Lec 02: Basics of Wealth Creation through Getting Jobs Done

EEE 452: Engineering Economics and Management

…how are ideas in leveraging EEC technology possibilities

for getting jobs done better being shaped in a competitive

market into eocnomic value or waste…

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Getting Jobs Done:

We are always busy in getting our jobs done—whether having sleep to recharge or breathing air to supply oxygen to our blood stream.

Our quality of living standards depends on how well we get our jobs done, and how much it costs—time, effort, money.

We are after endless journey of improving the quality of living standards.

To get jobs done better, we develop and deploy products; and we keep improving those products and the processes to deploy them.

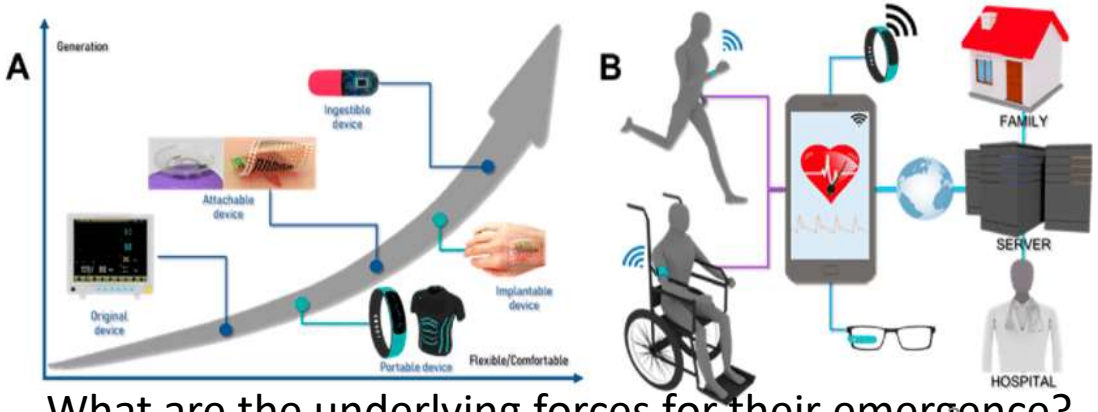
To invent and improve products—we need ideas, distilled from **empathy**, science and technology.

List of getting jobs done and products to help them done has been expanding, and they are getting integrated as a single whole system.

What is it? How does it help in getting jobs done?

Driving forces of innovation: i. Getting jobs done better,
ii. Empathy & Passion for perfection, iii. Science &Technolog
iv. Engineering, v. Creativity, and vi. Winning in competition

But a recent research study by Simon-Kucher & Partners shows that 72% of all new product & service introductions fail to live up to expectations—how to reduce?



What are the underlying forces for their emergence?

Historical Context in Getting Jobs Done:

Urgence of getting jobs done and innovating and deploying products to get them done are not new.

Since the very beginning, human beings are after them—perhaps, the journey started in causing friction between stones to cause fire to get light and heat in getting numerous jobs done.

Human beings have inherent ability to observe the surroundings, form knowledge about relations between underlying variables in causing reoccurring phenomena (begins as art, non-scalable), and imagine the occurrence of the effects due to the intentional manipulation of those variables.

They started feeding knowledge, imagination and urgency of getting jobs done to the creative process (another inherent ability) leading to ideas of technology invention and product as well as process innovation.

However, in those days of preindustrial age, knowledge was in art form--non-scalable. As a result, many of the inventions and innovations did face very early saturation—resulting in slow growth of wealth creation and living standards.

Due to non-scalability of ideas, quality of living standards or economic well being faced early saturation as well.

What were the driving forces in the above evolution?

Did it keep improving the quality of living standards?

Did it contribute to economic indicators like jobs, perceived value, willingness to pay, production, distribution, and consumption?

Did profit making competition emerge?

Up to Edison's light bulb, idea generation and advancement approach was based on intuition and tinkering. In 1900, Edison started GE's corporate lab for incremental refinement of filament for the light bulb—through flow of ideas stemming from scalable knowledge.

Extracting Increasing Utility in Getting Jobs Done:

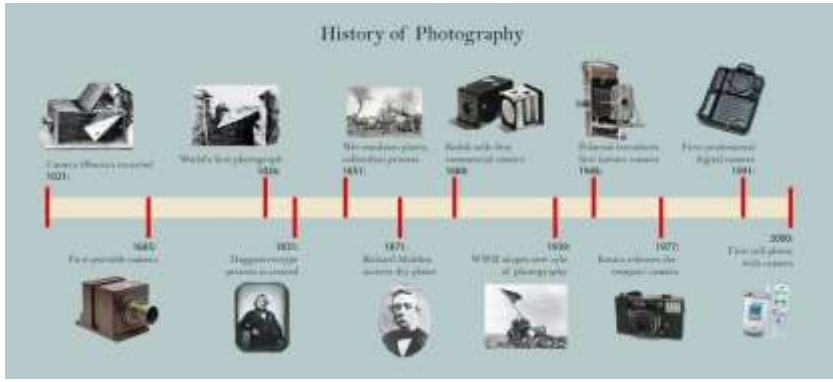
Within economics, the concept of utility is used to model worth or value. We extract value from products in getting our jobs done.

How much utility we extract from each product we consume determines our quality of living standards. Hence, we are improving products for extracting increasing utility.

The term has been adapted and reapplied within neoclassical economics, which dominates modern economic theory, as a utility function that represents a consumer's preference ordering over a choice set.

Utility function indicates utility values associated with bundles of goods: say U (X, Y). X and Y refer to quantity of two different types of products. The relationship between X and Y depends on type of products, purposes being served, situation, consumer preferences, and any other relevant factors.

As quality of living standards depend on utility we extract from products we deploy in getting jobs done, we have been after more products, better products, and complementary roles between products.



Photography utility progression due to continued improvement

Medical imaging utility advancement due to the introduction of multiple imaging modalities--products

Ideas and Utility:

Through Ideas, we invent new products, and also keep improving invented products, so that utility in getting our jobs done keeps increasing.

A product consists of a set of feature, N. The utility (*Tu*) of a product is distilled as the summation of utility produced by each feature *U(fi).* Consequently, willingness to pay (*WtoP*) depends on the total utility.

