web server logs to discover useful patterns of web user behaviour. E.g., Analysis on clickstream data. This gives information like how many people landed on the website, how much time they have spent on a particular page, what web page

they visited most. Also, this can help to figure out if there issues on the web page like revisiting on a particular page and if task terminates.

If there is a business challenge to deal (to understand an issue or to improve marketing), then with the help if data mining procedure like decision trees to classify existing customers or to find sequence in the pattern of actions. Clustering to segment the customers into groups with similar attributes and to draw useful meaning out of it.

Week 11:

IT productivity paradox: Has 4 aspects: measurement, time lags, redistribution, and mismanagement.

Measurement, time lags – this is related to the way the research is done. The shortcomings in the research.

Redistribution and mismanagement: Shortcoming in the practice.

Measurement is primary reason for productivity paradox.

Measurement of outputs and inputs: Reason for not seeing productivity gain could be that you are measuring wrong things.

Productivity is basically measured based on some inputs divided to some outputs ex; number of shirts produced by workers. If wrong output or inputs are used incorrectly then you get incorrect value resulting in lower or larger statistical value.

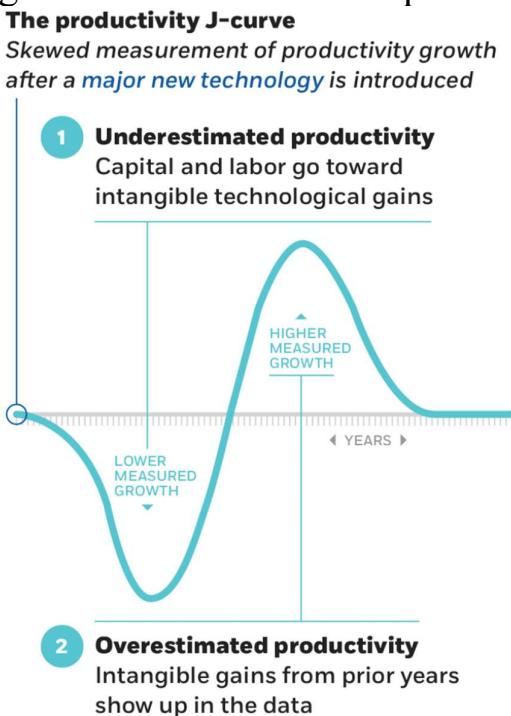
Output mismeasurement: In a company, there might be changes in the quality of product or customer services, but when measured input to output ratio, the value would be same as before. This will incorrectly signify under no productivity. But in reality, improving quality, speed, efficiency or customer service enhances productivity.

Input mismeasurement: Improved quality of work life. Upskilled employee force. Price index is often overstated. Labour input may be overestimated. Investment on training might not look very useful but

investment good amount on training but constantly provide gains for several years.

Time lags: Important measure to understand that the invested resources will not produce returns instantly. There might be small gains at that moment, but usually it takes 3-5 years for returns.

The Productivity J-curve: General purpose technologies (GPTs)(eg: electricity, blockchain, AI) such as AI enable and require significant complementary investments that are often intangible and poorly measured, even if they create valuable assets for a firm. E.g., business process redesign, co-invention of new products and business models, and investments in human capital. As firms adopt a new GPT, total factor productivity (TFP) growth will initially be underestimated because when its initially invested, results won't be seen instantly hence there is a downward graph movement. But later in the years, the invested resources start yielding significantly moving the graph upwards and making a 'J'. Capital and labour are spent to accumulate unmeasured output in the form of intangible capital stocks. Later, measured productivity growth overestimates true productivity growth. The capital service flows from those hidden intangible stocks and generates measurable output.



Redistribution and dissipation of profits: It signifies that IT is improving at a firm level and not industry level. When IT investment occurs, market share is redistributed. Firms will take advantage of their investment and gain upper hand over the firms who did not have investments. One firm's gain comes entirely at the expense of others. Only explains shortfall in IT productivity at the industry level but not at the firm level. Firms with inadequate IT budgets lose market shares and profits to high IT spenders. Strategic information systems take profits from competitors rather than lower costs.

Mismanagement of IT: The lack of explicit measures of the value of information makes it particularly vulnerable to misallocation and overconsumption by managers. Increasing organization slacks instead of outputs or profits, building inefficient systems, using outdated criteria for decision making. IT is not productive at the firm level.

3 types of arguments commonly made in the business case for an information system:

TABLE 9.1 Three Types of Arguments Commonly Made in the Business Case for an Information System

Type of Argument	Description	Example
Faith	Arguments based on beliefs about organizational strategy, competitive advantage, industry forces, customer perceptions, market share, and so on	"I know I don't have good data to back this up, but I'm convinced that having this customer relationship management system will enable us to serve our customers significantly better than our competitors do and, as a result, we'll beat the competition. . . You just have to take it on faith."
Fear	Arguments based on the notion that if the system is not implemented, the firm will lose out to the competition or, worse, go out of business	"If we don't implement this enterprise resource planning system, we'll get killed by our competitors because they're all implementing these kinds of systems. . . We either do this or we die."
Fact	Arguments based on data, quantitative analysis, and/or indisputable factors	"This analysis shows that implementing the inventory control system will help us reduce errors by 50 percent, reduce operating costs by 15 percent a year, increase production by 5 percent a year, and pay for itself within 18 months."

Total Cost of Ownership (TCO): Total cost of acquisition and all costs associated with the ongoing use and maintenance of the system.
Non-recurring costs: One-time costs that are not expected to continue after the system is implemented. E.g., Site preparation, technology purchases, training, renovation.

Recurring costs: Ongoing costs that occur throughout the life of the

system. E.g., Salary and benefits, electricity, upgrades and maintenance, monthly fees. Personnel costs are usually the largest recurring costs.

Benefits: Tangible benefits- E.g., Increase in sales due to increased customer reach.

Intangible benefits - E.g., Improvements in customer service.

Net present value: Ex: A company is looking to invest in new smart vending machines that will reduce costs and increase profits.

Management believes in the following year there is a probability of 0.55 that there will be a high demand in this technology with a market value of \$140m, and a probability of 0.45 that there will be a low demand in this technology with a market value of \$40m. If the cost of investing in this technology at time zero is \$100m and the discount rate is 8%. Should the project be accepted? Why or why not?

› Suppose the discount rate is 8%

› NPV of the project

$$\begin{aligned}
 &= -\$4,500 + \frac{\$103,500}{(1.08)^1} + \frac{\$130,250}{(1.08)^2} + \frac{\$155,250}{(1.08)^3} + \\
 &\frac{\$179,500}{(1.08)^4} \\
 &= -\$4,500 + \$95,833 + \$111,668 + \\
 &\$123,242 + \$131,938 \\
 &= \$458,182
 \end{aligned}$$

Costs	2014	2015	2016	2017	2018
Non-recurring					
Hardware	\$ 20,000				
Software	\$ 7,500				
Networking	\$ 4,500				
Infrastructure	\$ 7,500				
Personnel	\$100,000				
Recurring					
Hardware	\$ 500	\$ 1,000	\$ 2,500	\$ 15,000	
Software	\$ 500	\$ 500	\$ 1,000	\$ 2,500	
Networking	\$ 250	\$ 250	\$ 500	\$ 1,000	
Service fees	\$ 250	\$ 250	\$ 250	\$ 500	
Infrastructure	\$ 250	\$ 500	\$ 1,500		
Personnel	\$ 60,000	\$ 62,500	\$ 70,000	\$ 90,000	
Total costs	\$139,500	\$ 61,500	\$ 64,750	\$ 74,750	\$110,500
Benefits					
Increased sales	\$ 20,000	\$ 50,000	\$ 80,000	\$115,000	\$175,000
Error reduction	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000	\$ 15,000
Cost reduction	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Total benefits	\$135,000	\$165,000	\$195,000	\$230,000	\$290,000
Net costs/benefits	\$ (4,500)	\$103,500	\$130,250	\$155,250	\$179,500

NPV of the project

$$= -\$100m + \frac{(\$140m)(0.55) + (\$40m)(0.45)}{(1.08)^1} = -\$12.04m$$

Considering only NPV without considering real option approach, we will tend to reject the investment and think that it's not worth to buy start-up/service. But considering the real option approach, it would be worth for an investment depending on the market as NPV will be positive.

NPV approach will let you have the flexibility invest in a new start-up or a core technology. It helps in reversibility and scalability in the evaluation horizon. Value of IT investment may arise from the

flexibility in the investment. There are other opportunities from engaging in projects and not just simple cash profits.

Real option approach allows management to quantify these options: E.g., the project gives management the option to: Abandon a project that is operating at a loss and sell or redeploy the assets (option to abandon/switch), Scale back project that is operating at a loss (option to contract), Wait/learn more to see if a project will be profitable (option to defer/postpone), Expand/scale up the project based on its success (option to expand).

While presenting a business case, it's essential to know your audience. Different stakeholders hold very different perspectives about what and how an IS investment should be made. Several factors come into play in making investment decisions, and numerous outcomes can occur. Converting every possible benefit to monetary terms. Translate all potential benefits into monetary savings (e.g., annual savings). Proxy variables are used to quantify the impact of an investment. These variables help to achieve alternative measures of outcomes to help clarify the impact on the firm. It also helps in interpreting perceived value to the organization specially when one can't directly measure the outcome, with these variables outcomes can be predicted relatively. E.g., More direct contact with customers while reducing administrative workload. Measure what is important to management. Focus on the "hot-button" issues and how the system impacts them. E.g., Cycle time, regulatory or compliance issues, customer feedback, employee morale, etc.

IS development and acquisition strategy:

1. In house development: This means developing application or services within the firm. Firm will have development or production team, where this building new product/service will take place.
 - a. Software development life cycle SDLC: This is the traditional systems development method that organizations use for large-scale IT projects. A structured framework that consists of sequential processes by which information systems are developed

- Systems investigation
- Systems analysis
- Systems design
- Systems implementation
- Systems maintenance

A typical waterfall model is the example.

- b. Joint Application Design (JAD): A group-based tool for collecting user requirements and creating system designs.
 - c. Prototyping: An approach that defines an initial list of user requirements, builds a model (prototype) of the system, and then refines the systems in several iterations based on users' feedback.
 - d. Computer-Aided Software Engineering (CASE): A group of tools that automate many of the tasks in the SDLC
Upper CASE tools: automate early stages of the SDLC
Lower CASE tools: automate later stages of the SDLC
 - e. Rapid Application Development (RAD): A systems development method that combine JAD, prototyping, and integrated CASE tools to rapidly produce a high-quality system. Some other alternative methods and tools are; Agile development, end-user development and object-oriented development.
2. External acquisition: Similar to in-house development, you get to do System investigation and analysis but for other steps, firm hires people who do not belong to the current organisation to do it. Organisation comes up a proposal seeking vendors to take it up and then proposals are evaluated, and appropriate vendors are selected.
- i) Customer Software: Like in enterprise system, SAP.
Customizability: tailored to meet unique organizational requirements. Problem specificity: pays only for features specifically required for its users.
 - ii) Off-the-Shelf Software: Typically used for supporting business processes that do not require any specific tailoring. Generally, less costly, faster to procure, higher quality, less risky than custom systems. Some advantages and

disadvantage are below:

Advantages

Many different types of off-the-shelf software are available.
Software can be tried out.
The company can save much time by buying rather than building.
The company can know what it is getting before it invests in the product.
The company is not the first and only user.
Purchased software may eliminate the need to hire personnel specifically dedicated to a project.

Disadvantages

Software may not exactly meet the company's needs.
Software may be difficult or impossible to modify, or it may require huge business process changes to implement.
The company will not have control over software improvements and new versions.
Purchased software can be difficult to integrate with existing systems.
Vendors may discontinue a product or go out of business.
Software is controlled by another company with its own priorities and business considerations.
Intimate knowledge in the purchasing company is lacking about how and why the software works as it does.

- iii) Free Software: Software that comes with permission for anyone to use, copy, and/or distribute, either verbatim or with modifications, either gratis or for a fee. This is not free-download software. Free as in “free speech”, not free of cost. The freedom to run the program, for any purpose (freedom 0). The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this. The freedom to redistribute copies so you can help your neighbour (freedom 2). The freedom to distribute copies of your modified versions to others (freedom 3).
- iv) Open-source software are the software that can be freely used, changed, and shared (in modified or unmodified form) by anyone. Nearly the same as free software.
Public domain software: Software that is not copyrighted.
With or without source code
Copylefted software: Free software whose distribution terms (copyrights) ensure that all copies of all versions carry more or less the same distribution terms. E.g., Software under GPL (GNU General Public License). Use copyrights to

shield the program, and its modified versions, from some of the common ways of making a program proprietary.

v) **Outsourcing:** Use of outside contractors or external organizations to acquire IT services. Contracting out a business process (e.g., software development, call centre operation) to a third-party.

Offshoring: Relocating business process from one country to another (e.g., India and China)

Reasons for outsourcing:

- Cost and Quality Concerns: Higher quality systems as a lower price.
- Problems in IS Performance: Increase reliability through outsourcing.
- Supplier Pressure: The largest service providers are often the largest suppliers of computer equipment.
- Simplifying, Downsizing, and Reengineering: Focus on only the “core competencies”
- Financial Factors: Strengthen the balance sheets by liquidating IT assets; use IT services more wisely
- Organizational Culture: External service provider often bring enough clout to streamline IS operations as needed.
- Internal Irritants: Eliminate tension between end users and the IS staff

Self-check questions:

1) What is the Productivity Paradox of IT?

The productivity paradox is the peculiar observation made in IT process analysis that, as more investment is made in information technology, worker productivity may go down instead of up.

A lot of studies were made on IT investments, companies assumes they will have better gains after vast expenditure on IT. Firms consistently make real purchases. But it's observed that productivity in the service sector has not kept pace with that in manufacturing.

IT productivity paradox has 4 reasons: measurement, time lags, redistribution, and mismanagement.

Measurement, time lags – this is related to the way the research is done. The shortcomings in the research.

Measurement is primary reason for productivity paradox.

Measurement of outputs and inputs: Reason for not seeing productivity gain could be that you are measuring wrong things. Productivity is basically measured based on some inputs divided by some outputs ex; number of shirts produced per worker. If input or outputs are used incorrectly then you get incorrect value resulting in lower or extremely larger statistical value.

Output mismeasurement: In a company, there might be changes in the quality of product or customer services, but when measured input to output ratio, the value would be same as before. But this might incorrectly signify under no productivity. But in reality, improving quality, speed, efficiency or customer service enhances productivity.

Input mismeasurement: Improved quality of work life. Upskilled employee force. Price index is often overstated. Labour input may be overestimated. Investment on training might not look very useful but investment good amount on training but constantly provide gains for several years.

Time lags: Important measure to understand that the invested resources will not produce returns instantly. There might be small gains at that moment, but usually it takes 3-5 years for returns.

Redistribution and mismanagement: Shortcoming in the practice.

Redistribution and dissipation of profits: It signifies that IT is improving at a firm level and not industry level. When IT investment occurs, market share is redistributed. Firms will take advantage of their investment and gain upper hand over the firms who did not have investments. One firm's gain comes entirely at the expense of others. Only explains shortfall in IT productivity at the industry level but not at the firm level. Firms with inadequate IT budgets lose market shares and profits to

high IT spenders. Strategic information systems take profits from competitors rather than lower costs.

Mismanagement of IT: The lack of explicit measures of the value of information makes it particularly vulnerable to misallocation and overconsumption by managers. Increasing organization slacks instead of outputs or profits, building inefficient systems, using outdated criteria for decision making. IT is not productive at the firm level.

- 2) What are the explanations for the paradox?

A statement that is seemingly contradictory or opposed to common sense and yet is perhaps true. An argument that apparently derives self-contradictory conclusions by valid deduction from acceptable premises.

A paradox is a statement that contradicts itself, or that must be both true and untrue at the same time. Paradoxes are quirks in logic that demonstrate how our thinking sometimes goes haywire, even when we use perfectly logical reasoning to get there. But a key part of paradoxes is that they at least sound reasonable. They're not obvious nonsense, and it's only upon consideration that we realize their self-defeating logic.

Eg: Nobody goes to Murphy's Bar anymore — it's too crowded. If the bar is crowded, then lots of people are going. But if so, many people are going, it makes no sense to say "nobody goes" there anymore.

- 3) Which explanation appears to account for the biggest share of the paradox?

Measurement is primary reason for productivity paradox.

Measurement of outputs and inputs: Reason for not seeing productivity gain could be that you are measuring wrong things. Productivity is basically measured based on some inputs divided by some outputs ex; number of shirts produced per worker. If input or outputs are used incorrectly then you get incorrect value resulting in lower or extremely larger statistical value.

Output mismeasurement: In a company, there might be changes in the quality of product or customer services, but when measured input to output ratio, the value would be same as before. But this might incorrectly signify under no productivity. But in reality, improving quality, speed, efficiency or customer service enhances productivity.

Input mismeasurement: Improved quality of work life. Upskilled employee force. Price index is often overstated. Labour input may be overestimated. Investment on training might not look very useful but investment good amount on training but constantly provide gains for several years.

- 4) Which explanations point to shortcomings in research?

Measurement, time lags – this is related to the way the research is done. The shortcomings in the research.

Measurement is primary reason for productivity paradox.

Measurement of outputs and inputs: Reason for not seeing productivity gain could be that you are measuring wrong things. Productivity is basically measured based on some inputs divided by some outputs ex; number of shirts produced per worker. If input or outputs are used incorrectly then you get incorrect value resulting in lower or extremely larger statistical value.

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Time lags: Important measure to understand that the invested resources will not produce returns instantly. There might be small gains at that moment, but usually it takes 3-5 years for returns.

- 5) Which explanations point to shortcomings in practice?

Redistribution and mismanagement: Shortcoming in the practice.

Redistribution and dissipation of profits: It signifies that IT is improving at a firm level and not industry level. When IT investment occurs, market share is redistributed. Firms will take advantage of their investment and gain upper hand over the firms who did not have investments. One firm's gain comes entirely at the expense of others. Only explains shortfall in IT productivity at the industry level but not at the firm level. Firms with inadequate IT budgets lose market shares and profits to high IT spenders. Strategic information systems take profits from competitors rather than lower costs.

Mismanagement of IT: The lack of explicit measures of the value of information makes it particularly vulnerable to misallocation and overconsumption by managers. Increasing organization slacks instead of outputs or profits, building inefficient systems, using outdated criteria for decision making. IT is not productive at the firm level.

- 6) Explain how the example of investment in ATMs by banks contributes to the IT productivity paradox.

The original plan for ATMs had both marketing and operations implications. The marketing emphasis was to demonstrate convenience banking that would translate into increased deposits for the bank offering this service. The operations thrust was to reduce costs by using ATMs to replace live tellers, reduce the number of new brick-and-mortar branches, and limit the growth of paper check transactions.

Recent studies, however, indicate that live tellers continue to be in demand, new branch starts are steady, and paper check transactions are growing at 5 percent each year. The relationship between ATMs and bank deposits has proven to be somewhat tenuous in most cases. An estimated 90 percent of all commercial bank checking account customers have access to ATMs with a debit card, but only one-third of them use an ATM

on a regular basis, and of these, a single use per month is the average. That single use represents only 5 percent to 6 percent of the average monthly transactions on a checking account.

While there are certainly ATM-ophiles with twenty-plus uses each month, the average banking customer appears to use the ATM infrequently and possibly only in an emergency. These statistics are not encouraging to the banking industry that was actively seeking large productivity increases through the application of computer-based technology in a self-service delivery mechanism.

- 7) Explain how the computer price deflator used in the government statistics contributes to the IT productivity paradox in the service (computer-using) industries.

Note to vinit: he didn't speak about government statistics.

If its just computer price deflator, then some points from 10) can be written.

- 8) Explain the time lags argument for the IT productivity paradox.

Time lags: Important measure to understand that the invested resources will not produce returns instantly. There might be small gains at that moment, but usually it takes 3-5 years for returns.

- 9) Explain the renting dissipating property of information, and how it explains the IT productivity paradox at the industry level.

Monetary value of the assets has evolved over years. Value of 1000\$ 20 years ago has deflated now. Price of a computer might have been approx. 100\$ 2 decades ago but now it would be around 1500\$. Productivity improvement attributed to computer-producing industry should be allocated to computer-using industry. In computer using industries, productivity maybe fluttering out and people might overestimate the amount of investment in computer using industry. In manufacturing, computer producing industry, the productivity is higher than it should be. Hence in computer using industries, productivity should be more when compared to computer producing

companies this is because price index used to adjust the price which is often overstated.

- 10) Explain the mismanagement argument for the shortfall in IT productivity at the firm level.

Mismanagement of IT: The lack of explicit measures of the value of information makes it particularly vulnerable to misallocation and overconsumption by managers. Increasing organization slacks instead of outputs or profits, building inefficient systems, using outdated criteria for decision making. IT is not productive at the firm level.

Week 13:

Primary Threats to IS security are: Natural disasters, accidents, Employees & Consultants, Links to Outside Business Associates and outsiders.

Precautions taken to keep all aspects of information systems safe from destruction, manipulation, or unauthorized use or access, while providing the intended functionality to legitimate users.

Organizational considerations- Availability, Integrity, Confidentiality, Accountability.

An ongoing process consisting of- Assessing risks, developing a security strategy, Implementing controls and training, Monitoring security.

IS Risk Assessment: Obtain an understanding of the risks to the availability, integrity, and confidentiality of data and

systems. Should encompass all of an organization's systems, so as to identify threats and vulnerabilities, determine their probabilities of being exploited, and to assess the potential impact.

IS security programs are important economically: Assess the value of the assets being protected, determine their probability of being compromised, compare the probable costs of assets being compromised with the estimated costs of protections.

Risk rating for each particular function or asset: Uses both quantitative data (e.g., value of the asset and implementation costs of security measures) and qualitative data (e.g., results from interviews and walkthroughs)

TABLE 10.5 Options for Addressing IS Risks

Option	Description	Condition
Risk reduction	Taking active countermeasures to protect your systems	■ High risk cannot be accepted.
Risk acceptance	Implementing no countermeasures and simply absorbing any damages that occur	■ There exists a low likelihood/impact. ■ Other factors are more important than security.
Risk transference	Having someone else absorb the risk	■ Other parties may be better equipped to manage the risk.
Risk avoidance	Using alternate means, or not perform tasks that would cause risk	■ Risk is unmanageable. ■ Risk is too high.

Developing a security strategy:

- Once risks are assessed, a strategy should be formulated that details what IS controls (technology, people, policies, etc.) should be implemented.
 - Preventive Controls
 - Prevent potentially negative event from occurring
 - E.g., authentication controls, encryption, etc.
 - Detective Controls
 - Assess whether anything went wrong
 - E.g., intrusion detection systems, security testing, etc.
 - Corrective Controls. Mitigate the impact of any problem after it has arisen. E.g., Computer emergency response team (CERT), patch management, etc.

- Balance between implementing preventive measures and providing functionality for the users. Principle of Least Privileges (POLP). Users should only be given access that are needed to perform their duties.
- Defence-in-Depth: Employ multiple layers of controls to avoid having a single point of failure

Time-based model of security:

- Evaluates the effectiveness of an organization's security
 - $P(t)$ = Time it takes an attacker to break through the organization's preventive controls
 - $D(t)$ = Time it takes to detect that an attack is in progress
 - $C(t)$ = Time it takes to respond to the attack
 - If $P(t) > D(t) + C(t)$, then the organization's security procedures are effective.
- This calculation provides a means for management to identify the most effective approach to improving security.

› Example 1

- XYZ Company evaluates its security procedures with the following estimates:
 - Estimated time to detect an intrusion attempt and notify appropriate security staff = 15 minutes
 - Estimated time for intruder to successfully penetrate system = 20 minutes
 - Estimated time to analyze detected intrusion attempts and implement corrective actions = 6 minutes

- Are the security procedures of XYZ Company effective? Why or why not?

$$P(t) > D(t) + C(t).$$

$$P(t)=20 \quad D(t)=15 \quad C(t)=6$$

Then, $20 < 21$. Hence it takes 20 mins to intrude and 21 mins to figure it out and this is not effective.

› Example 2

- Suppose XYZ Company is considering the investment of \$100,000 to enhance security:
 - Option 1: Invest \$65,000 to purchase a new firewall that would increase the estimated time to successfully penetrate the system by 10 minutes
 - Option 2: Invest \$30,000 to upgrade the intrusion detection system that would reduce the time to detect an intrusion attempt and notify appropriate security staff by 4 minutes
 - Option 3: Invest \$25,000 in new methods for responding to computer security incidents so as to reduce the time required to analyze detected intrusion attempts and implement corrective actions by 2 minutes
- Which options would you recommend? Why?

Ans: Option 1 & 2.

$P(t) > D(t) + C(t)$.

By choosing op 1, we can increase $P(t)$ by 10mins and by choosing op2, we can increase 4mins of $D(t) + C(t)$. So, the gap is increased by 14mins.

Considering previous examples values, now it takes 30mins to intrude and 16 mins to figure it out. Hence these are best options within the budget.

Implementing controls and training:

- Once a comprehensive strategy has been formulated, organizations can decide which controls to implement and train personnel regarding security policies and measures
- Commonly used controls
 - Access restrictions
 - Encryption
 - Firewalls
 - Virus monitoring and prevention
 - Secure data centers
 - Mobile device management
 - Systems development controls
 - Human controls
- Access restrictions:
 - Authentication: Process to determine the identity of the person requiring access.
 - Factors of Authentication

- Something You Know (Knowledge Factor)
E.g., password
 - Something You Have (Ownership Factor) E.g., smart card
 - Something You Are (Inherence Factor) Eg: Biometrics
 - Two-factor (multiple-factor) Authentication
 - CAPTCHA: Test to determine whether the user is human
- Encryption:
 - The process of converting an original message (plaintext) into a form that cannot be read (ciphertext) by anyone except the intended receiver
 - Objectives: Confidentiality, Integrity, Authentication, Nonrepudiation (Proof that the sender actually sent the message. Prohibits the author of the message from falsely denying that he sent the message).
 - Two types of algorithms: Symmetric key algorithm (Same key for both encryption and decryption) and asymmetric key algorithm (public key and private key).
- Digital signature:
 - A mathematical scheme for demonstrating the authenticity of a digital message or document.
 - Gives a recipient reason to believe the message was created by a known sender, such that the sender cannot deny having sent the message (authentication and non-repudiation). The message was not altered in transit (integrity)
 - Employs asymmetric key algorithms. Here they can't use symmetric key algorithm because, key in the symmetric approach is known by everyone and anybody can forge it. Repudiation can occur. People can deny that they have sent the message.

Scenario: Alice wants to send a message to Bob. They want to make sure no one sees the message and bob wants to make sure that the

message is from alice and allice can't deny the message. What should they do?

In this case, they need to use 4 keys.

When Alice sends the message, she needs to sign the message with her private key and encrypt the message with Bob's public key and send the message.

When bob receives the message, he should decrypt the message by his private key and verify the signature with Alice's public key.

- Digital certificate:

- An electronic document that uses a digital signature to bind a public key with an identity. A digital certificate includes:
 - Owner's public key
 - Owner's name or alias
 - Expiration date of the certificate
 - Serial number of the certificate
 - Name of the organization that issued the certificate
 - Digital signature of the organization that issued the certificate
- Certificate Authority (CA): A trusted third party that issues digital certificates. Uses its own digital signature to bind a public key with an identity

One more scenario:

When bob gets alice public key, how does bob knows that key belongs to alice (that he knows) and not someone else. Here comes Digital certificate. When Alice gets a digi certificate (which is like verified public key)

If Bob has any doubts regarding Alice public key, he can go to certificate authority (CA) and verify Alice's digital certificate with CA's public key.

So Alice, Bob, and CA has own private keys and corresponding digital certificate. To verify someone's public key, now they can rely on their digital certificate. This can be verified at certificate authority's public key.

Secure socket layer (SSL): An encryption standard used for secure transactions such as credit card purchases and online banking.

IS Security Policies and Procedures:

- Some of the best things to secure information systems are not necessarily technical in nature
- Information Policy: Outlines how sensitive information will be handled, stored, transmitted, and destroyed
- Security Policy: Explains technical controls on all organizational computer systems.
- Use Policy: Outlines the organization's policy regarding appropriate use of in-house computer systems.
- Backup Policy: Explains requirements for backing up information.
- Account Management Policy: Lists procedures for adding and removing users to systems.
- Incident Handling Procedures: Lists procedures to follow when handling a security breach
- Business Continuity Plan / Disaster Recovery Plan

Business Continuity Plan: Describes how a business continues operating after a disaster, before normal operations have been restored.

Disaster recovery plan:

- Subset of the business continuity plan
- Spells out detailed procedures for recovering from systems-related disasters
(e.g., virus infections)
- What events are considered a disaster?
- What should be done to prepare the backup site?
- What is the chain of command, and who can declare a disaster?
- What hardware and software are needed to recover from a disaster?

- Which personnel are needed for staffing the backup sites?
- What is the sequence for moving back to the original location after recovery?
- Which providers can be drawn on to aid in the disaster recovery process?

Monitoring security:

- Organizations should continuously monitor the effectiveness of the controls.
- Monitoring external events
 - Information Sharing and Analysis Centers (ISAC)
 - Computer Emergency Readiness Team (CERT)
- IS auditing
 - Often performed by external auditors
 - Help organizations assess the state of their IS controls; ensure IS availability, integrity, and confidentiality; and determine necessary changes.
 - Control OBjectives for Information and related Technology (COBIT)
 - A framework created by IS Audit and Control Association (ISACA) for IT management and governance
 - A set of best practices that helps organizations both maximize the benefits from their infrastructure and establish appropriate controls

Week 6

Any marketing activity requires
Change the mobile to DND

Mobile platforms have unique opportunity because it is highly personal you don't share it. So, marketing in this platform helps in identifying the address using ip address or cookies. It is highly personal. For marketers you can identify your customers well but you can't do that in desktops or public computers.

Me time – a big portion of the time people are busy seeking relaxation/browsing/ watching YouTube, entertainment. Bad news for marketing this app doesn't do well. Not effective. Affects the business harshly.

Also, the popups are really hard to deal with on mobile phones.
Fat finger- they click by mistake, not really paying attention.

Mobile do work well sometimes.

Utilitarian – practical purpose – pens, paper, insurance, computer – for use
Hedonic = for fun, pleasure- books, restaurant.

People involvement – where people are retained and are motivated to recall information about a product.

Mobile computing

Mobility – how mobile the device is. laptop

Embedded – how much it is embedded in physical objects. Smart watch, fit bit, doorbell, smart light bulb, smart air purifier. Computing power embedded in physical object.

Broad reach.

Mobility.

5 attributes:

Ubiquity

Convenience and instant connectivity

Personalization

Localization

Applications:

1. Information on the go.
2. Product and content sales.
3. Location based service

A computer environment where virtually every object has processing power with wireless or wired connections to a global network

Invisible “everywhere computing” that is embedded in the objects around us

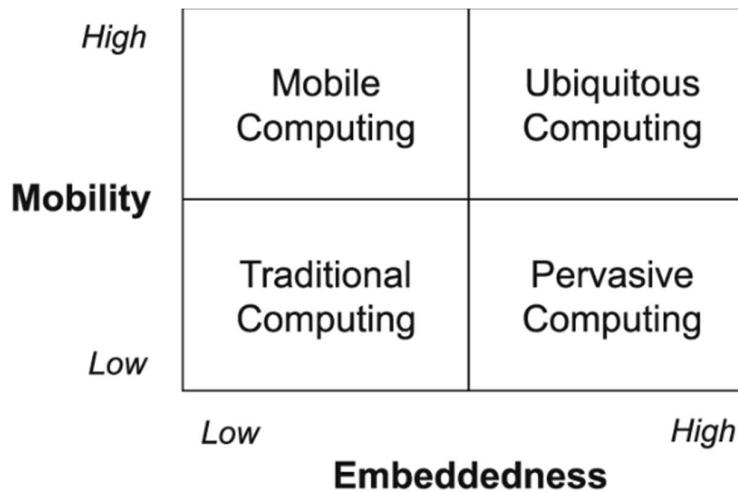
Some enabling technologies

- - Radio Frequency Identification (RFID)
 - A wireless technology that allows manufacturers to attach tags with antennas and computer chips on goods and then track their movement through radio signals
- - Wireless Sensor Networks (WSNs)
 - Networks of inter-connected, battery powered, wireless

sensors placed in the physical environment - Internet of Things

A broad range of physical objects(computer, sensors, motors, etc.) that are interconnected and automatically share data over the Internet

The phrase has arisen to reflect the growing number of smart, connected products and highlight the new opportunities they can represent



Non cash payments:

- Cheques
 - › Electronic Transfers
 - Direct Debit
 - BPAY
 - Direct Credit
 - Pay Anyone
 - Person-to-Person Payments
- › Payment Cards
 - Credit and debit cards - Store-value cards
- › Cryptocurrencies - Bitcoin

Issuer (Issuing Bank)

- - Financial institution that offers card association branded payment cards directly to consumers
- - Assumes primary liability for the consumer's capacity to pay off debts they incur with their card
 - › Acquirer (Acquiring Bank)
- - Financial institution that processes credit or debit card payments on behalf of a merchant
- - Accepts the risk that the merchant will remain solvent
 - › Card Associations

- A network of issuing banks and acquiring banks that process payment cards of a specific brand
- Visa, MasterCard, American Express, UnionPay, JCB, Diner's Club, Discover, etc.
- Credit card ("CR") and international debit card ("CHQ" or "SAV") transactions
- EFTPOS Payments Australia Limited(ePAL)
 - - Electronic Fund Transfer at Point of Sale (EFTPOS) system
 - - ATM and domestic debit card ("CHQ" or "SAV") transactions

Payment card schemes

Four-party Scheme (Open Loop)

- Issuer and acquirer are different entities
 - E.g., Visa, MasterCard, UnionPay, EFTPOS
- › Three-party Scheme (Closed Loop)
- Issuer and acquirer are the same entities
 - E.g., American Express, Discover, Diner's Club

Authorization

- The process by which the card issuer approves or declines a card transaction.
- › Clearing
- A process through which a card issuer exchanges transaction information with an processing bank. › Settlement
 - A process through which a card issuing bank exchanges funds with a processing bank to complete a cleared transaction.

Fraud card transactions

Card Not Present (CNP) Transaction

- A payment card transaction made where the cardholder does not or can not physically present the card for a merchant's visual examination at the time that an order is given and payment effected (Wikipedia)
- E.g., mail-order transactions by mail or fax, or over the telephone or Internet
- A major route for credit card fraud

› Skimming

- Theft of credit card information used in an otherwise legitimate transaction by photocopy, skimming device (skimmer), etc.