Hence, we need ideas—an endless flow of them so that we keep increasing the utility we derive in a day or over a month or vear.

$$f_1, f_2, \ldots, f_N$$

$$f_i = f_i + \Delta f_i$$

$$Tu = \sum_{i=1}^{i=n} U(f_i)$$

$$WtoP = f(Tu)$$

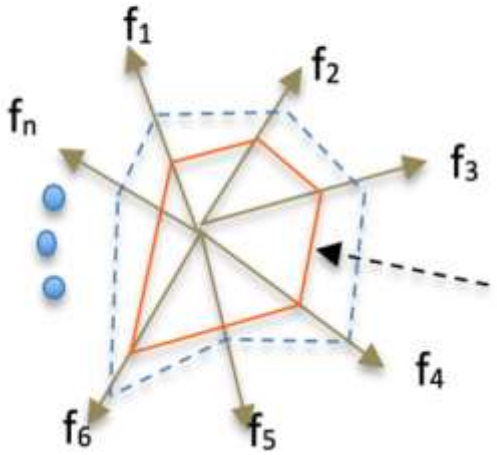


Figure 4: Feature map of a typical product, which keeps changing with subsequent releases

CATEGORY	iPhone 5	iPhone 4S	iPhone 4	iPhone 3GS	iPhone 3	iPhone
Resolution	1136 x 640; 326ppi	960 x 640; 326 ppi	960 x 640; 326 ppi	480 x 320; 163 ppi	480 x 320; 163 ppi	480 x 320; 163 ppi
Camera size (megapixels)	8	8	5	3	2	2
Video calling	FaceTime	FaceTime	FaceTime	none	none	none
Video recording	HD 1080p	HD 1080p	HD 720p	VGA	none	none

Utility Dynamics:

As we keep adding features to a product, total utility of the product keeps increasing, but the incremental utility from the addition of each feature (marginal utility) has a diminishing tendency.

Similarly, the utility produced by a feature keeps increasing with advancement, but the marginal utility due to progression keeps falling.

In general, marginal utility, $MU_x = \frac{\triangle U}{\triangle X}$.

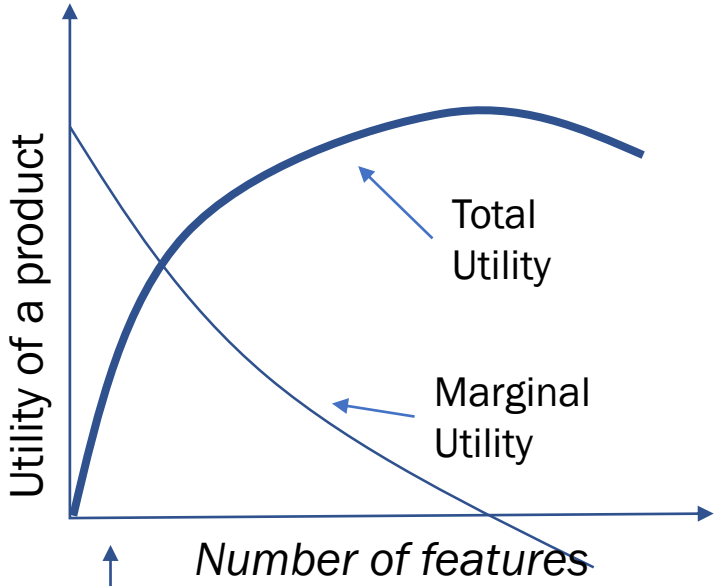
How would you define marginal utility of a product and an individual feature?

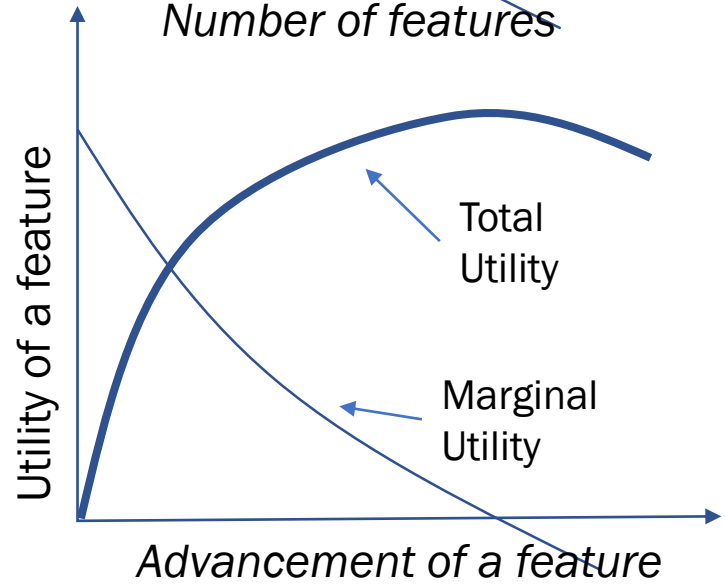
There is also possibility that the total utility of a product and utility of a feature run the risk of suffering from declining after getting flattened or reaching saturation.

Hence, the marginal utility may be have negative value too—examples?

Not all features have same implications on utility. On the other hand, utility implication of advancement of each feature also varies. Moreover, cost also varies.

Our challenge is to target most suitable features for maximizing the return on investment for innovation





Utility Optimization From the Perspective of Rational Consumer Behavior

Model of rational behavior for a consumer. In this model we assume a consumer faces a choice of n commodities labeled 1,2,...,n each with a market price p_1, p_2,..., p_n. The consumer is assumed to have an ordinal utility function U (ordinal in the sense that only the sign of the differences between two utilities, and not the level of each utility, is meaningful), depending on the amounts of commodities x_1, x_2,..., x_n consumed. The model further assumes that the consumer has a budget M which is used to purchase a vector x_1, x_2,..., x_n in such a way as to maximize $U(x_1, x_2,..., x_n)$. The problem of rational behavior in this model then becomes a mathematical optimization problem, that is:

subject to:

subject to:

$$\sum_{i=1}^{n} p_i x_i \leq M.$$

$$x_i \geq 0 \quad \forall i \in \{1, 2, \ldots, n\}$$

This model has been used in a wide variety of economic contexts, such as in general equilibrium theory to show existence and Pareto efficiency of economic equilibria.

Consumer Preferences: Trade off and Optimization in Product Enhancement

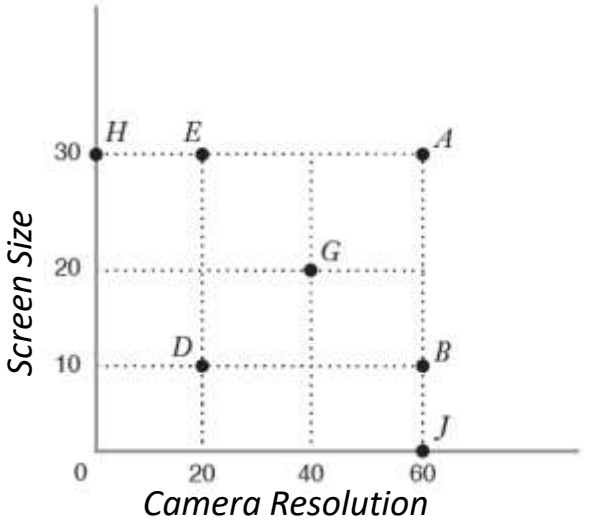
As a consumer, we make choices every day of your life. Besides choosing among automobiles, we must decide what kind of housing to rent or purchase, what food and clothing to buy, how much education to acquire, and so on.

Similarly, the selection of a smartphone depends on trade off of performances of certain features against others—often, subconsciously.

Furthermore, cost of adding a feature or advancement of a feature varies over feature. Similarly, value extraction from the advancement also varies—often, depending on excludability or complementary effects.

Trade off and optimization depend on consumer preferences, cost of advancement, and value extraction ability—for maximizing return on investment made for advancement.

The first step in designing research for the optimization of a product or service is to carefully identify the parameters of the optimization problem. This requires a close dialogue between a research professional and the manager responsible for design.



Example of a Choice Task

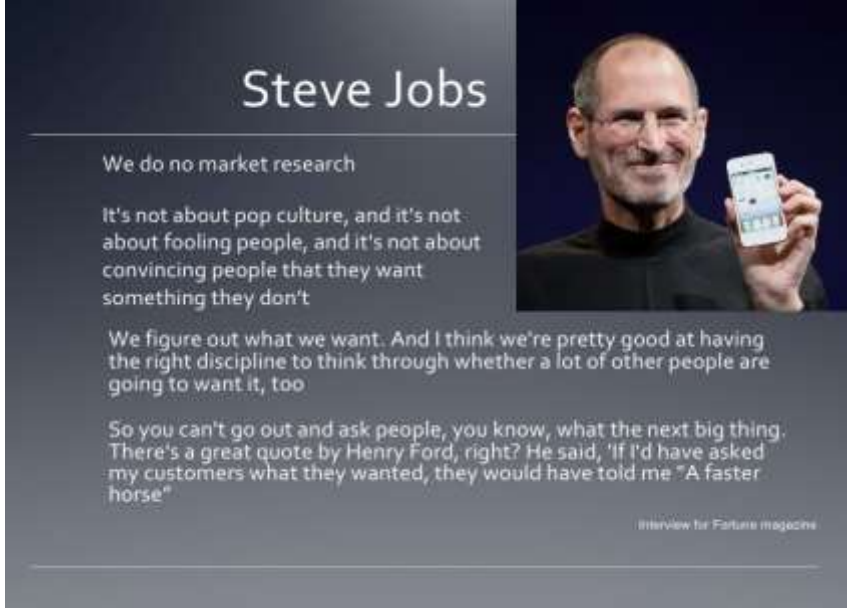
Option:	Brand X	Brand Y	Brand Z: Basic	Brand Z: Premium	
Features:	42" screen	50" screen	27" screen	42" screen	
	DVD Player built in	DVD Player built in	No DVD Player	DVD Player built in	
	Not HDTV Ready	HDTV Ready	Not HDTV Ready	HDTV Ready	
	Surround Sound	Standard Audio	Standard Audio	Surround Sound	None of the above
	12 mo. warranty	90 day warranty	90 day warranty	90 day warranty	
Price:	$2,999	$3,499	$1,499	$2,799	
Choose One:	( )	( )	( )	( )	( )

How will you choose?

Knowing Consumer Preferences:

Observe, Silently Feel and Articulate with Empathy

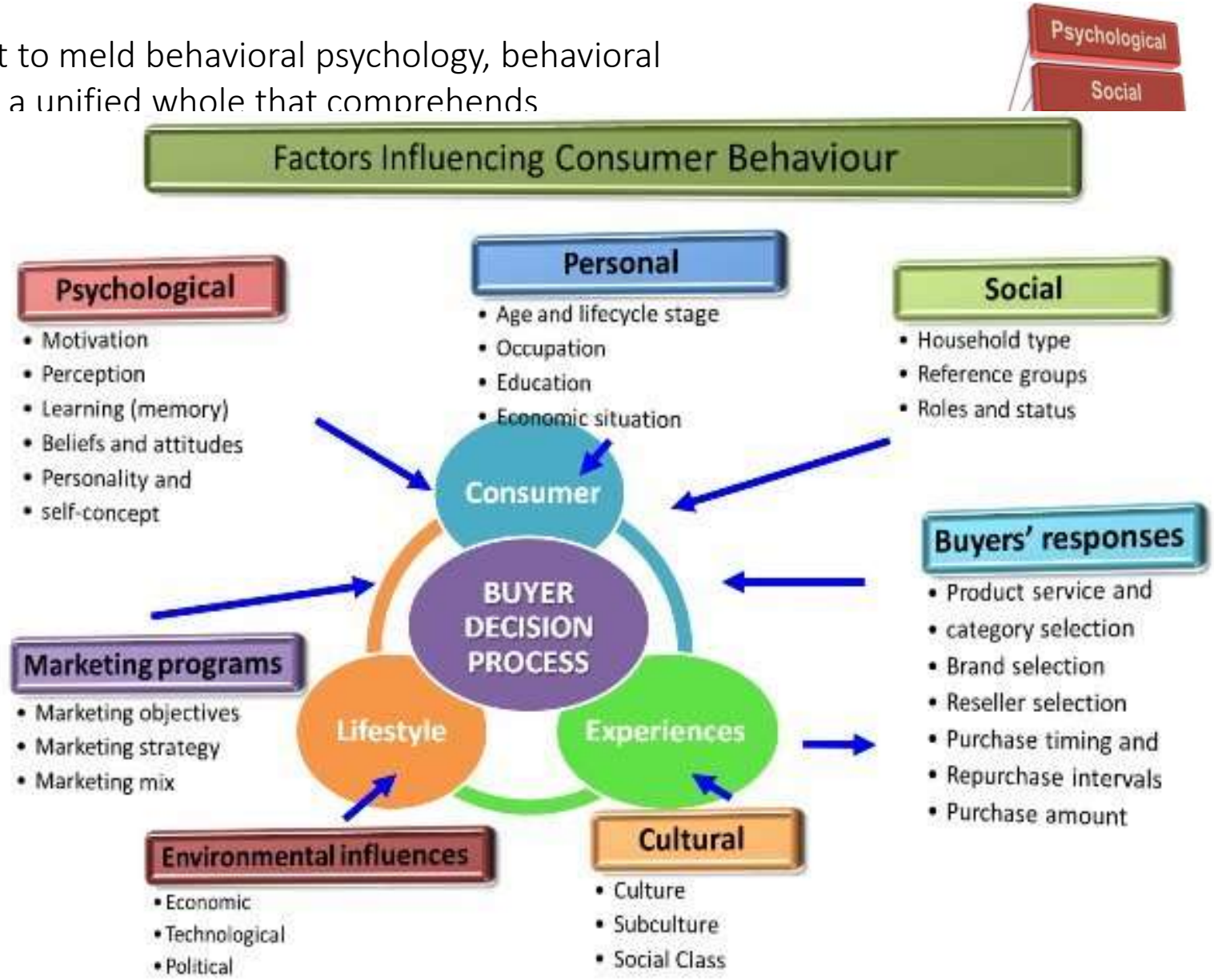
- Consumers do not know; often, they give misleading information
- If we develop features as per consumer feedback, we will never be able to create excitement among consumers.
- There is time lag between gathering consumer feedback and implementation.
- Consumer expectation keeps changing, invariable different the time product shows up.
- Consumers' feedback gets closure to the reality if we show them—but it takes huge R&D cost to develop close to reality prototype.
- Hence, we need to silently observe and detect latent consumer preferences, beyond the articulation capability of target customers
- If we do so, they will get excited upon seeing the product that they did not imagine, resulting in high willingness to pay--a critical requirement for maximizing value capturing.
- Interestingly, as customers start using the innovative product, their excitement keeps fading, revealing the necessity of additional preferences. Hence, innovators are compelled to keep releasing better version, with added and improved features, for keep maintaining the excitement.