Card Security Code

- - 3 or 4 digits printed on the card or
 - signature strip
 - MasterCard: CVC2 (Card Validation Code)
 - VISA: CVV2 (Card Verification Value)
 - American Express: CID (Card IDentification)
- - Not encoded on the magnetic stripe
 - › 3-D Secure Protocol
- - Added authentication steps for online payments
 - Verified by VISA
 - MasterCard SecureCode
 - American Express SafeKey

Contactless payment

Radio Frequency Identification (RFID)

- - Visa payWave
- - MasterCard Paypass
- - American Express Contactless Payments (Express Pay)
 - › Near Field Communication (NFC) - Mobile Visa payWave
 - MasterCard Mobile Paypass
 - American Express Mobile NFC

A secure way to carry your credit card or charge card information in an encrypted digital form on your mobile device

- Apply Pay
- Android Pay
- Samsung Pay

Stored value cards

- › Value stored on a card instead of an externally recorded account › Ideal for micropayments
- › Card Types
 - Magnetic Strip Cards
 - - Storing information only
(passive cards)
 - - Processing done on device
 - Smart Cards
 - Microchips embedded
 - Store more (100x) information
 - Information encrypted
 - Contact vs. contactless (proximity) card

Crypto currency

- › Virtual currencies that are not issued by any central bank
- › Use encryption technologies to secure transactions and to generate new units of currency › E.g., Bitcoin
 - - Transferred as payment within a completely decentralized peer-to-peer payment network
 - - Authenticity of each transaction is ensured by digital signatures
 - - Encryption ensures transactions remain anonymous
 - - Transaction is broadcast within the Bitcoin network, and is stored on a secure, public ledger that is accessible to any computer that wants to verify it
 - Public ledger takes the form of a blockchain
 - An indelible, decentralized public ledger to which transactions are added in blocks, serving as proof of all transactions ever made
 - Constantly verified and maintained by the Bitcoin network
 - Any changes made require consensus by the majority of nodes
 - Advantages over other electronic payments – Requires no trusted middleman
 - Low transaction fees
 - Anonymous

An open, distributed ledger that can record transactions between two parties and in a verifiable and permanent way

- - Distributed Database
 - No single party controls the data or the information
- - Peer-to-Peer Transmission
 - Communication occurs directly between peers instead of through a central node
- - Transparency with Pseudonymity
 - o - Every transaction and its associated value are visible to anyone with access to the system
 - o - Users can choose to remain anonymous or provide proof of their identity to others
- - Irreversibility of Records
 - Once a transaction is entered in the database and the accounts are updated, the records cannot be altered
- - Computational Logic
 - Users can set up algorithms and rules that automatically trigger transactions between nodes

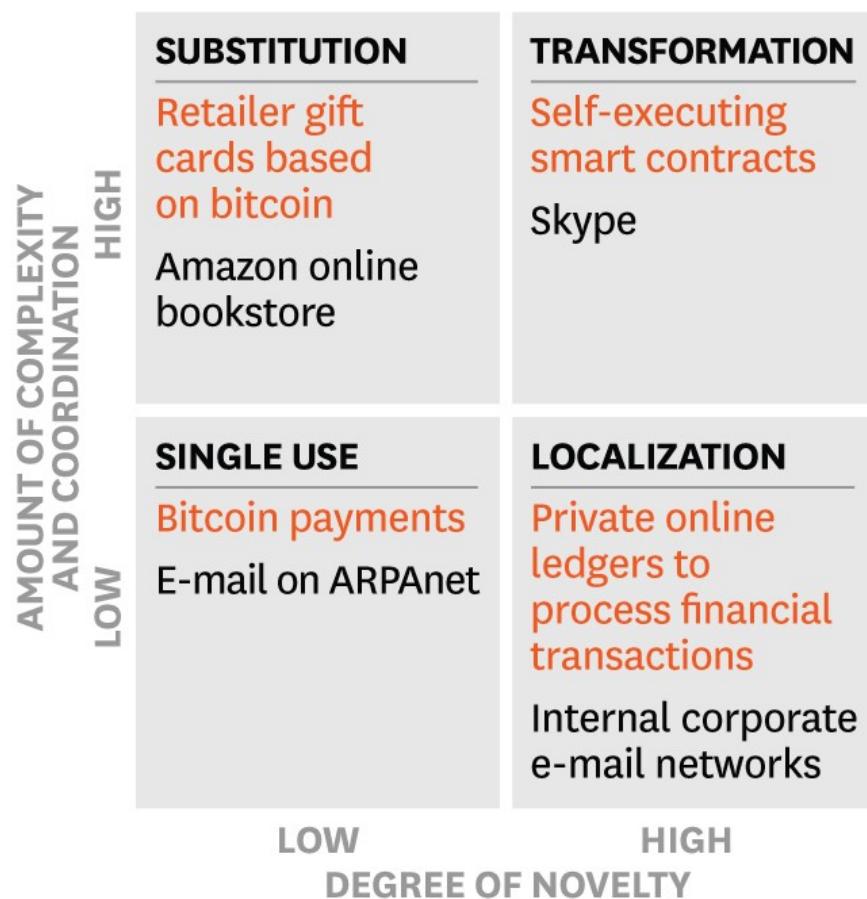
BLOCKCHAIN

› Blockchain will revolutionize business, but it's going to take a lot longer › Not a “disruptive” technology, which can attack a traditional business

model with a lower-cost solution and overtake incumbent firms quickly

- Disruption describes a process whereby a smaller company with fewer resources is able to successfully challenge established incumbent businesses (Christensen et al. 2015)

- › A foundational technology
- Create new foundations for economic and social systems
- › Will require broad coordination
- The level of complexity – technological, regulatory, and social – will be unprecedented



FROM “THE TRUTH ABOUT BLOCKCHAIN,”
BY MARCO IANSITI AND KARIM R. LAKHANI,
JANUARY–FEBRUARY 2017

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- › Two contextual dimensions - Novelty
- The degree to which an application is new to the world
- Complexity

- The level of ecosystem coordination involved – the number and diversity of parties that need to work together to produce value with the technology

› Four phases of technology development - Single use

- - Create better, less costly, highly focused solutions
- - Easiest place to start - Localization
- - Need only a limited number of users to create immediate value
- - A natural next step for companies - Substitution
 - Build on existing single-use and localized applications, but involve broader and increasingly public users
 - Transformation
 - Tied to new business model in which the logic of value creation and capture departs from existing approaches

First Wave (1960s – 1970s)

- Automated individual activities in the value chain - Increased productivity because of new data
- Standardization of processes across companies

› Second Wave (1980s – 1990s)

- - The rise of the Internet, with its inexpensive and ubiquitous connectivity
- - Enabled coordination and integration across activities; with outside suppliers, channels, and customers; and across geography

› Third Wave (Now)

- - Value chain was transformed in the first two waves, but products were largely unaffected
- - IT is becoming an integral part of the product itself
 - Embedded sensors, processors, software, and connectivity in the products, coupled with a product cloud

› Physical components

- Product's mechanical and electrical parts (e.g., engine block, tires, and batteries)

› Smart components

- - Sensors, microprocessors, data storage, controls, software, and, typically, an embedded operating system and enhanced user interface (e.g., engine control unit, antilock braking system, rain-sensing windshields with automated wipers, and touch screen displays)
- - Amplify the capabilities and value of physical components › Connectivity components
- - Ports, antennae, and protocols enabling wired or wireless connections with the product
- - Amplify the capabilities and value of smart components

› Three forms of connectivity

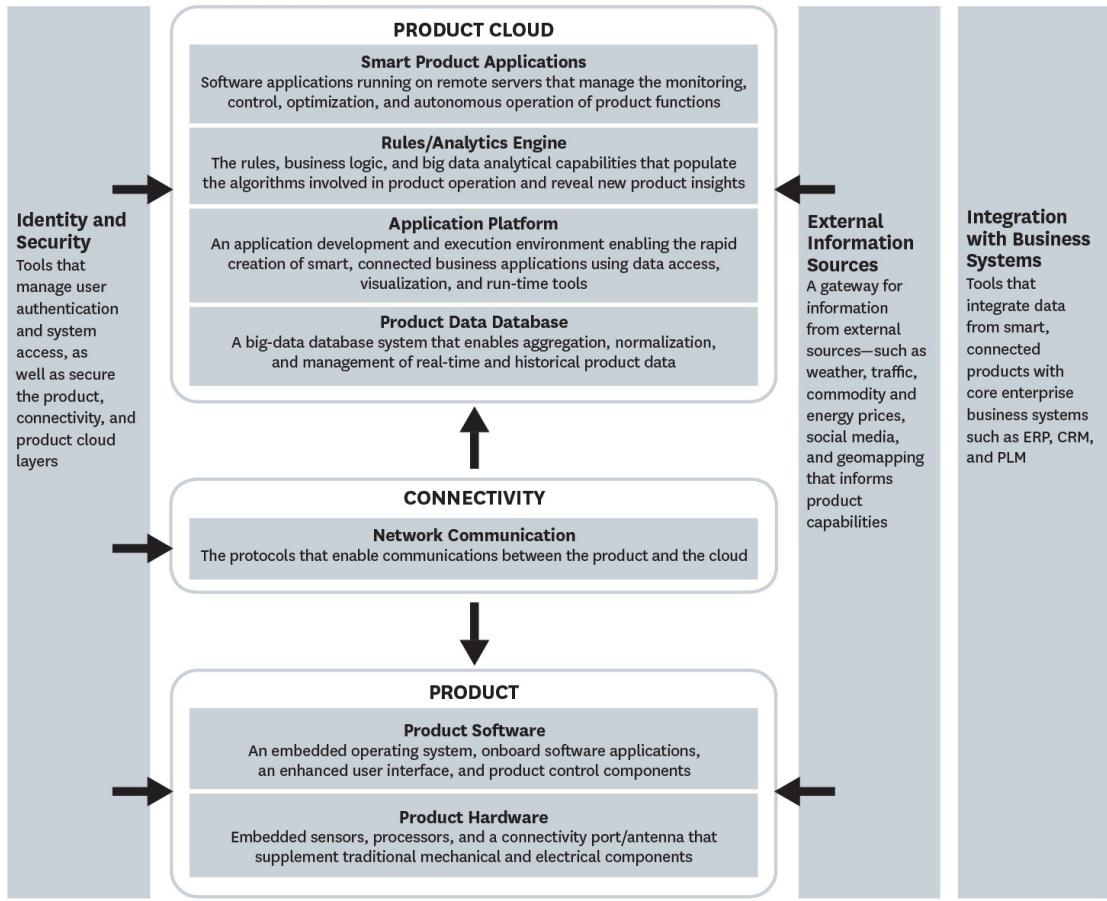
- - One-to-one
 - - An individual product connects to the user, the manufacturer, or another product through a port or other interface
 - - E.g., a car is hooked up to a diagnostic machine
- - One-to-many
 - - A central system is continuously or intermittently connected to many products simultaneously
 - - E.g., many Tesla automobiles are connected to a single manufacturer system that monitors

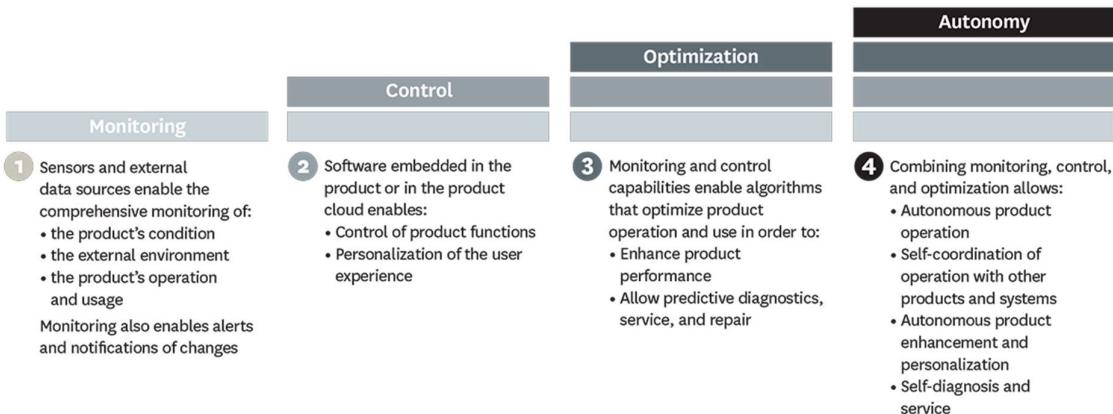
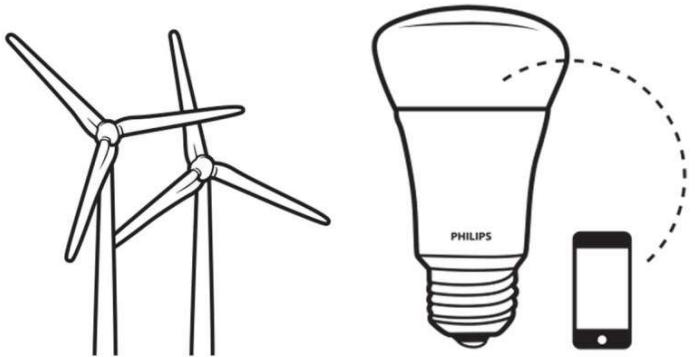
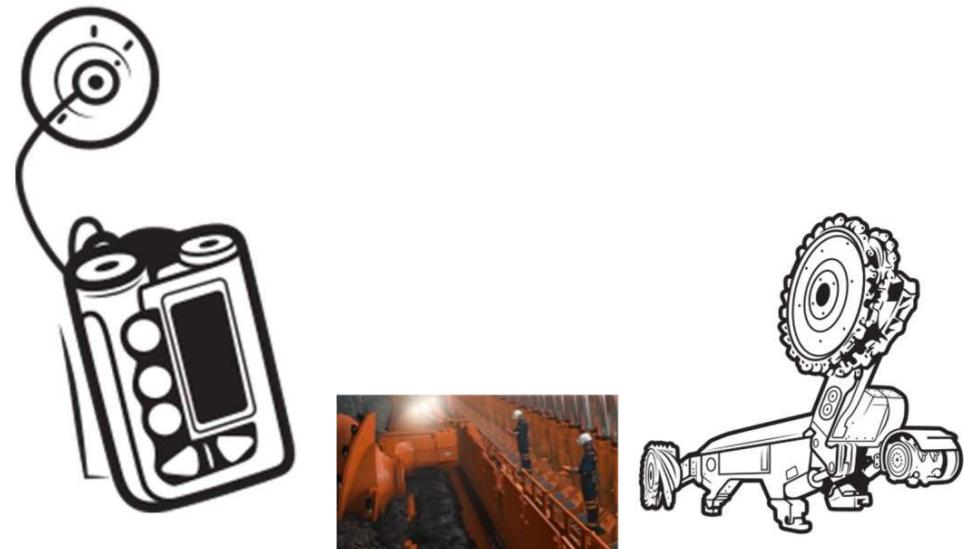
performance and accomplishes remote service and upgrades

- - Many-to-many
 - - Multiple products connect to many other types of products and often also to external data sources
 - - E.g., an array of types of farm equipment are connected to one another, and to geolocation data, to coordinate and optimize the farm system

› Dual purposes of connectivity

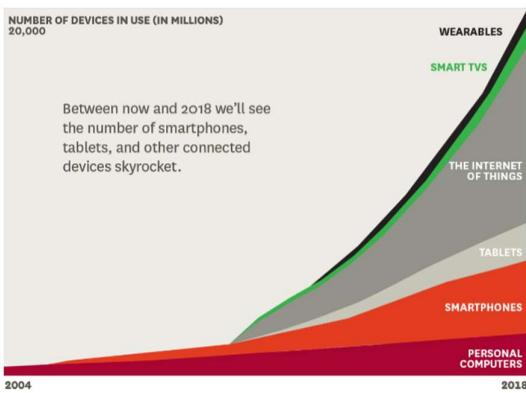
- - Allows information to be exchanged between the product and its operating environment, its maker, its users, and other products and systems
- - Enables some functions of the product to exist outside the physical device (i.e., product cloud)



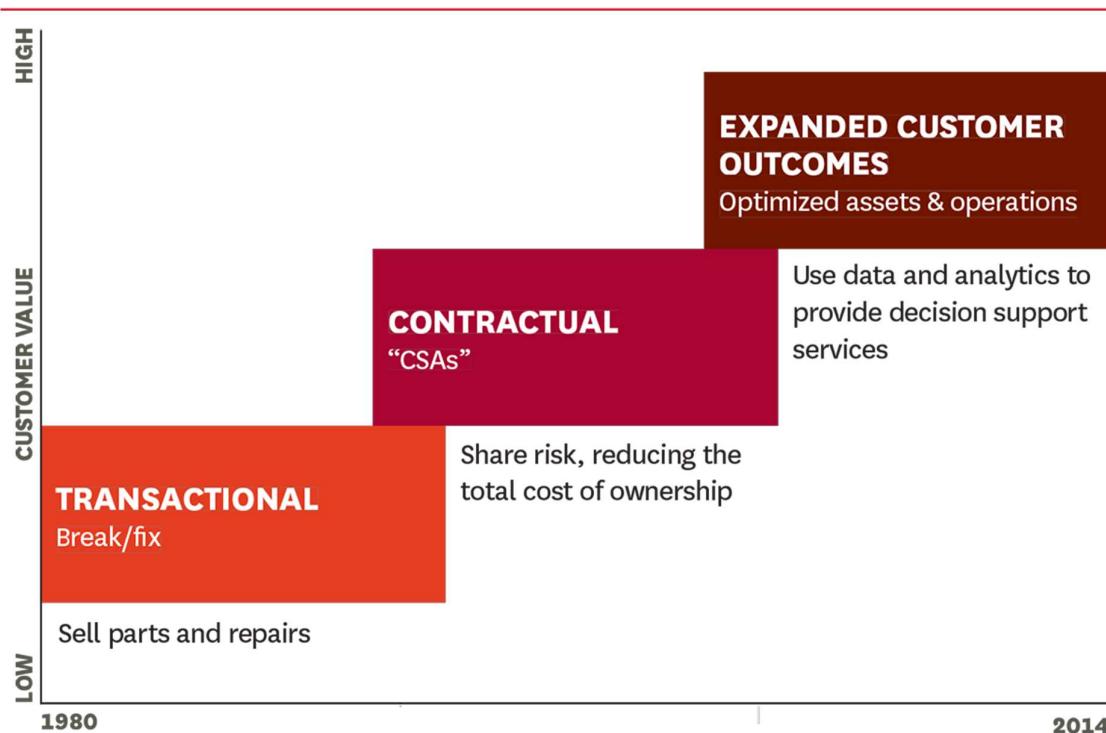


- › The digitization of previously analog machine and service operations, organizational tasks, and managerial processes
- › Ubiquity of digital connectivity
- The pervasive deployment of digital sensors with the growth of Internet of Things - Virtually limitless computing power at very low cost through cloud computing

- > Pushing both established and start-up players in many industries to compete in new ways
- > Companies will have to rethink their business models, identifying new opportunities for creating and capturing value
 - How to create value for customers (value proposition)
 - How to capture the value (how to make money)