With wooden and paper protype, Jeffrey Hawkins used to pretend to using an envisioned PDA in conceivable situations in which his target customers would be using—that is that way he figured out consumer preferences for the Palm Pilot.

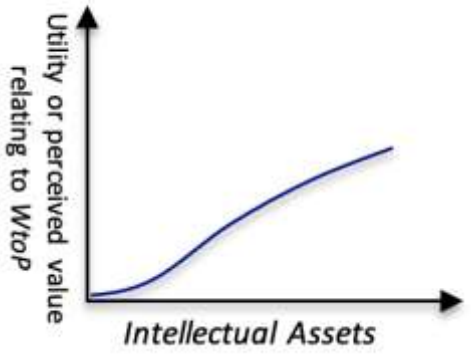
Science of Interpreting Consumer Preferences:

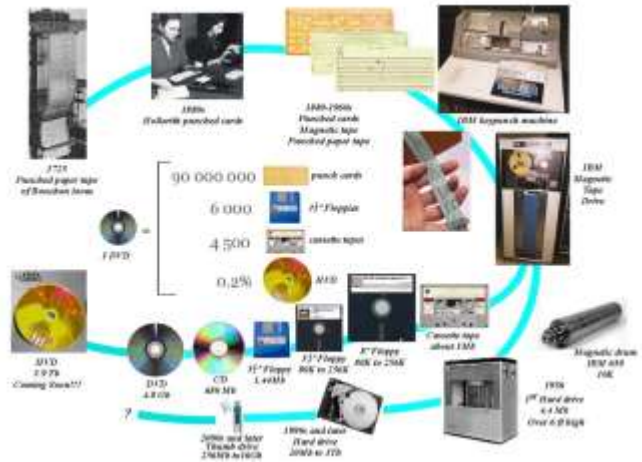
- Consumer behavior analysis has sought to meld behavioral psychology, behavioral economics, and marketing science into a unified whole that comprehends consumer behaviour.
- Research in consumer behavior analy and marketing science, and its effects within and beyond behavior analysis.
- The immediate precursor or context c setting, which comprises the consum stimuli and motivating operations tha informational reinforcement likely to or product purchase or use.
- Assumption of neoclassical economic economici that always seek to maxim preferences
- However, research in behavioural eco judgements and decisions are often s and are strongly dependent on the cc
- There are impacts of status quo bias, and the sunk cost effect; there is also lock-in effect due to non-compatibility.



Science and Engineering: for scaling up utility in getting jobs done

- Enhancement of each feature for keep increasing utility demands a flow of ideas—for incremental progression.
- Addition of new features demands breakthrough ideas.
- For example, the addition of camera to smartphone needed breakthrough idea of digital camera. Moreover, it needed continued refinement.
- Although camera was invented out of intuition, tinkering and craftsmanship, but that was not sufficient for its continued advancement, and also creating its suitability to make it a smartphone feature.
- Hence, we need science for keep producing knowledge for inventing and advancing technologies. And we need engineering for its optimum, precision implementation.
- In the absence of science and engineering, inventions during the preindustrial stage suffered from early saturation—slowing down the improvement of quality of living standards.
- Successive industrial revolutions have been unfolding due to the scalability of art form of knowledge into science, its use for technology invention and advancement and transfer of craftsmanship into engineering.
- Hence, reinvention journey has been progressing in creating increasing value or utility in getting our jobs done.





To Keep Increasing Utility: Keep changing technology core in creating rolling waves

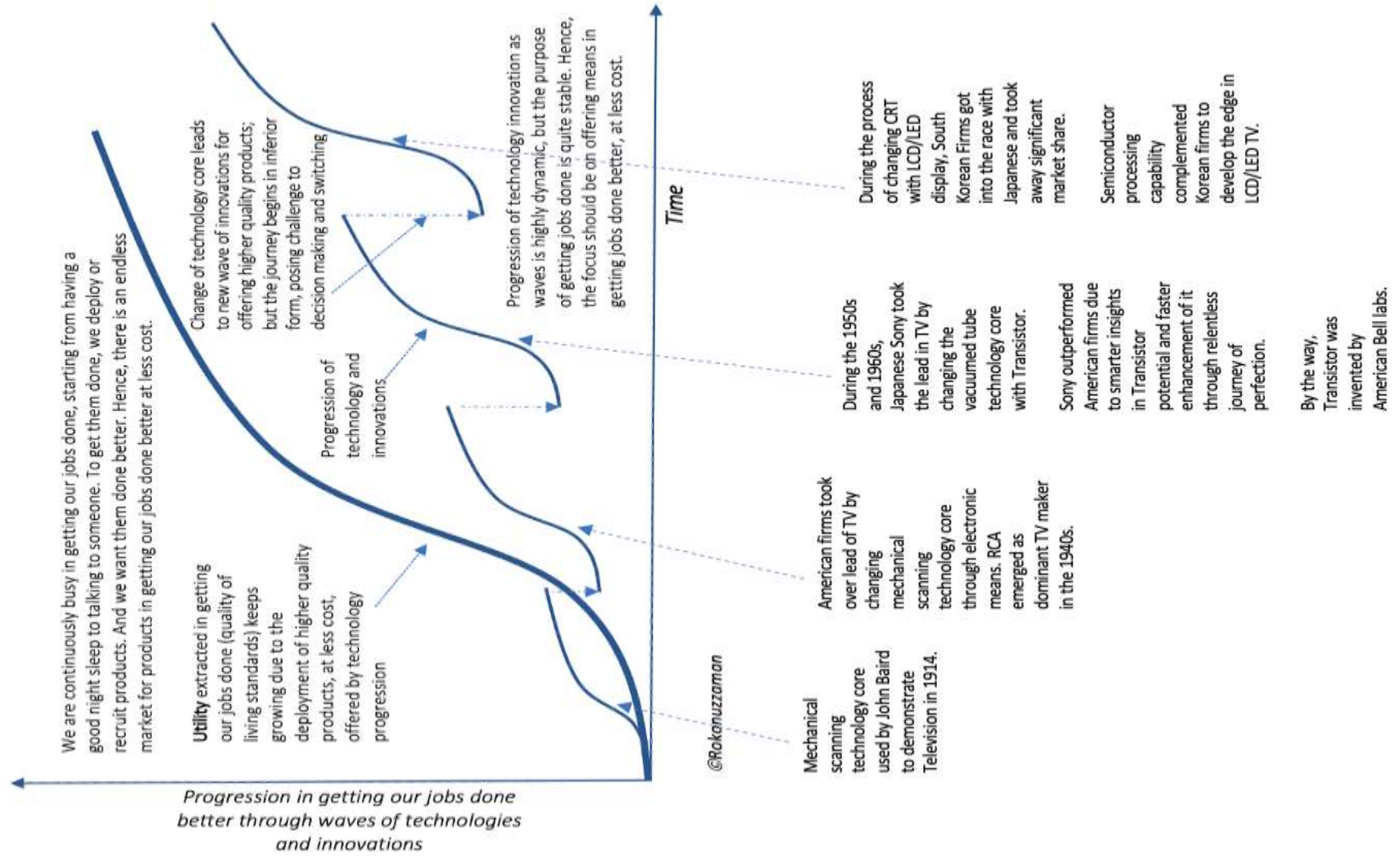


Figure 2: Episodic model of growth of inventions through a series of technology changes—explained further with the example of the evolution of television.

Market Keeps Expanding with Growing Utility

- Irrespective of the greatness of the idea and potential strength of the underlying technology core, innovation emerges in primitive form.
- Such primitive product creates very little willingness to pay among a small group of customers. Even at loss, innovators succeed to sale to among a few people only.
- For example, automobile has been a great innovation. In contrary to 6m+ car sale in 2017, German automakers succeeded to sale just 900 cars in 1901.
- Over the last more than a century, automakers have been increasing the utility, and also reducing the cost for each unit of utility.
- As a result, increasing utility is being offered at diminishing per unit of utility price, resulting in growing sale and profit.
- Such capability of innovators of offering continually better products is vital in expanding the market.
- Hence, creating a flow of ideas is a must for expanding the market. How will you get them?

Figure 13: Market keeps expanding due to successive better versions, driving economic growth.

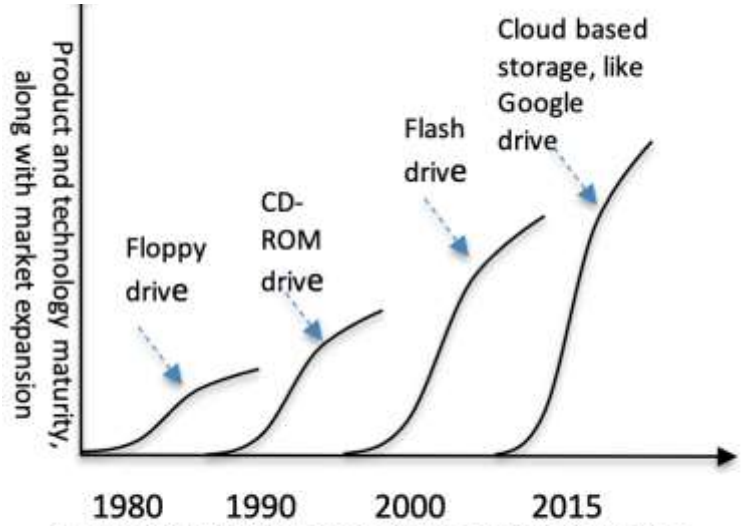


Figure 09: Portable computer storage industry, successive disruptive waves offering better as well as cheaper substitutes.

Growing Number of Jobs to be Done in an Integrated Manner: Raising Policy Issues

There have been three major trends: i. number of jobs to be done is increasing, ii. creating increasing utility in getting each of them done, and iii. getting discrete jobs done in an integrated manner.

Many of hour higher level goals demand to perform a series of lower level jobs in a hierarchical fashion—resulting in transaction cost, errors, and delay. Utility could be increased substantially by having real-time integration of them.

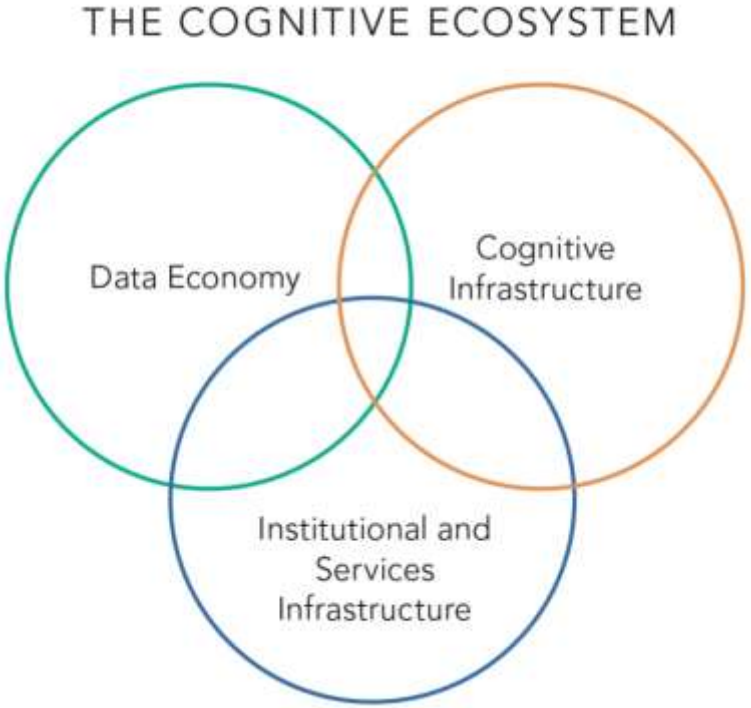
Hence, there has been a trend of real-time integration among them—demanding the exploitation of the possibility of gathering knowledge from sensor data and feeding them into models to assess the current situation, determine the trend, predict the unfolding future and taking the action.

It has been transforming off-line act of a number of data collectors, experts and regulators into a real-time machine capability in the doing job far better, and also faster.

Furthermore, it's going to cross national boundaries, connecting the whole world into an integrated system being monitored and controlled by machine's cognitive capability. Will it make national institutions increasingly ineffective?

As reinvention waves keep progressing (particularly around newly formed cognitive technology core--through fusion), individuals and also institutions keep losing privacy, control, and relevance.

Although technology is our means of getting jobs done better, the profit motive of innovators, often, undermines the broader purpose of society. Hence, this technology-led transformation is too important to be left with the narrow interest of a few individuals.



Higher Quality at Less Cost:

- Human beings are driven by economic incentives. They are after getting better products at less cost. They would not buy and deploy any product until and unless the perceived value is more than the price they need to pay. Moreover, the opportunity cost for not buying other products should be less.
- On the other hand, producers are after more profit. Hence, the challenge has been to produce higher quality products at less cost, while paying more for other inputs like labor, materials, energy, etc.
- Moreover, damage done to the environment should keep falling, and increasing taxes to be paid for growing health and elderly cares.
- In fact, addressing this conflicting situation is at the core of our capability for addressing the challenge of producing more with less out of ECE competence.
- Fortunately, ECE ideas offers the opportunity for improving the quality and reducing the material, energy and labor cost simultaneously. For example, photo relays serve the purpose better while consuming less materials and energy. What are other examples?
- Ideas for reduction of material and energy need also reduces emission and environmental harm.