- > Exact replication infinite times at zero marginal cost
 - - Unlike analog signals, digital signals can be transmitted perfectly, without error
 - - Digital signals can be replicated indefinitely without any degradation
 - - Once the investment in network infrastructure has been made, the digital signals can be communicated to the incremental consumer at (almost) zero marginal cost
 - > Drive business transformation enabled by ubiquitous digital technology
 - - Improve the scalability of operations
 - - Make it easy to combine new and old business processes
 - - Make it easy to connect industries and communities to generate novel opportunities
 - > An open global network of machines, data, and people, linking previously discrete tasks and equipment
 - Adding digital sensors to the machines
 - Connecting the machines to a common, cloud-based software platform
 - > Results in systems that can monitor, collect, exchange, analyze, and deliver valuable new insights like never before



- › Transactional Model (1980s-1990s)
 - Selling equipment, parts and repairs
- › Contractual Model (2000s)
 - - Intense competition and falling prices for its top-tier capital goods
 - - Contract service agreements (CSAs)
 - Guaranteed total operational management of an asset, including preventive maintenance and repairs
 - - Sharing risk and reducing the total cost of ownership
 - - Generated reliable high-margin income over the life (several decades) of the equipment
 - CSAs accounted for <75% of GE's revenue backlog and industrial earnings by 2005



- › Outcome-based Model (2010s)
 - Focuses on providing data synthesis and analysis and designing real-time and predictive solutions to optimize complex operations of its customers - Revolutionizes value creation and capture
 - Creates value by extracting useful data from the sensors and using that information to optimize equipment performance, utilization, and maintenance
 - Captures value by charging a percentage of customer's incremental revenue from improved performance
 - Creates more than \$1.5 billion in incremental revenue in 2013



-
- › Building new software capabilities
 - - Co-location of the software team
 - - Create a software platform that would work across the entire enterprise
 - - Make developing new applications more efficient
 - - Allow for rapid cross-industry innovation
 - - Enable independent developers to build applications on GE's platform
 - - E.g., Predix and Predictivity
 - › Learning to sell the new model
 - - From "box seller" to solution-based sales

- Chief commercial officer to rethink and redevelop its go-to-market and commercialization strategies
 - Solution architects to shape deals based on the value derived by the customer
 - Customer engagement has become far more complex
- › Building out the ecosystems
- Strengthen the loose network of suppliers, distributors, and developers of related products and services that enable and enhance GE's offerings
- Experiment different types of partnerships (e.g., Caradigm by GE Healthcare and Microsoft)
 - Rely more on crowdsourcing for innovation (e.g., Quirky)
 - Partner with potential competitors (e.g., Cisco, Accenture, Amazon)
- › Apply the **digital lens** to existing products and services
 - What cumbersome processes in your business or industry are amenable to instrumentation and connectivity?
 - Which ones are most challenging to you or your customers?
 - E.g., Uber has digitized and transformed transportation services
- › **Connect** your existing assets across companies
 - How can you connect with and enhance their value and extract some of it? - E.g., Nest is connecting with public utilities
- › Examine new modes of **value creation**
- E.g., The industrial and consumer printing company 3D Systems is creating new business models
- What new data could you accumulate, and where could derive value from new analytics?
 - How would recombining the components of your business give rise to new opportunities?
 - How could the data you generate enable old and new customers to add value?
- › Consider new **value-capture** modes
 - E.g., SAP's cloud effort allow it to charge customers differently
 - Could you do a better job of tracking the actual value your business creates for others?

- - Could you do a better job of monetizing that value, through either value-based pricing or outcomes-based models?
 - › Use software to **extend the boundaries** of what you do
- - Digital transformation will shift the capability base so that expertise in software development becomes increasingly important
- - Your existing capabilities and customer relationships are the foundations for new opportunities
- - Invest in software-related skills that complement what you have, but make sure you retain those critical foundations

SOME EXTRA NOTES

How connections, sensors and data revolutionizing business

The made home smart phone device, how are they changing the business models?

Main focus is on two components:

1. How they create value – value proposition
 - value created – digitization, reduce energy bill, they use data to optimize
2. How they capture the value- revenue model- in past they sold the product. Now they sell an even more expensive product. They involve a small fee for the subscription plan. They make money from that as well.

Dual purpose – smart device- a device with internet connections and AI

Discussion:

No. blockchain is not a disruptive innovation. Why not?

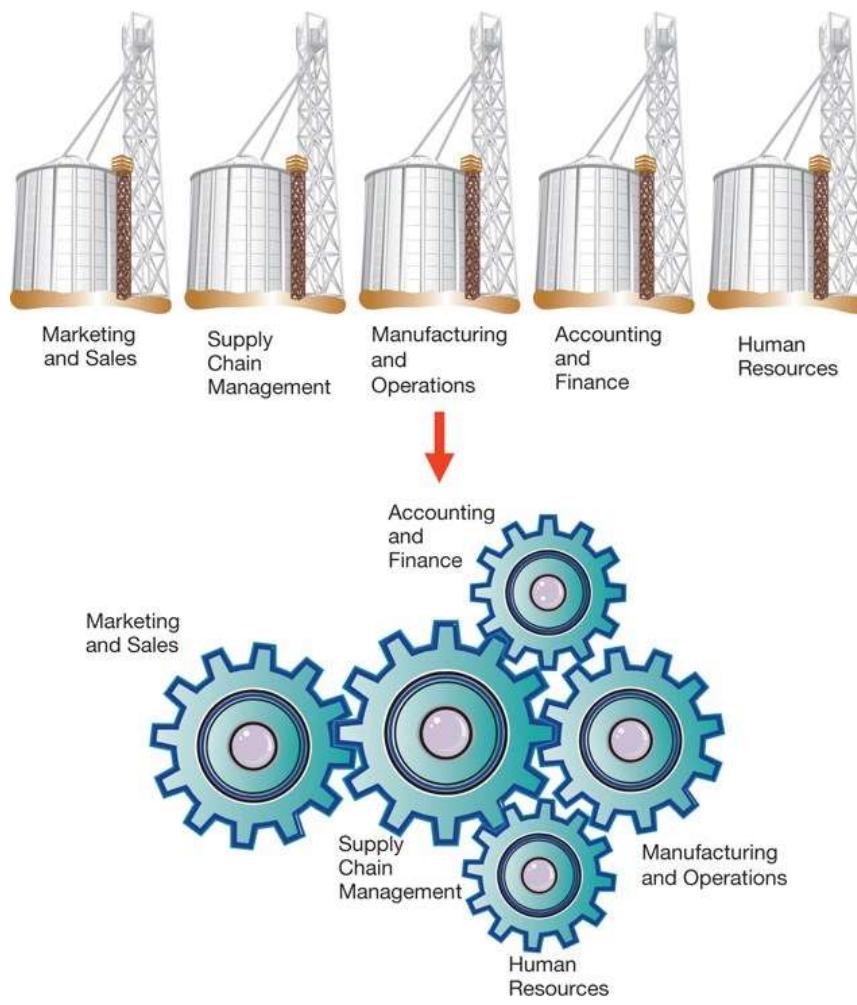
It takes time to overtake a company.

The truth is it will take years to transform business.

Week 9

Enterprise system:

Functional Areas and Business Processes



- > Traditionally, companies are organized around functional areas
 - Marketing and Sales
 - Supply Chain Management
 - Management and Operations - Accounting and Finance
 - Human Resources
- > However, most business processes cross the boundaries of business functions
 - Order-to-Cash
 - Procure-to-Pay
 - Make-to-Stock / Make-to-Order

- > More helpful to think in terms of business processes from a customer's (both internal and external) point of view
-

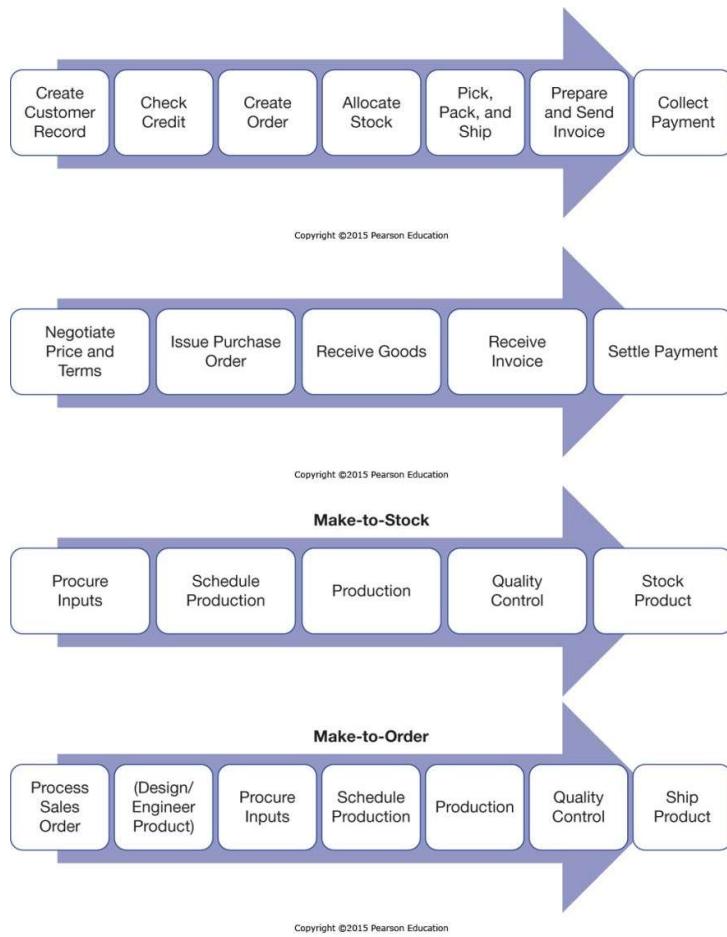
Common Core Business Processes

> Order-to-Cash Process

- - The process of selling goods or services and collecting revenue for them
- - Functional areas involved
 - Marketing and Sales, Accounting and Finance, Manufacturing and Operations

> Procure-to-Pay Process

- - The process of ordering goods or services and paying for them
 - - Functional areas involved
 - Supply Chain Management, Accounting and Finance, Manufacturing and Operations
- > Make-to-Stock / Make-to-Order
- - The process of manufacturing goods, either based on forecasts or based on orders
 - - Functional areas involved
 - Marketing and Sales, Supply Chain Management, Management and Operations, Accounting and Finance



› Core (Primary) Activities

- - Inbound Logistics
 - - Activities associated with receiving and stock raw materials
 - - Part of the procure-to-pay process
- - Operations and Manufacturing
 - - Activities such as order processing and/or manufacturing or assembly processes that transform raw materials and/or component parts into end products
 - - Make-to-stock and make-to-order process
- - Outbound Logistics
 - - Activities associated with the distribution of end products
 - - Part of the order-to-cash process
- - Marketing and Sales
 - Activities associated with the presales activities of the company, including the creation of marketing literature, communication with potential and existing customers, and pricing of goods and services
 - Customer Service
 - Activities associated with the postsales activities

› Support Activities - Administration

- Processes and decision making that orchestrate the day-to-day operations of an organization

- Firm Infrastructure

- Providing the necessary infrastructure to support the

applications that primary activities use - Human Resources

- Employee management, such as hiring, interview scheduling, payroll and benefits management

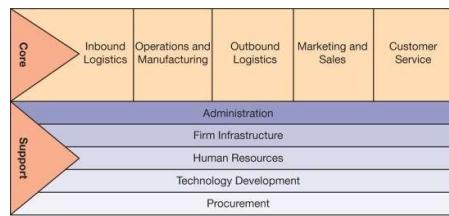
- Technology Development

- Design and development of applications that support the

primary activities

- Procurement Activities

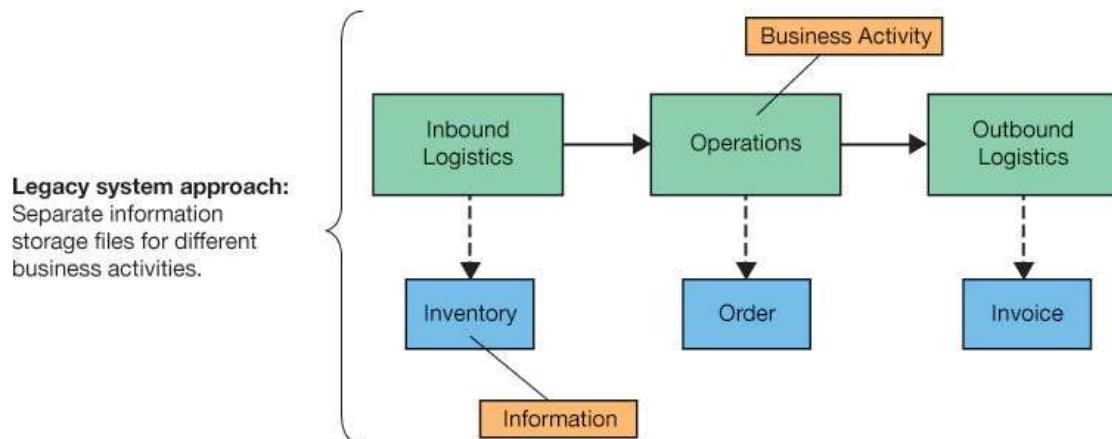
- Purchasing of goods and services that are required as inputs to the primary activities



Source: Based on Porter and Heitor (1985).

Legacy Systems

› Older stand-alone computer systems within an organization with older versions of applications that are either fast approaching or beyond the end of their useful life within the organization



› Information silos

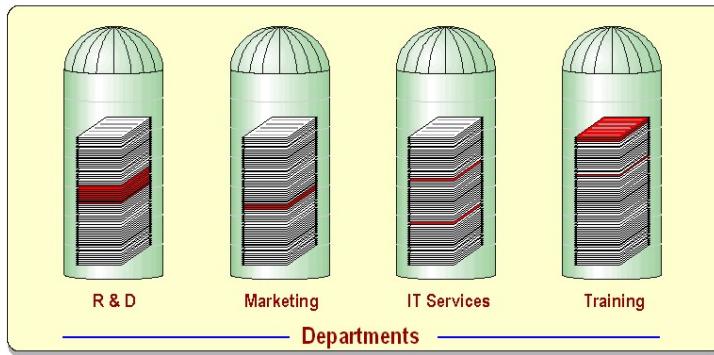
- Information is spread across dozens or even hundred of separate computer systems, each housed in an individual function, business unit, region, factory, or office

› Fragmented systems

- Costs for storing and rationalizing redundant data, rekeying and reformatting data, updating and debugging, programming communication links between systems, etc.

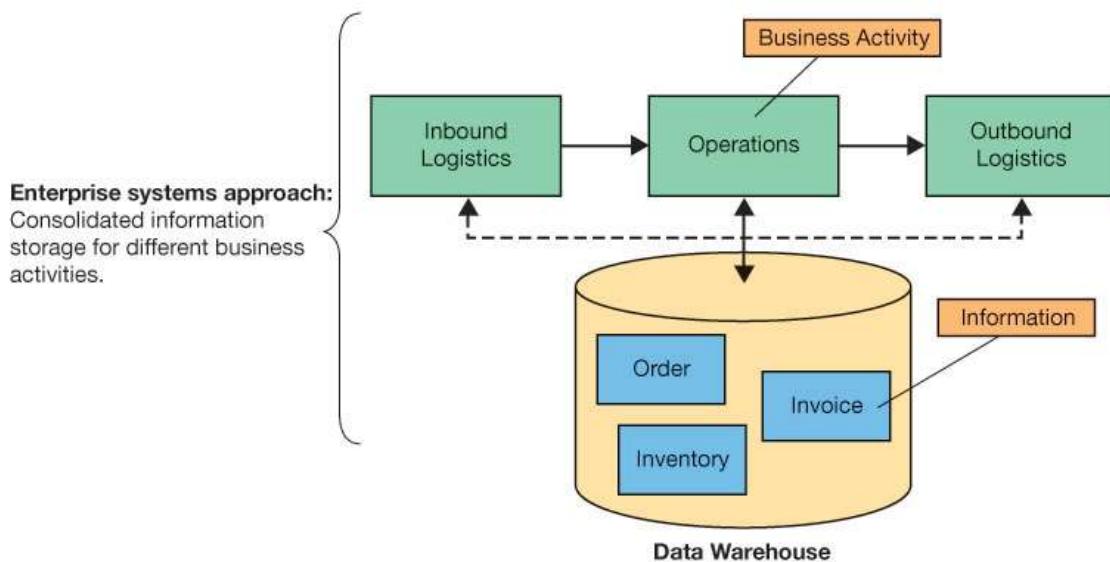
› Fragmented business/organization

- Operations based on fragmented processes - Decisions based on fragmented information



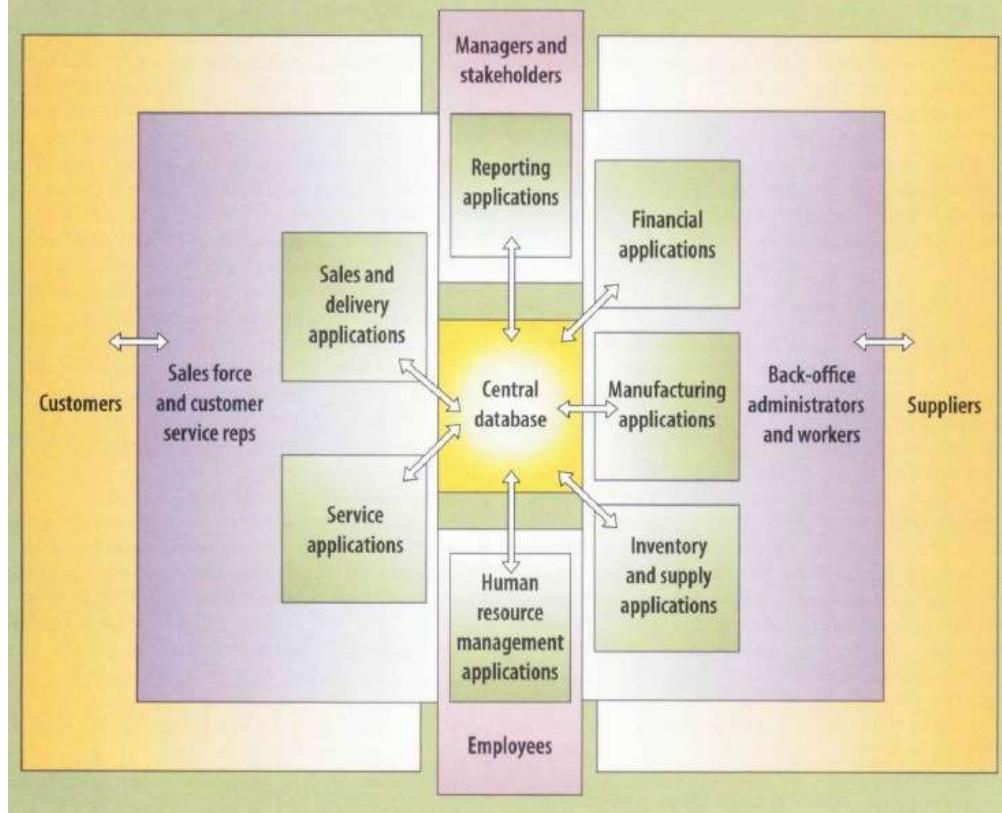
Enterprise Systems

- › Information systems that span the entire organization and can be used to integrate business processes, activities, and information across all the functional areas of a firm



ANATOMY OF AN ENTERPRISE SYSTEM

At the heart of an enterprise system is a central database that draws data from and feeds data into a series of applications supporting diverse company functions. Using a single database dramatically streamlines the flow of information throughout a business.