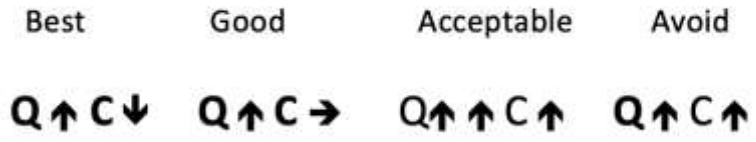
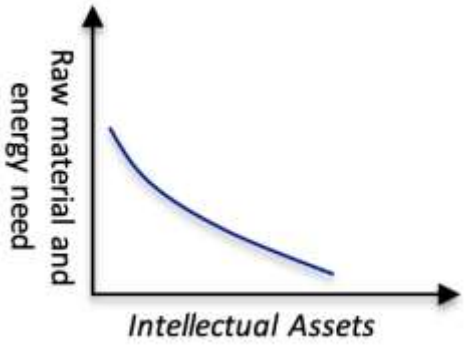
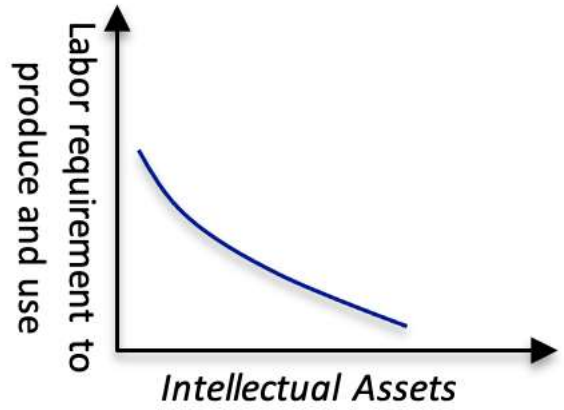


Figure 3: Four different plausible scenarios





Increasing Fitness to Purpose for Maximizing Utility:

One of the popular approach has been Design Thinking. This is about empathy centric cognitive process to understanding purposes to be served and figuring out suitable product features so that fitness of purpose could be improved.

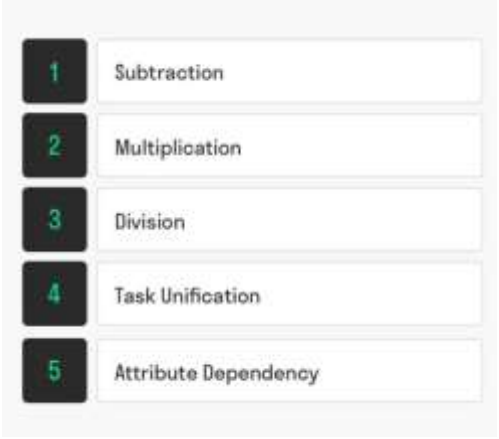
Design thinking encompasses processes such as context analysis, problem finding, and framing, ideation and solution generating. It also involves creative thinking, sketching, and drawing, modeling, prototyping, testing, and evaluating.

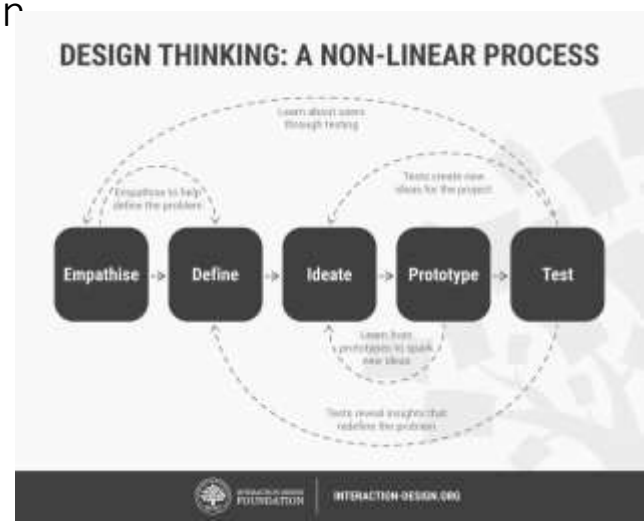
Another one is Systematic Inventive Thinking (SIT). This is a thinking method developed in Israel in the mid-1990s. It has been derived from Genrich Altshuller's TRIZ engineering discipline.

Altshuller's main discovery was that creative solutions incorporate an elimination of a conflict in the problem state. A conflict is a state where one parameter must be changed, in order to get some benefit, but changing that parameter causes a deterioration of another important parameter. Routine engineering design deals with this situation by searching for the "best fit" compromise, a trade off that maximized the utility and minimizes the negative impact of a specific configuration of the variance of the available input parameters.

SIT is a descendant of the work of Genrich Altshuller, a Russian engineer who analysed over 200,000 patents to identify the 40 common inventive principles of his unique formula, named TRIZ.

SIT has five thinking tools: i. Subtraction, ii. Multiplication, iii. Division, iv. Task Unification, and v. Attribute dependence.





Expanding the Economies of Scale and Scope:

Through material, energy, and labor saving ideas, and ideas for increasing the fitness to purpose, economies of scale effect should be increased.

Cost=F(material, labor, energy, N); In simplistic form, cost=R&D/N+ …. As N increases, R&D,R&D/N decreases—resulting in reduction of per unit cost.

Yes, additional R&D will increase upfront cost, but due to the negligible marginal cost for implementing R&D outputs in each unit, exploiting scale advantage out of ideas creates the opportunity of improving the quality and reducing the cost.

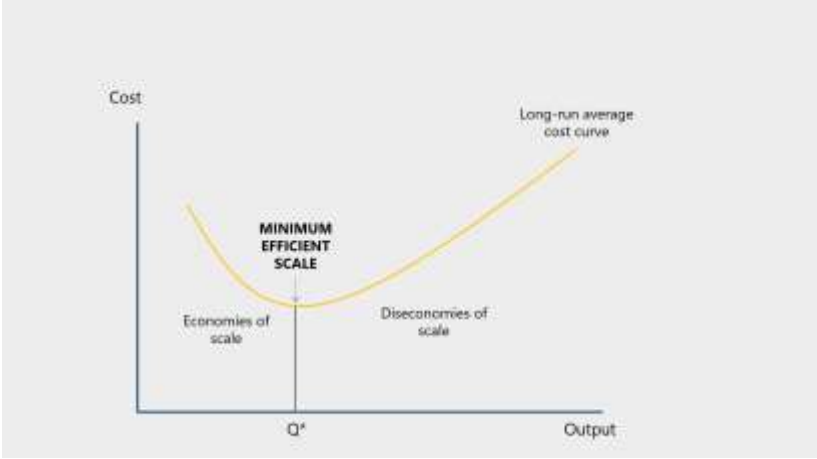
On the other hand, the exploitation of scope advantage by reusing core ideas among multiple products of a family also opens the opportunity of increasing quality and reducing the cost.

For example, the upfront R&D cost increases the quality, while reducing the cost of VLSI chips., But it demands exploiting the growing scale advantage for reaching the minimum efficient scale.