- › A single comprehensive database that collects data from and feeds data into modular applications supporting virtually all of a company's business activities
- › Streamlines a company's data flows and provides management with direct access to real time operating information
- › Dramatic gains in productivity and speed

Enterprise System Rollout Challenges

- › Profoundly complex software, large investment of money, time, and expertise are not the biggest problems
- › Failure to reconcile the technological imperatives of the enterprise system with the business needs of the enterprise itself
 - Install an enterprise system without first having a clear understanding of the business implications

- > An enterprise system, by its very nature, imposes its own logic on a company's strategy, organization, and culture
 - - It pushes a company toward generic processes even when customized processes may be a source of competitive advantage
 - - It pushes a company toward full integration when a certain degree of business unit segregation may be in its best interests
 - - The logic of the system conflicts with the logic of the business

Strategy Clash

- > Business often must be modified to fit the system
- Vendors try to structure the systems to reflect their “best” practices
- Techniques and processes, identified through experience and research, that have consistently shown results superior to those achieved with other means
- Some degree of customization is possible
- Decide which modules to install that are most appropriate to the business
- Adjust the system using configuration tables to achieve the best possible fit with the company’s processes
- Major modifications are impracticable
- Need to adapt or completely rework some business processes to fit the requirements of the system

When System and Strategy Clash

- > Companies can potentially lose their competitive advantages by adopting the best practices within their industry
 - Force companies to abandon their unique ways of doing business, putting them on par with their industry competitors
- > Balancing the way you want to work and the way the system lets you work
 - Is it the best way of doing business?
 - Do the system’s technical imperatives coincide or conflict with the company’s business imperatives?
 - How similar can a company information flows and its processes be to those of its competitors before it begins to undermine its own sources of differentiation in the market?

The Impact on an Organization

- > Support opposite organizational goals

- - Break down hierarchical structures, freeing people to be more innovative and more flexible
- - Exert more management control and impose more uniform processes
- › Universal, real-time access to operating and financial data allows companies to streamline their management structure
 - Flatter, more flexible, and more democratic organizations
 - Decentralized organizational structure
- › Centralization of control over information and the standardization of processes
 - Hierarchical, command-and-control organizations with uniform cultures
 - Centralized organizational structure

The Impact on an Organization

- › Global uniformity vs. local autonomy
 - - How much uniformity should exist in the way it does business in different regions or countries?
 - - Introduce more consistent operating practices across the geographically dispersed units
 - - Differences in regional markets remain so profound that strict process uniformity would be counterproductive
 - › Federalist operating model
 - - Roll out different versions of the same system in each regional unit, tailored to support local operating practices
 - - To preserve local autonomy while maintaining a degree of corporate control
 - - What should be commonly implemented through the organization? What should be allowed to vary?

Elf Atochem

- › Fragmentation of critical information systems among 12 business units
 - Operating data were not flowing smoothly through the organization
 - Top management was not getting the information to make sound and timely business decisions

- › Real troubles stemmed from fragmentation of organization
 - The 12 business units shared many customers but each unit was managed autonomously

Elf Atochem

- › Clarify strategy before planning the enterprise system
 - Refocused strategy on radically improving customer service
- Petrochemical products are commodities, the company that can offer the best customer often wins the order
 - Focused on 4 key cross-unit processes
 - Materials management, production planning, order management, and financial reporting
- Most distorted by the fragmented organizational structure - Greatest impacts on managing customer relationship
 - Installed only those SAP's R/3 modules required to support the 4 processes

Elf Atochem

- › Fundamental changes to organizational structures – Not just computer systems
 - - Combining all accounts-receivable and credit departments into one function → consolidated each customer's activities into one account
 - - Combining all unit's customer-service departments → gave customers one contact point
 - › Create competitive advantage with the enterprise system
 - - The system generated the real-time information necessary for connecting sales (demand) and production planning (supply)
 - - As orders enter or change, the system updates forecasts and factory schedules
 - - Production runs shift quickly based on customer needs. Only one other company has the capability.

Elf Atochem

- › Put the right people in place
 - Computer systems without the right people don't change organizational behavior - A new demand manager position to orchestrate sales and production planning
 - Salespeople can guarantee orders six weeks ahead of production

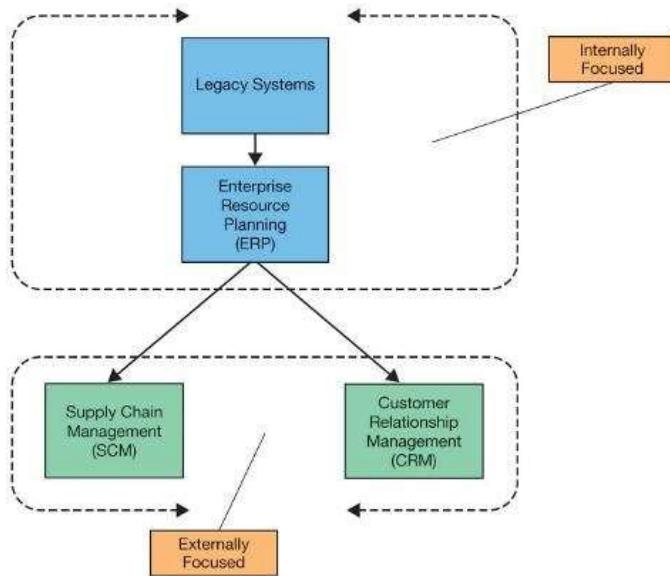
› Implement the system gradually

- - Unit-by-unit rollout
 - Installed the system one business units at a time
- - Large and broadly representative implementation team (60 persons)
 - Business analysts, information technologists, “super users” representing different business units and corporate functions
- - The large and broadly representative implementation team and unit-by-unit rollout enabled staffing the effort mainly with insiders
 - Reduced implementation costs and boosted employees’ understanding of the system

The Role of Management

- › Companies that have the biggest problems are those that install an enterprise system without thinking through its full business implications
- › Clarify strategic and organizational needs – and business implications of integration
 - before implementing
 - o - How might an enterprise system strengthen our competitive advantages?
How might it erode them?
 - o - What will be the system’s effect on our organization culture?
 - o - Do we need to extend the system across all our functions or should we implement only certain modules?
 - o - Would it be better to roll the system out globally or restrict it to certain regional units?
 - o - Are there other alternatives for information management that might actually suit us better than an enterprise system?

Evolution of Enterprise Systems

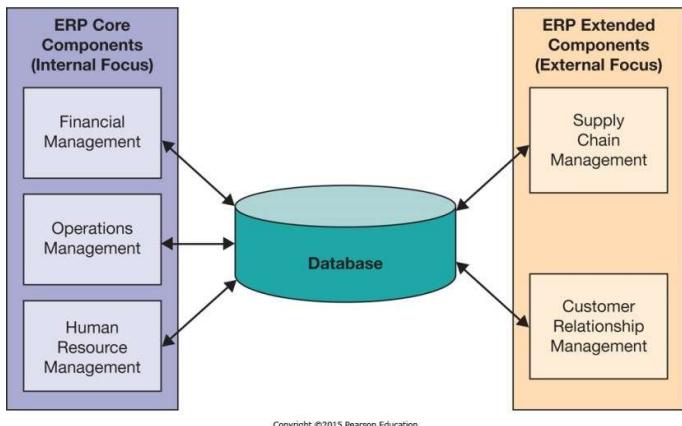


› Internally focused systems

- - Support functional areas, business processes, and decision making within an organization
- - Enterprise Resource Planning(ERP)
 - Integrates business activities across department boundaries, including planning, manufacturing, sales, marketing, etc.

› Externally focused systems

- - Coordinate business processes with customers,suppliers, business partners, and others who operate outside an organization's boundaries
- - Customer Relationship Management(CRM)
 - Concentrates on activities involved in promoting and selling products to customers as well as providing customer service and nourishing long-term relationships
- - Supply Chain Management(SCM)
 - Integrates the value chains of business partners within a supply chain, improving the coordination of suppliers, product or service production, and distribution



ERP Core Functions

TABLE 7.2 Key Capabilities of SAP's Enterprise Systems

Capability	Explanation
Financials	Allows organizations to manage corporate finance functions by automating financial supply chain management, financial accounting, and management accounting
Human capital management	Gives organizations the tools needed to maximize the profitability potential of the workforce, with functionality for employee transaction management and employee life cycle management
Operations	Empowers organizations to streamline operations with integrated functionality for managing end-to-end logistics processes while expanding collaborative capabilities in supply chain management, product life cycle management, and supplier relationship management
Corporate services	Allows organizations to optimize centralized and decentralized services for managing real estate, corporate travel, and incentives and commissions

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Example: SAP ERP Modules



End-User Service Delivery					
Analytics	Strategic Enterprise Management	Financial Analytics	Operations Analytics	Workforce Analytics	
Financials	Financial Supply Chain Management	Financial Accounting		Management Accounting	Corporate Governance
Human Capital Management	Talent Management		Workforce Process Management		Workforce Deployment
Procurement and Logistics Execution	Procurement	Supplier Collaboration	Inventory and Warehouse Management	Inbound and Outbound Logistics	Transportation Management
Product Development and Manufacturing	Production Planning	Manufacturing Execution	Enterprise Asset Management	Product Development	Life-Cycle Data Management
Sales and Services	Sales Order Management	Aftermarket Sales and Service	Professional Service Delivery	Global Trade Services	Incentive and Commission Management
Corporate Services	Real Estate Management	Project Portfolio Management	Travel Management	Environment, Health, and Safety	Quality Management

Benefits and Costs

› Benefits

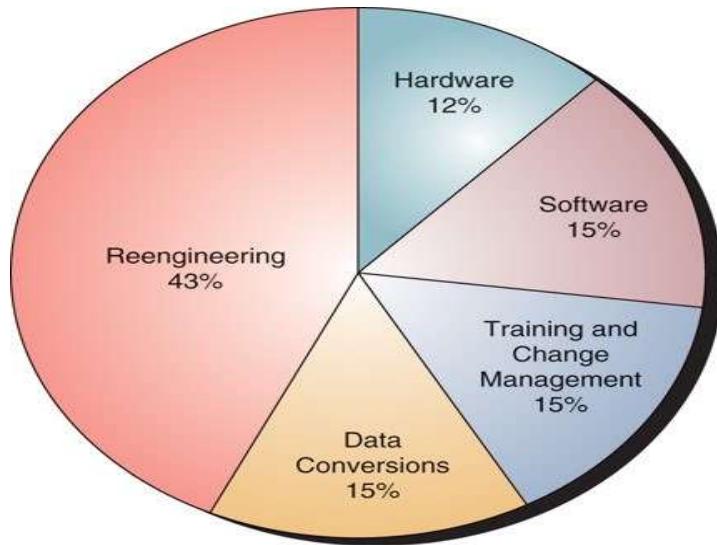
- - Improved availability of information
- - Increased interaction throughout the organization
- - Improved (reduced) lead times for manufacturing
- - Improved customer interaction
- - Reduced operating expenses
- - Reduced IS costs
- - Improved supplier integration
- - Improved compliance with standards, rules, and regulations

› Costs

- Travel and training costs for

personnel

- Ongoing customization and integration costs
- Business process studies - Project governance costs



Business Process Management (BPM)

- › A systematic, structured improvement approach by all or part of an organization whereby people critically examine, rethink, and redesign business processes in order to achieve dramatic improvements in one or more performance measures, such as quality, cycle time, or cost
- › Business Process Reengineering(BPR)
 - - The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed (Hammer and Champy, 1993)
 - - Encompasses the envisioning of new work strategies, the actual process design activity, and the implementation of the change in all its complex technological, human, and organizational dimensions (Davenport, 1993)
- › Business Process Improvement(BPI)
 - - A systematic approach to help an organization optimize its underlying processes to achieve more efficient results
 - - Less radical, less disruptive, more incremental than BPR
- › Information systems are the key enabler for radical change

TABLE 7.3 Some Other Terms Closely Related to Business Process Management

Business activity modeling	Business process redesign
Business activity monitoring	Business process reengineering
Business architecture modernization	Functional process improvement
Business process improvement	Work flow management

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BPI vs. BPR

	Business Improvement	Business Process Reengineering
Level of Change	Incremental	Radical
Process Change	Improved new version of process	Brand new process
Starting Point	Existing processes	Clean slate
Frequency of Change	One-time or continuous	Periodic one-time change
Time Required	Short	Long
Typical Scope	Narrow, within functions	Broad, cross functional
Horizon	Past and present	Future
Participation	Bottom-up	Top-down
Path to Execution	Cultural	Cultural, structural
Primary Enabler	Statistical control	Information technology
Risk	Moderate	High

Example: IBM Credit

› The original process

- - A sales representative called in with a request for financing. An operator in the central office wrote down the request.
- - The request was then dispatched to credit department to check the customer's credit status.
- - The business practices department modified the standard loan covenant in response to the request.
- - The pricing department determined the appropriate interest rate.
- - The administration department turned all the information into an quote letter

which was then delivered to the sales representative by FedEx. › Problems

- The entire process took 6 days on average (up to 2 weeks). Customers could be seduced by other computer vendor or simply called the deal off.
- When the sales representative called, no one could tell where the request was and when it could be done.

Example: IBM Credit

› Solution 1: Automating and improving the process

- Install a control desk to answer the status of the request.
- The request was returned to the control desk after each step, logged the competition, and forwarded to the next step.
 - Sophisticated queuing theory and linear programming used to balance workloads and staff.
 - Performance standards were introduced for each department.
- Process time got worse, even though each department achieved almost 100% compliance on its performance.
- The actual work only took 1.5 hours (90 minutes).
- The remaining time was wasted on handling the forms off from one department to the next.

Source: Hammer and Champy, *Reengineering the Corporation*, 1993.

Example: IBM Credit

› Solution 2: Reengineer the process

- Replaced the specialists (credit checkers, pricers, etc.) with generalists (deal structurers) to processes the entire request from beginning to end.
 - Decision support systems were developed to guide deal structurers and provide rapid access to all key information.
- › Results
- Process time reduced by 90% (from 6 days to 4 hours).
 - Process volume increased by 100 times (10,000%).
 - No increase in head count (even a small head count reduction).

Basic Steps in BPM

- › Develop a vision for the organization that specifies business objectives
 - Reducing costs, shortening the time it takes to get products to market, improving quality of products and/or services, etc.

- › Identify and critical processes that are to be redesigned
- › Understand and measure the existing processes as a baseline for future improvements
- › Identify ways that information systems can be used to improve the processes
- › Design and implement a prototype of the new processes

WEEK 10

Article

Business processes are among the last remaining points of differentiation - It's virtually impossible to differentiate from competitors based on products alone

- Rivals sell similar offerings
- Hard to beat overseas competitors (with cheap offshore labor) on product cost › Become an analytics competitor
- Use sophisticated data-collection technology and analysis to wring every last drop of value from all your business processes
 - - E.g., Not only what your customers want, but also how much they're willing to pay and what keeps them loyal
 - - E.g., Not just track existing inventory, but also predict and prevent future inventory problems

Competing on Analytics

- › 1. Create a Single Analytics Initiative
- Common technology and tools to facilitate data sharing and avoid the impediments of
 - inconsistent reporting formats, data definitions, and standards
 - Place all data-collection and analysis activities under a common leadership

- E.g., P&G created a centrally managed “cyberanalytics” group of 100 analysts drawn from many different functions

- Sales and marketing analysts supply data on growth opportunities in existing markets to supply analysts, who can then design more responsive supply networks

- › 2. Champion Analytics from the Top

- Acknowledge and endorse the changes in culture, processes, and skills that analytics

- competition

- Prepare to lead an analytics-focused organization

- Understand the theory behind and recognize the limitations

- Consult experts who understand your businesses and know how analytics can be applied

Competing on Analytics

- › 3. Focus Your Analytics Effort

- Channel your resources into analytics initiatives that most directly serve your

- overarching competitive strategy

- E.g., Harrah's aims at improving customer loyalty, customer service, and related areas such as pricing and promotions

- › 4. Establish an Analytics Culture

- Instill a companywide respect for measuring, testing and evaluating quantitative

- evidence

- Urge employees to base decisions based on hard facts

- Gauge and reward performance the same way – applying metrics to compensation and rewards

THINGS YOU CAN COUNT ON

Analytics competitors make expert use of statistics and modeling to improve a wide variety of functions. Here are some common applications:

FUNCTION	DESCRIPTION	EXEMPLARS
Supply chain	Simulate and optimize supply chain flows; reduce inventory and stock-outs.	Dell, Wal-Mart, Amazon
Customer selection, loyalty, and service	Identify customers with the greatest profit potential; increase likelihood that they will want the product or service offering; retain their loyalty.	Harrah's, Capital One, Barclays
Pricing	Identify the price that will maximize yield, or profit.	Progressive, Marriott
Human capital	Select the best employees for particular tasks or jobs, at particular compensation levels.	New England Patriots, Oakland A's, Boston Red Sox
Product and service quality	Detect quality problems early and minimize them.	Honda, Intel
Financial performance	Better understand the drivers of financial performance and the effects of nonfinancial factors.	MCI, Verizon
Research and development	Improve quality, efficacy, and, where applicable, safety of products and services.	Novartis, Amazon, Yahoo

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Competing on Analytics

› 5. Hire the Right People

- - Possess top-notch quantitative-analysis skills
- - Can express complex ideas in simple terms, and can interact productively with decisions makers

› 6. Use the Right Technology

- - Prepare to spend significant resources on technology such as CRM or ERP systems
 - No transaction or other significant exchange occurs without leaving a mark

- - Present data in standard formats, integrate it, store it in a data warehouse
- - Make data easily accessible to everyone
- - Expect to spend years gathering enough data to conduct meaningful analyses
 - E.g., Dell took 7 years to create a database that includes 1.5 million records of all its print, radio, broadcast TV, and cable ads
 - Couples the database with sales for each region in which the ads appeared (before and after their appearance)
 - Enables the company to fine-tune promotions for every medium in every region

Lecture

Why Organizations Need BI and Analytics?

- › Business Intelligence
 - Tools and techniques for analyzing and visualizing *past* data
- › Analytics
 - Tools and techniques used to understand why something happened, predict *future* outcomes, or discover hidden patterns in large data sets
 - › Data-driven organizations
 - Make decisions that can be backed up with verifiable data
 - - Measurably more productive and profitable than those that are not (McAfee & Brynjolfsson, 2012)
 - - Better respond to ongoing threats and opportunities, and better plan for the future (Redman, 2013)
 - Globalization, competitive pressures, consumer demands, societal changes, governmental regulations, etc.

- Decision making can be pushed lower into the organization, freeing up senior management time for more important decisions



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Analytics

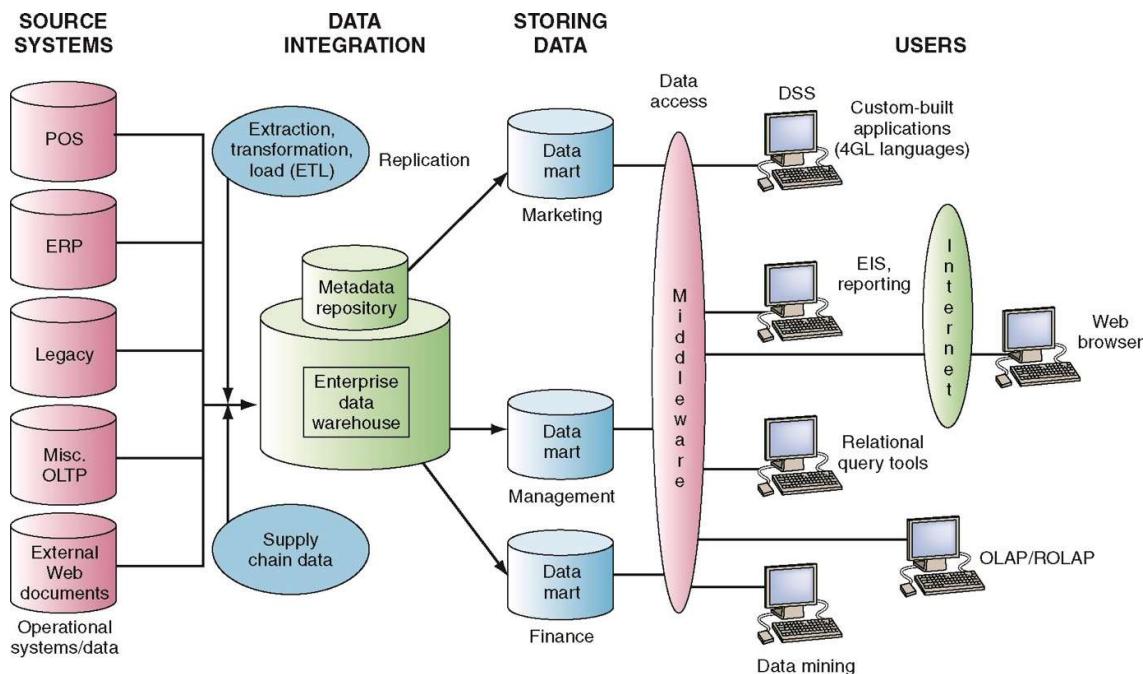
- › The use of math and statistics to derive meaning from data in order to make better business decisions
 - Descriptive Analytics
 - Tell you what happened in the past, but not why it happened, or what might change - E.g., dashboards, scorecards, alerts, etc.
 - Predictive Analytics
 - o - Use past data to model future outcomes
 - o - E.g., how customers will respond to a marketing promotion, how sales will be affected by certain market conditions, etc.
 - Prescriptive Analytics
 - o - Use techniques like optimization or A-B testing to advise managers and workers on how best to do their jobs

- - E.g., Tell a TV salesman the right discount to offer, a web designer which type of ad will elicit more clicks, a truck driver where to stop for gas, etc.
- → Combining big data with effective analytics is a key competitive advantage for organizations

Big Data

- › Vast volumes and types of information that companies can now collect and process using increasingly high-tech systems
- › Characteristics of big data - High Volume
 - Storing and managing increasing amounts of data poses tremendous challenges
 - High Variety
 - Structured data (e.g., transaction data)
 - Unstructured data (e.g., audio, video, comments on social networks)
 - Semi-structured data (e.g., clickstreams and sensor data)
- High Velocity
- Organizations have to process and use the data even more quickly

BI Architecture



BI Architecture

› Operational Systems

- Systems used to interact with customers and run

a business in real-time

› OnLine Transaction Processing (OLTP) Systems

- Operational systems designed to handle multiple concurrent transactions from customers

› Extraction, Transformation, Loading (ETL)

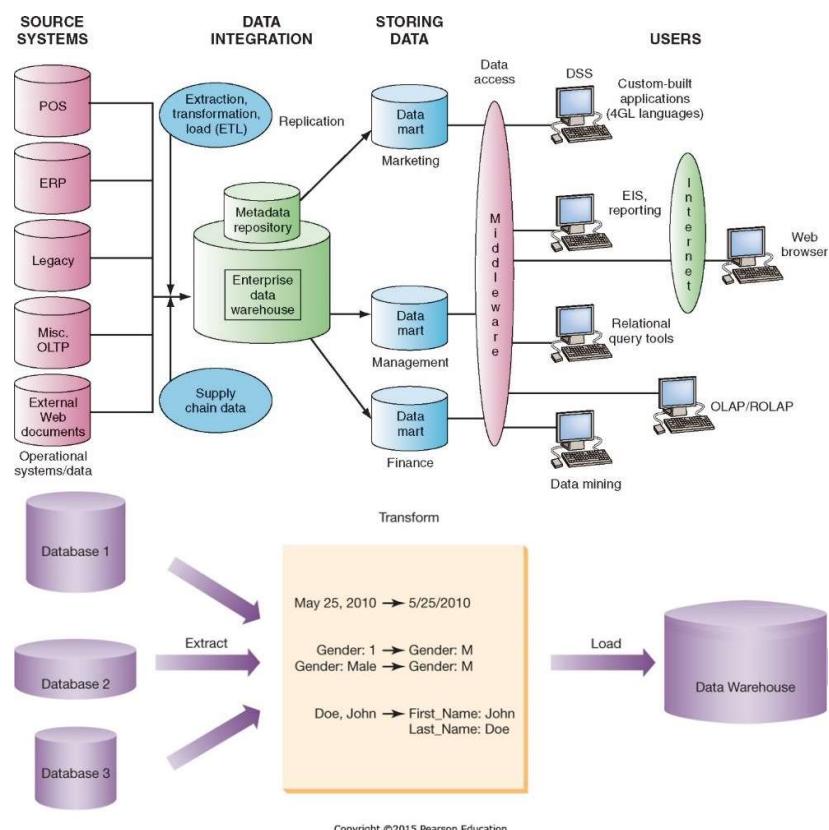
- Process for consolidating data from operational

systems with other organizational data › Data Warehouse

- A single repository of historical data for analysis and reporting

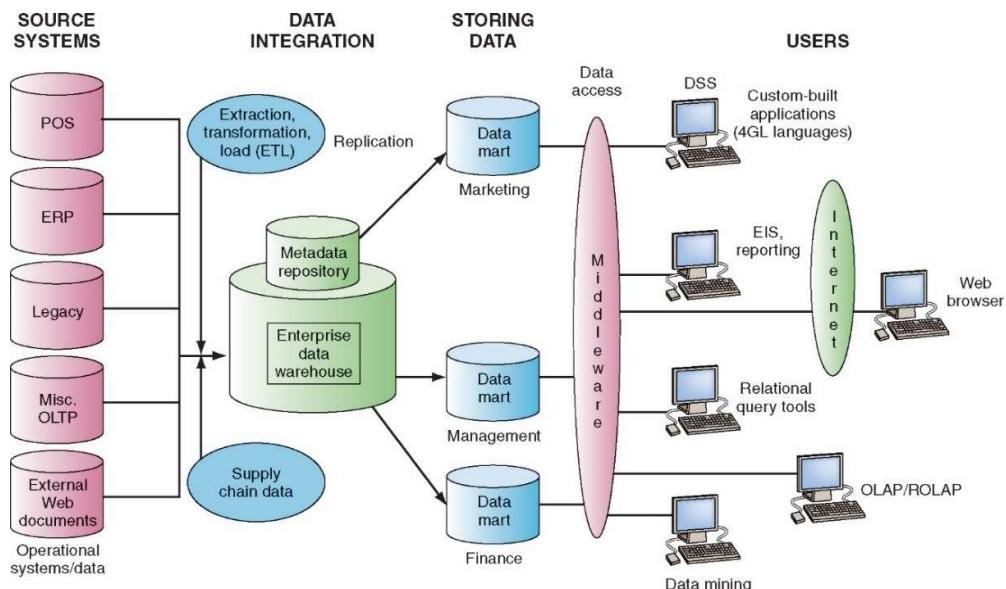
› Data Mart

- A data warehouse that is limited in scope and customized for the decision support needs of a particular end-user group



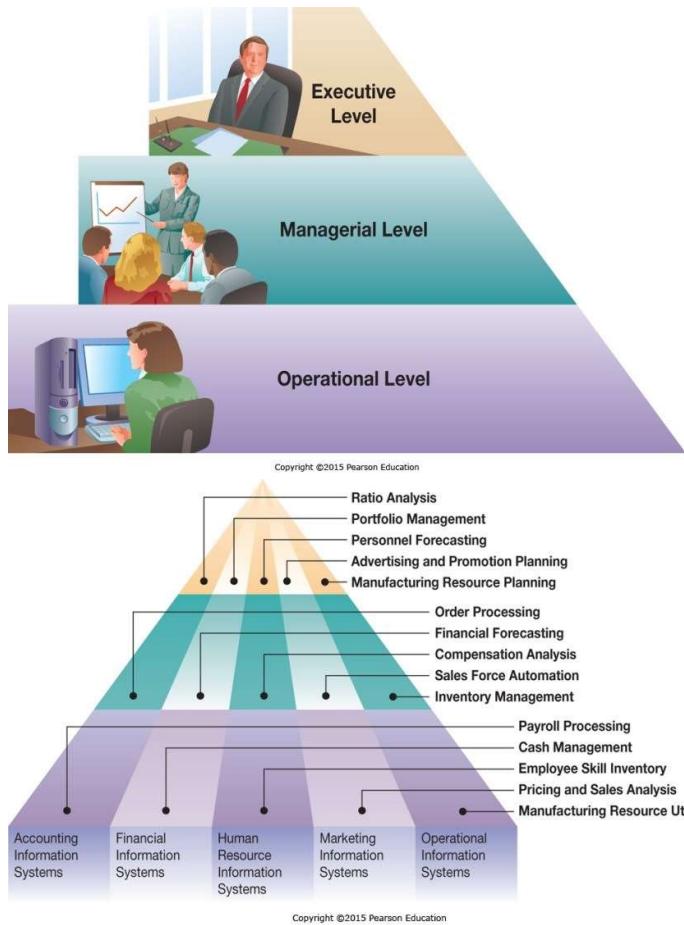
- › Decision Support Systems
- › Online Analytical Processing (OLAP) › Dashboards
- › Data Mining

- Classification
- Estimation
- Clustering
- Association Discovery - Text Mining
- Web Mining

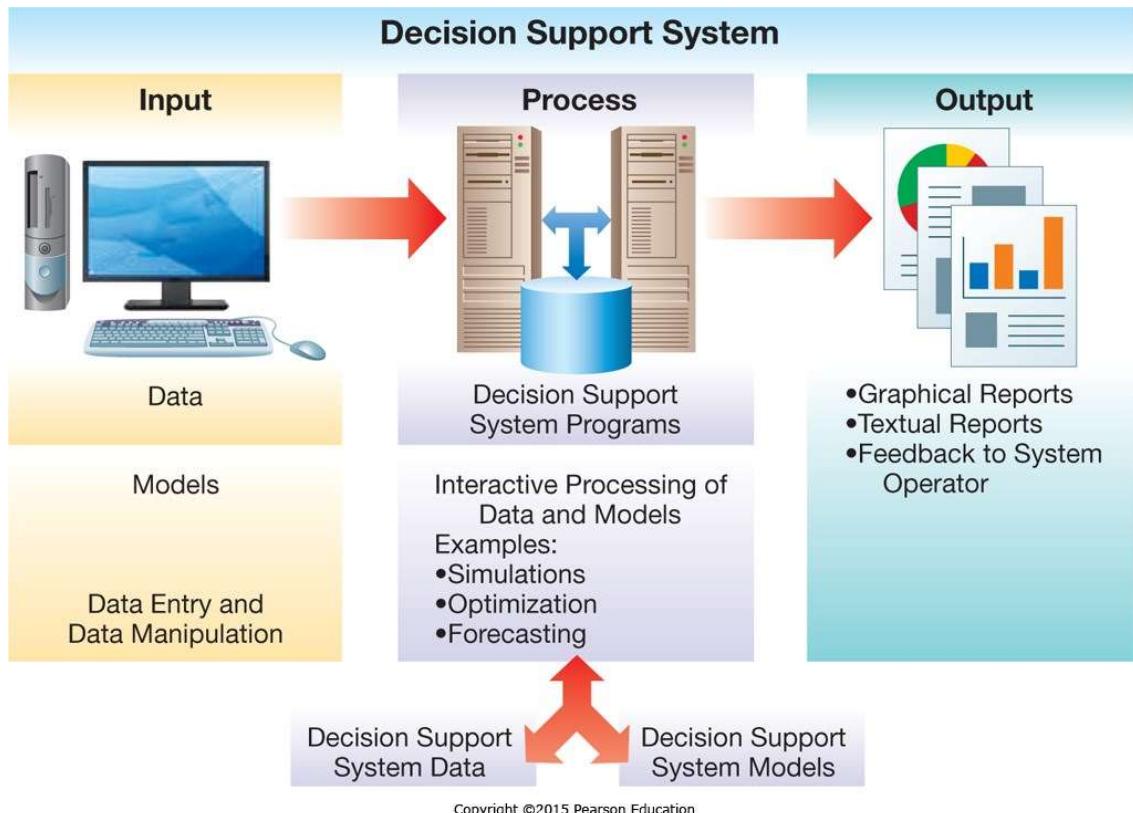


Decision Support System (DSS)

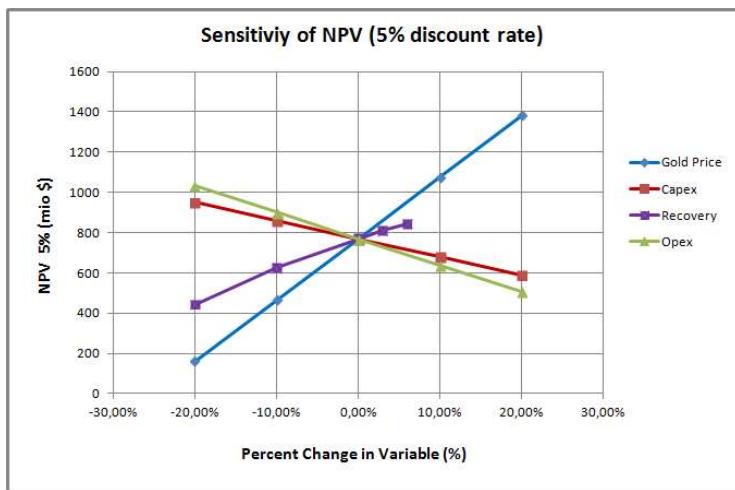
- › A special purpose information system designed to support organizational decision making related to a particular recurring problem
- Used by managerial-level employees to help them solve semi-structured problems
 - Problems that require a combination of standard solution procedures and individual judgment (e.g., sales forecasting)
 - Some procedures to follow for a given situation can be specified in advance
- › Employ mathematical models
 - Simplified representations, or abstractions, of reality
- › Designed to be an interactive decision aid



Decision Support System (DSS)



Decision Support System (DSS)



- › What-if Analysis
 - How hypothetical changes in inputs

influence the results

- › Goal-seeking Analysis

- How input parameters need to be changed to achieve a desired end state

- › Sensitivity Analysis

- How different input values and their probability of occurring will impact the results of a model