However, exploiting the economies of scale advantage demands growing market.

Smart firms are after ECE ideas for exploiting economies of scale and scope advantages, and overcoming diseconomy of scale.

3rd party plug-in option also increases the scope effect.



In microeconomics, economies of scale are the cost advantages that enterprises obtain due to their scale of operation, with cost per unit of output decreasing which causes scale increasing.

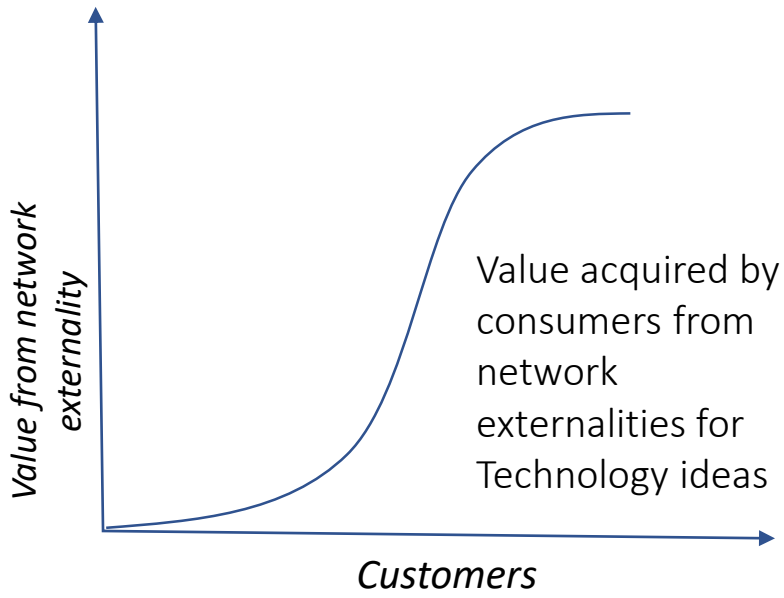
In industrial organization, the minimum efficient scale (MES) or efficient scale of production is the lowest point where the plant (or firm) can produce such that its long run average costs are minimized.

Economies of scope: a proportionate saving gained by producing two or more distinct goods, when the cost of doing so is less than that of producing each separately.

Diseconomies of scale are the cost disadvantages that economic actors accrue due to an increase in organizational size or in output

Increasing network externality effects:

- Due to network effect, perceived value of products keeps increasing with the growth of customers base. This is called network externality effect or demand side economies of scale effect.
- Deliberate attempts should be pursued for creating network externality effect out of intelligently designed features.
- Moreover, the transformation of services over digital space creates the network externality effects.
- For example, telemedicine platform has the potential of benefiting from network externality effect—growing number of doctors connected leads to more options of getting services.
- Although, there is an exponential growth nature, in reality, it saturates after certain volume of customers.
- In addition to network connection, a series of ideas should be exploited for maximizing value from network externality effects.
- Facebook and Google became global monopolies for exploiting this aspect of innovation.



Network externality is an economics term that describes how the demand or perceived value for a product is dependent on the demand of others buying that product.

Marked safe feature of FB, does it contribute to network externality effect?

Frugal innovation: misleading affordable innovation

Frugal innovation attempts to make existing industrial products affordable to low-income people.

This basic thesis had been to remove certain features or make some features inferior of products which are being bought buy high-income groups.

But the removal of features or making some of them inferior also reduces the perceived value.

For example, TATA pursued frugal innovation thesis for TATA nano

Despite lower price, TATA nano failed to reached to make enough sale for reaching minimum efficient scale. As a result, upon suffering from RS 1,000 crores loss, TATA discontinued this once highly thoughted innovation.

Feature removal and erosion reduced the perceived value far more than the cost reduction. Hence, customers found cheaper car non-attractive.

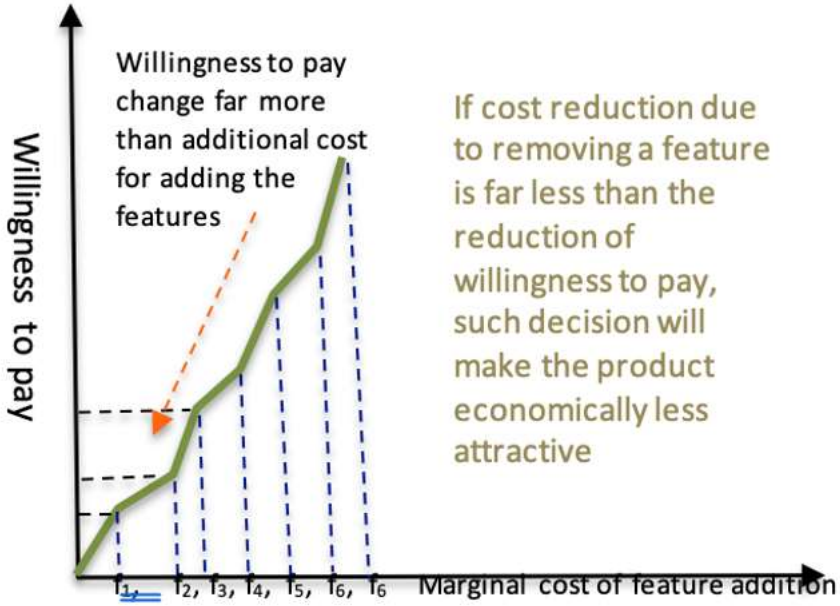


Figure 10(b): Hypothetical relation between marginal cost of adding features and change in willingness to pay.

Figure 10(a): Tata's Nano, stripped down version a state-of the-art family sedan.

Upgrade Technology Core:

- The upgradation of technology core opens the opportunity of reducing material and energy need. It also increases the quality and lowers the environmental impact.
- Some of the options have been to change mechanical and electromechanical technology core with electronics.
- Change of hardware with software brings multidimensional benefits.
- The change of technology core also increases the economies of scale effect. Particularly, zero cost of copying software is a powerful option.
- Due to the exploitation of these opportunities, many industrial products have been evolving, often taking episodic form.
- However, there has been growing R&D need for pursuing the opportunity of changing technology core for making products better and also cheaper. It also demands growing market for reaching the minimum efficient scale—leading to globalization.