- › Optimization Models

- Find the best balance between certain parameters within given constraints

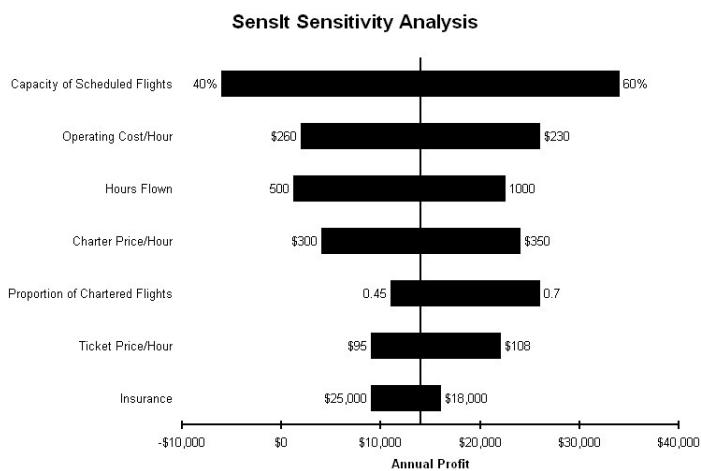


TABLE 6.6 Common DSS Uses for Specific Organizational Areas

Area	Common DSS Uses
Corporate level	Corporate planning, venture analysis, mergers and acquisitions
Accounting	Cost analysis, discriminant analysis, breakeven analysis, auditing, tax computation and analysis, depreciation methods, budgeting
Finance	Discounted cash flow analysis, return on investment, buy or lease, capital budgeting, bond refinancing, stock portfolio management, compound interest, after-tax yield, foreign exchange values
Marketing	Product demand forecast, advertising strategy analysis, pricing strategies, market share analysis, sales growth evaluation, sales performance
Human resources	Labor negotiations, labor market analysis, personnel skills assessment, employee business expenses, fringe benefit computations, payroll and deductions
Production	Product design, production scheduling, transportation analysis, product mix, inventory levels, quality control, plant location, material allocation, maintenance analysis, machine replacement, job assignment, material requirements planning
Management science	Linear programming, decision trees, simulation, project planning and evaluation, queuing, dynamic programming, network analysis

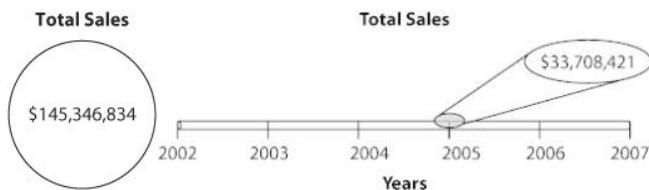
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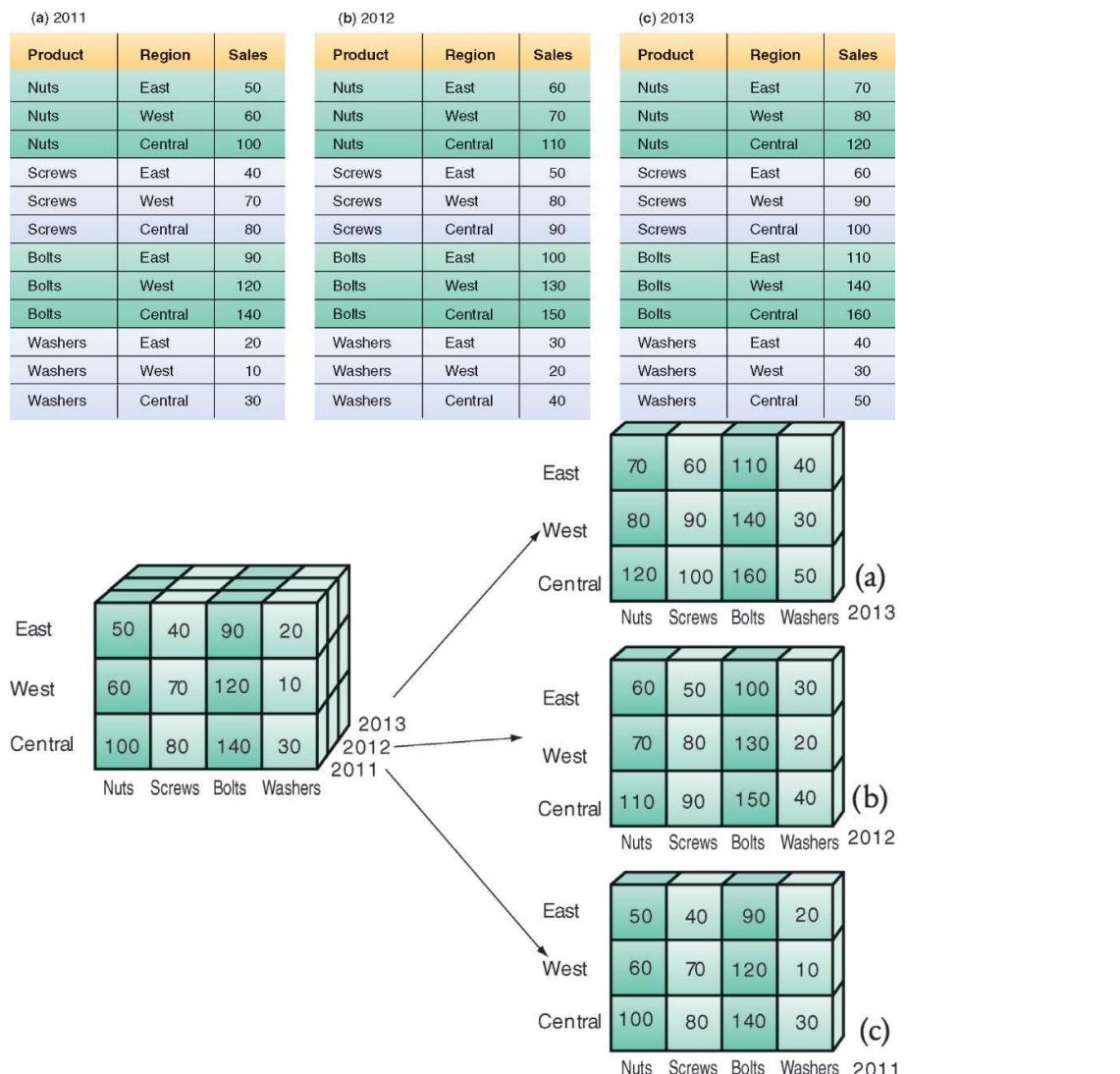
Online Analytical Processing (OLAP)

- → The process of quickly conducting complex, multidimensional analyses of data stored in a database that is optimized for retrieval, typically using graphical software tools
 - E.g., “What were the profits for each week in 2013 by sales region and customer type?”
- → Measures (Facts)
 - Values or numbers the user wants to analyze (e.g., sales) - “What” you want to see
- → Dimensions
 - Provide a way to summarize the data (e.g., region, time, product)
 - “How” you want to see

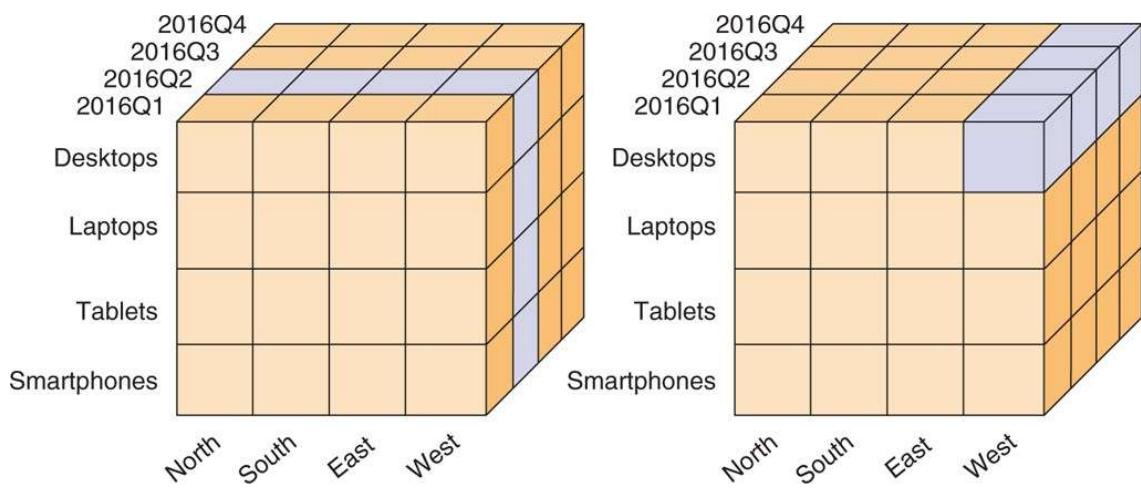
- → OLAP Cube
 - Data structure allowing for multiple dimensions to be added to a traditional two-dimensional table
- → Slicing and Dicing
 - Analyzing the data on subsets of the dimensions



Relational Database vs. OLAP Cube



Slicing and Dicing

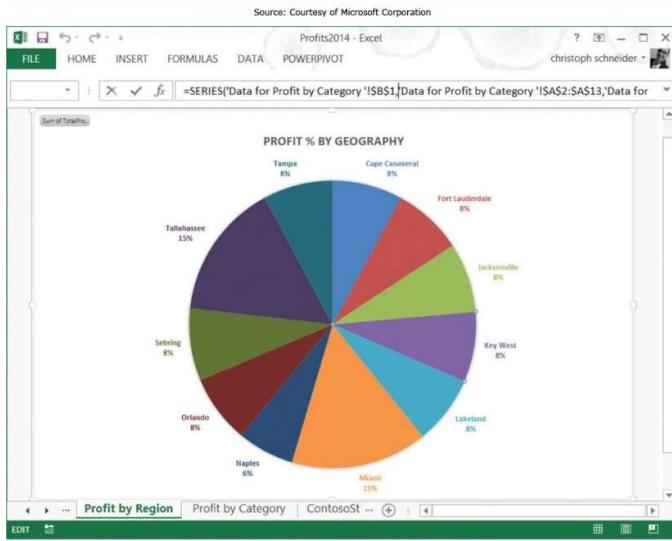
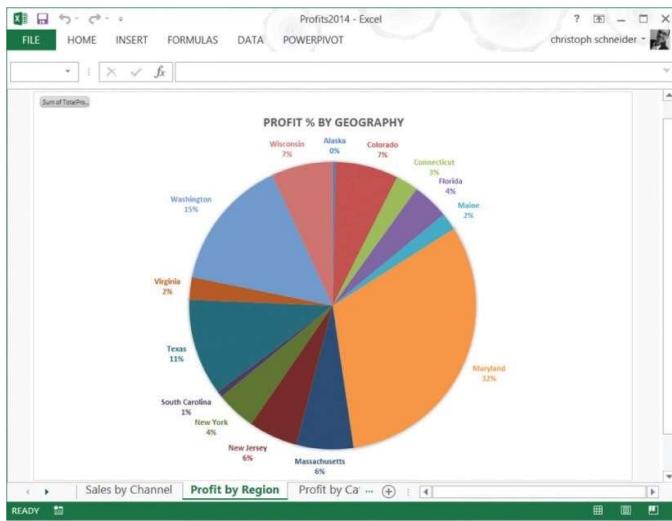


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Dashboards



- › Present key performance indicators and other summary information used by managers and executive to make decisions





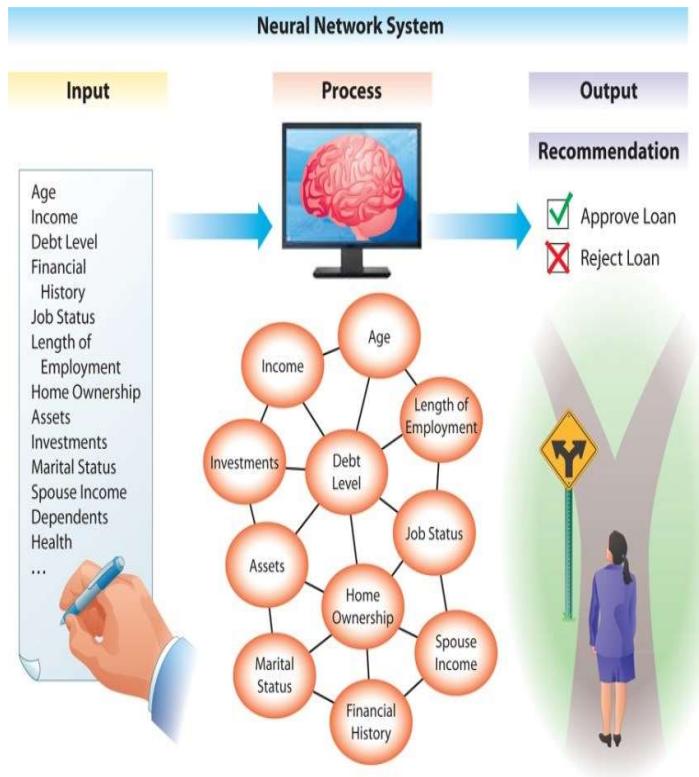
Data Mining

- › Methods used by companies to discover “hidden” predictive relationships in data to better understand their customers, products, markets, or any other phase of their business for which data have been captured
- › Two basic operations
 - Identifying previous unknown patterns - Predicting trends and behaviors

- › Applications
 - Classification
 - Estimation
 - Association Discovery - Clustering
 - Text and Web Mining

DM for Classification

- › Classification
 - Assignment a newly presented object to one of a set of predefined classes
 - Used when groups are known › Applications
 - Identifying potential customers (prospects)
 - Classifying credit applicants as low, medium, or high risk
 - Spotting fraudulent insurance claims



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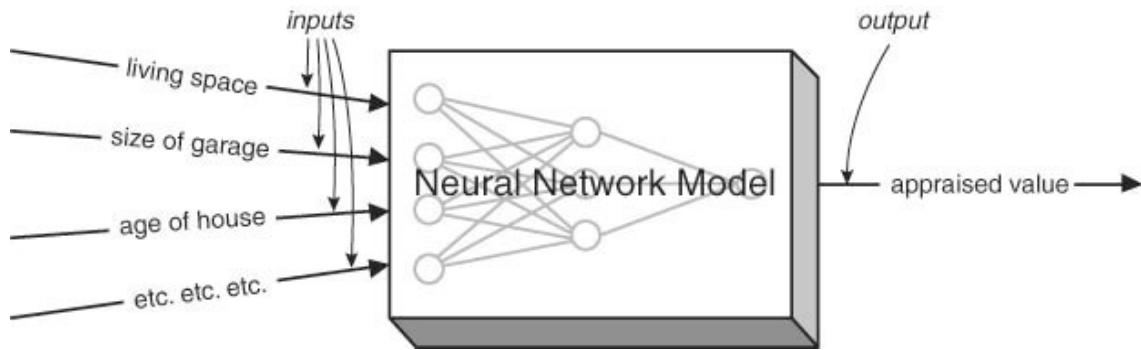


DM for Estimation

- › Estimation
- Comes up with a value for some unknown continuous variable (e.g. income,

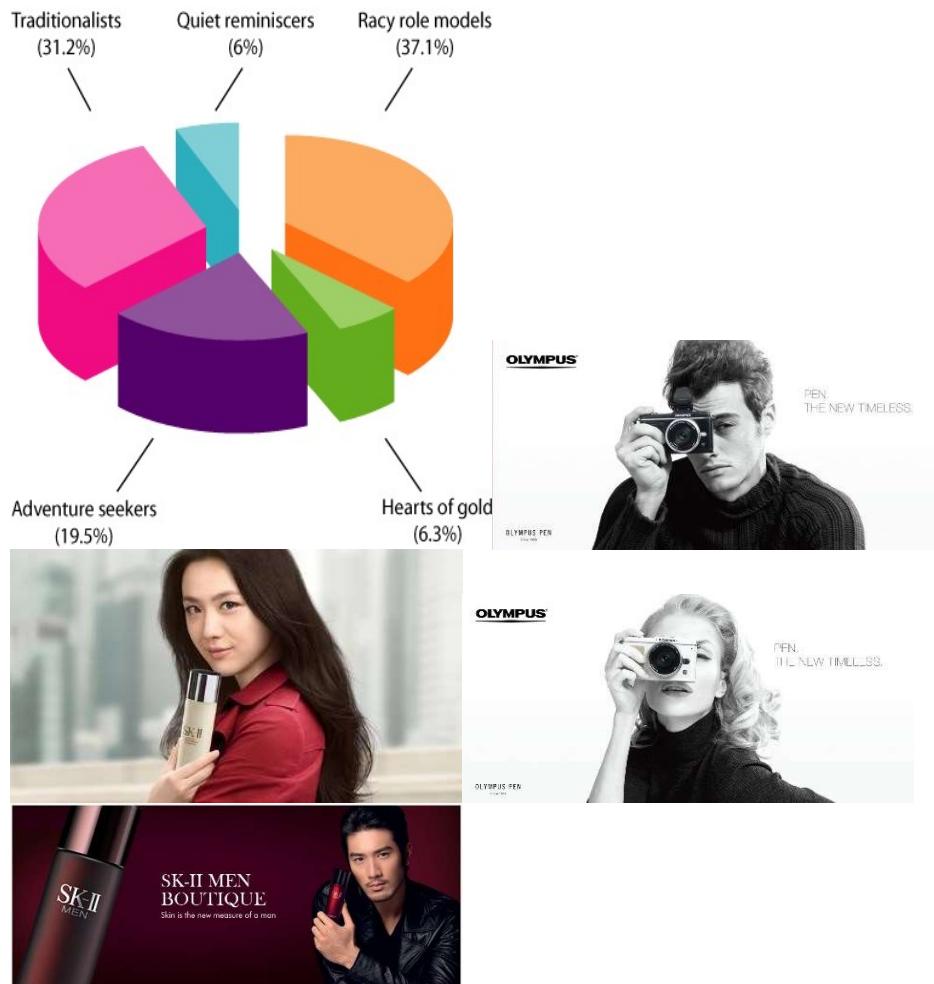
order size, credit card balance) given some input data › Applications

- Estimating the lifetime value of a customer
- Estimating the probability that someone will respond to a marketing promotion
- Determining which customers will leave within the next 6 months (churn)



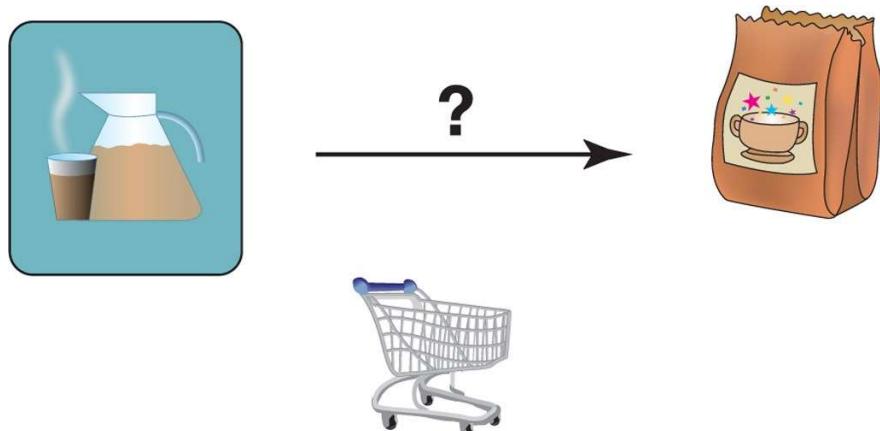
DM for Clustering

- › Grouping related records together on the basis of having similar values for attributes (e.g. age groups, income levels, etc.)
- Used when groups are unknown
- › Applications
- Targeting certain groups of customers in marketing campaigns
- New product development



DM for Association Discovery

- › Find associations or correlations among sets of items (e.g. items typically purchased together)
- › Applications
 - Redesign the store's layout and optimize the customers' "navigational path"
 - though the store
 - Product recommendations / cross-selling / bundling

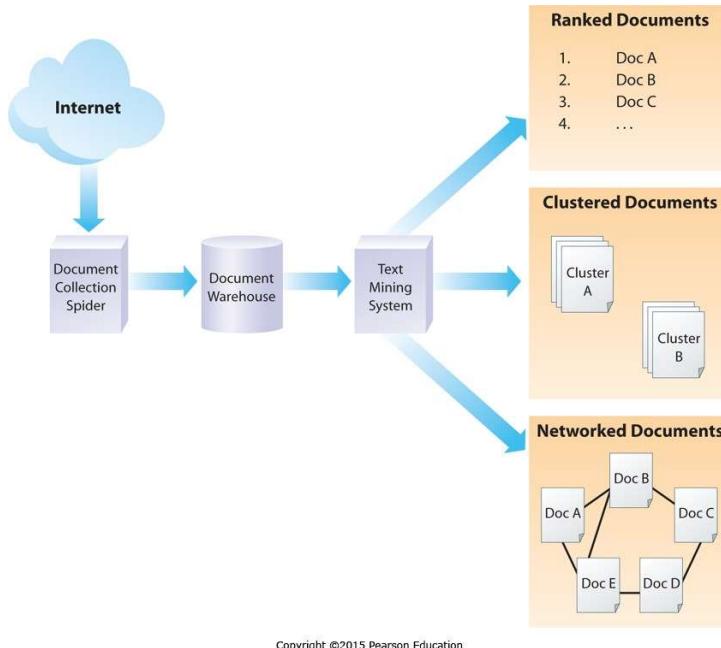


Coffee → Sugar [Support 20%, Confidence 80%]

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Text Mining

- › The use of analytical techniques for extracting information from textual documents
- › Applications
 - Analyze email text to block spam
 - Analyze customer text comments
 - Identify documents of interest to users with specific profiles
 - Filter and match resumes to job postings by human resources



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Web Mining

› Web Content Mining

- Analyze the content data (text, image, audio, etc.) available in web documents
 - E.g., Sentiment analysis and topic modeling on online reviews

› Web Structure Mining

- Analyze the underlying link (node and connection) structure of web documents
 - E.g., Link analysis on web pages and hyperlinks
 - E.g., Social network analysis on social relationships in a network

› Web Usage Mining

- Analyze web server logs to discover useful patterns of web user behavior

- E.g., Analysis on clickstream data

Sentiment Analysis

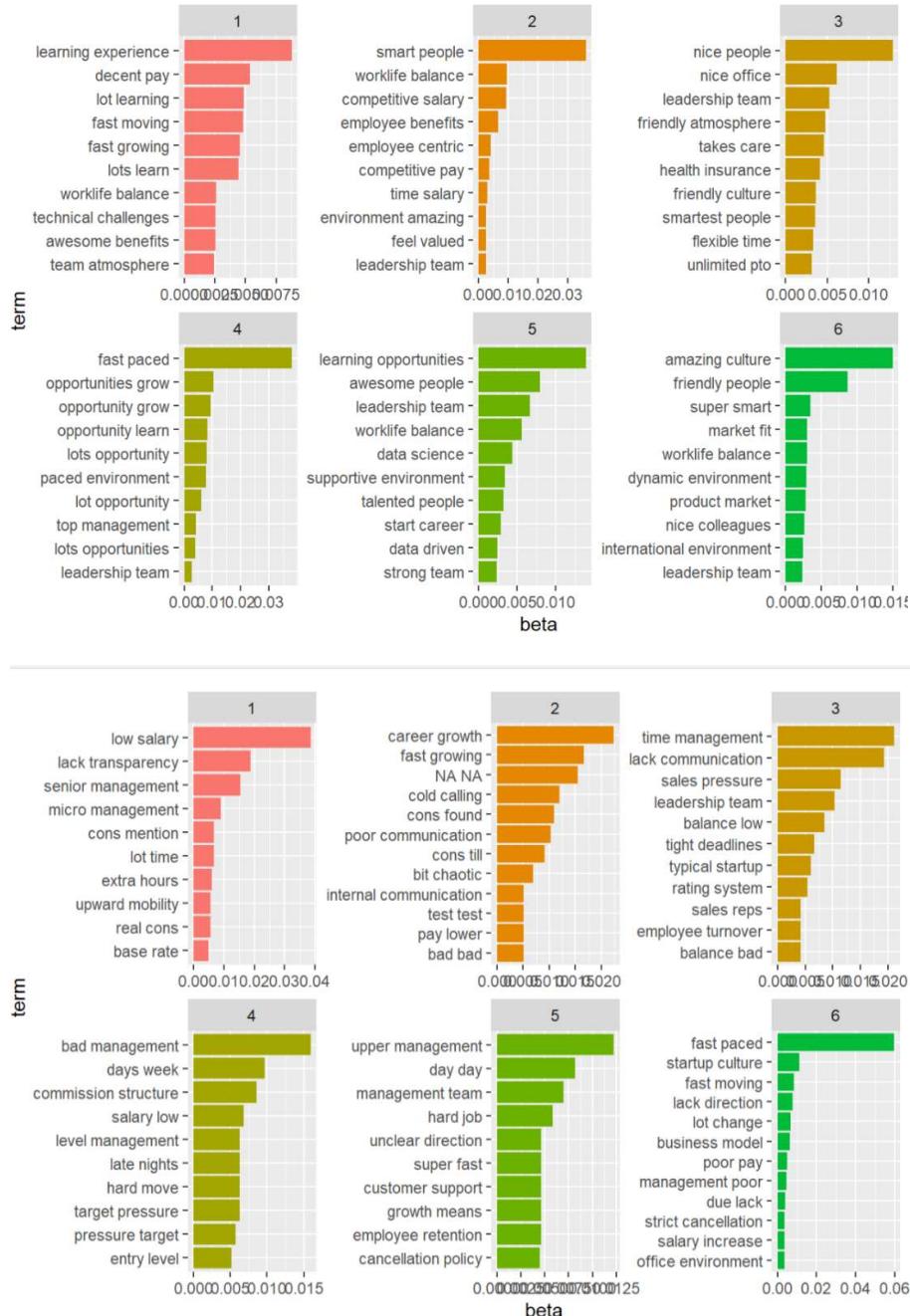
› A.k.a. opinion mining

- › The use of natural language processing, text analysis and computational

linguistics to identify and extract subjective information in source materials.

Topic Modeling

- › A type of statistical modeling for discovering the abstract "topics" that occur in a collection of documents



Web Mining

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- E.g., Analysis on clickstream data

Link Analysis

› A data-analysis technique used to evaluate relationships (connections) between nodes

› Google PageRank

- - Algorithm used by Google Search to rank websites in their search engine results
- - “Recommendations” (connections) from other pages (nodes)
- - “Reputation” (PageRank) of the recommenders (nodes)

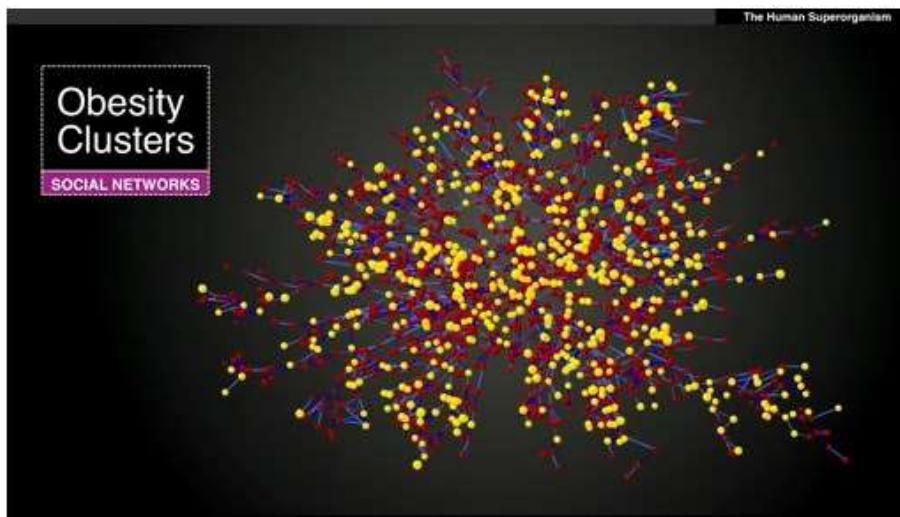
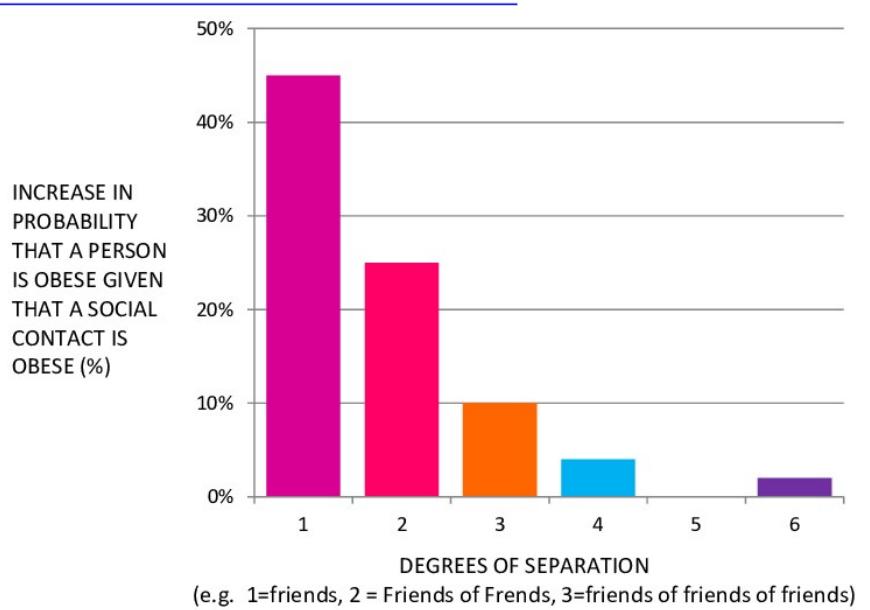
The Hidden Influence of Social Networks

› Your risk of obesity is...

- 45 percent higher if your friends are obese

- 25 percent higher if your friend's friends are obese

- 10 percent higher if your friend's friend's friends, someone you probably don't even know, are obese



Social Network Analysis

- › A strategy for investigating social structures through the use of network and graph theories
- › Applications
 - What Your Friends Say About You
 - The geographic locations of a user's Facebook friends are a better predictor of their geographic location than their IP address

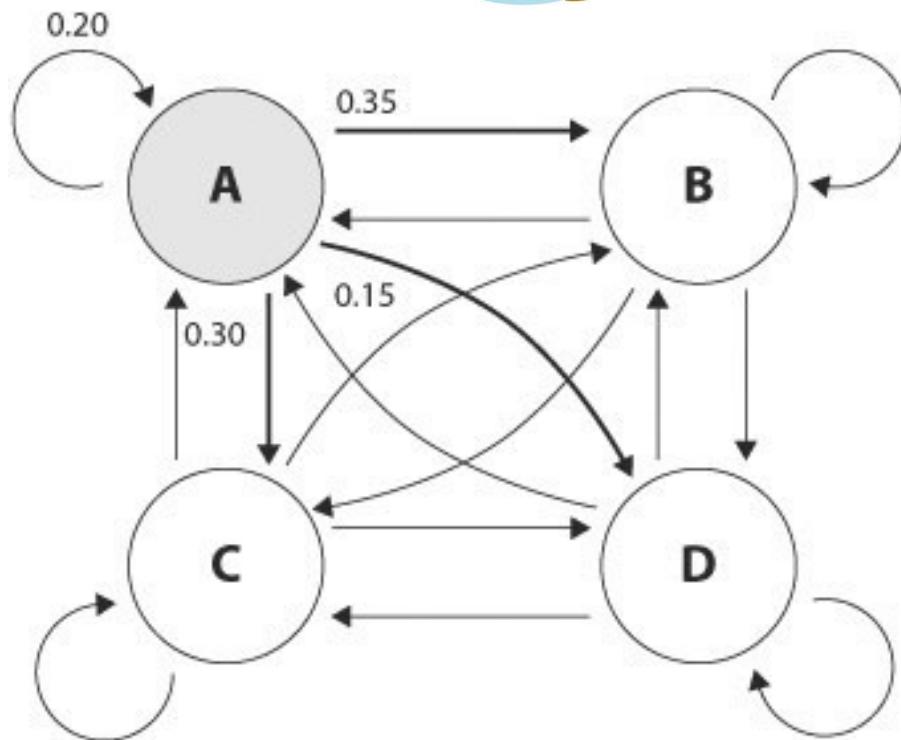
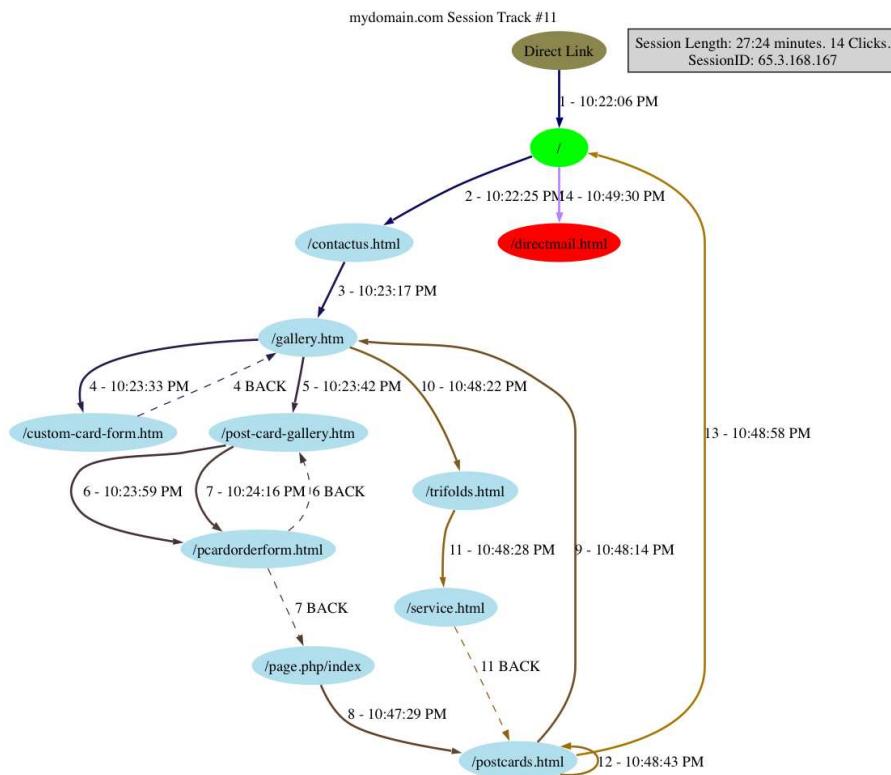
- Allows Facebook to provide services and advertising customized for a geographic area
- Social Marketing
 - - Identify the key influencers and make sure they are happy
 - - Having a member in a social group churn increases the probability of churn for other members by a factor of 5

Web Mining

- › Web Content Mining
 - Analyze the content data (text, image, audio, etc.) available in web documents
 - E.g., Sentiment analysis and topic modeling on online reviews
- › Web Structure Mining
 - Analyze the underlying link (node and connection) structure of web documents - E.g., Link analysis on web pages and hyperlinks
 - E.g., Social network analysis on social relationships in a network
- › Web Usage Mining
 - Analyze web server logs to discover useful patterns of web user behavior
 - E.g., Analysis on clickstream data

Clickstream Analysis

- › Clickstream Data
 - Recording of the parts of the screen a computer user clicks on while web browsing or using another software application



Bank of America

- › Business Challenge
- Improve the marketing of home equity loans

› Applying Data Mining - Decision tree

- Classify existing customers as likely or unlikely to respond to a home equity loan offer
- Flagged as “good prospect for home equity lines of credit” - Sequential pattern analysis
 - - Discover a sequence of events that had frequently preceded successful solicitations in the past
 - - Determine when customers were most likely to want a home equity - Clustering
 - - Segment the customers into groups with similar attributes
 - - One of the 14 clusters had two intriguing properties
 - 39% of the people in one cluster had both business and personal accounts
 - The cluster accounted for more than a quarter of the likely responders
 - - People might be using home equity loans to start businesses

Bank of America

- › Acting on the Results
 - Old campaign message: “use the value of your home to send your kids to college”
 - New campaign message: “now that the house is empty, use your equity to do what you’ve always wanted to do”
- › Measuring the Effects of Data Mining
 - Response rate increased from 0.7% to 7%