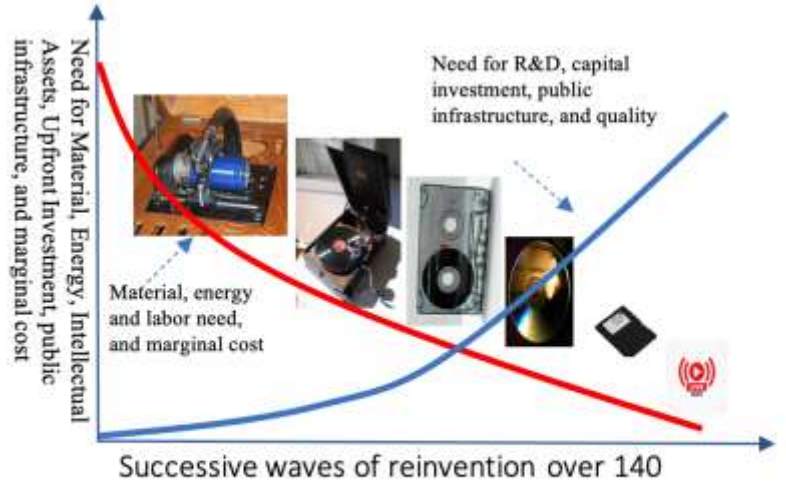


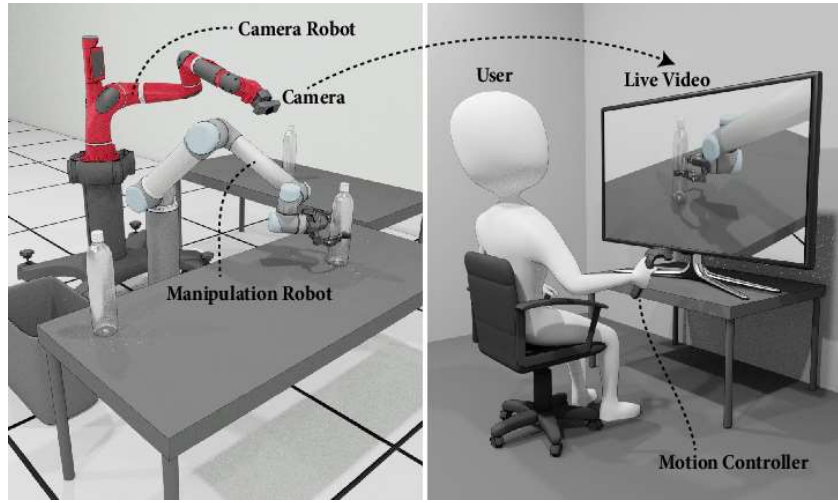
Figure 10: Reinvention of music industry keeps reducing material and energy need

Can you detect unique technology cores?

What are their implications on material, energy, quality, cost, and economies of scale?

Improve human machine interfaces: through reinvention

- Codify human knowledge and skill needed to operate and produce products.
- Develop a set of rules for human engagement and delegate those rules to machines—automating both production and usages
- Develop intuitive human-machine interface for easing the use of humans' innate abilities.
- Redesign interfaces for making human-machine interface foolproof.
- Develop self-testing and self-alignment capability for reducing errors and testing requirement.
- All major products are being reinvented to ease human-machine interfaces, resulting in higher perceived quality and reduced cost of production and usages.
- Tele transporting human cognitive ability is an emerging area for leveraging real-time virtual presence of human for quality improvement and cost reduction further.
- Some of the technology cores for reinventing human machine interfaces have been: i. switches, ii. dials and knobs, iii. keyboard and text commands, iv. point and clk devices a GUI, v. multitouch, vi. voice commands, vi. gesture, vii. AR&VR, and viii. neural interfaces
- Apple has been showing innovation magic by reinventing human-machine interfaces by leveraging technology cores like GUI, and multitouch.
- Collaborative robotics or co-bots has been growing for scaling up this possibility.



Optimum Reallocation of Human Role for Maximizing Gain:

- Production jobs are being divided into a set of discrete tasks—resulting in transition from Artisans to low skilled labor force.
- Human capital is engaged in R&D for producing ideas for automating the role of human capital for offering codified knowledge and skill in production.
- Human capital is engaged in R&D for reducing the need for codified and knowledge and skill during operation and developing intuitive interface for innate abilities.
- Growth of R&D investment is leading to reduction of role of humans in production and usages—resulting in higher quality and lower cost.
- There has been exponential growth in R&D investment for producing ideas for maintaining same level of effect on quality and cost improvement—as big ideas are getting harder to find.
- R&D is experiencing diminishing return.
- Human free production runs the risk of slowing down innovation due to lack of learning during operation.
- Automation of Innate abilities is highly expensive. For example, attempt of automating of innate abilities of human driver has already incurred R&D cost to above $80 billion.

An analysis found research productivity for firms fell, on average, about 10% per year. It would take 15 times more researchers today than it did 30 years ago to produce the same rate of economic growth.

Specifically, the number of Americans engaged in R&D has jumped by more than twentyfold since 1930 while their collective productivity has dropped by a factor of 41.

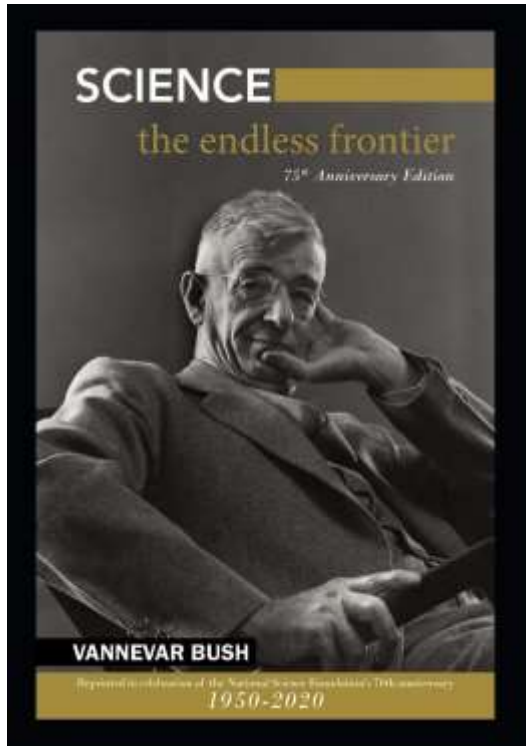
> "It's getting harder and harder to make new ideas, and the economy is more or less compensating for that. The only way we've been able to roughly maintain growth is to throw more and more scientists at it."
>
> — Nicholas Bloom

Forming and Understanding Market for Leveraging Ideas:

- In ancient philosophical writings, Carl Marks noted repeated observations—human beings have inherent tendency of producing and pursuing ideas to recreate the world.
- As economic value creation primarily depends on three factors—such as Y=F(natural resources, labor, ideas)– founding principles of market economy focused on capitalizing ideas for creating increasing wealth from limited natural resources and labor.
- Hence, market economy offered freedom of ownership of capital and pursing profit making competition for offering higher quality at less cost out of ideas
- It led to the formation of market of ideas; one of the notable developments has been granting patents, and allowing their trades. However, in most of the cases, idea supply, demand and trade take places in embedded or implicit form.
- However, Prof. Schumpeter noted that major ideas grow as waves causing destruction to incumbent products, jobs, and firms—giving birth to creative destruction phenomenon.
- This creative destruction also leads to wealth annihilation—due to loss of market value of assets, IPs, and shares. Hence, wealth formation and annihilation are coupled in idea led wealth creation in the market economy.

Science and Engineering For Scalability of Ideas:

- Freedom of competition to profit from ideas is not good enough for creating increasing wealth.
- During the preindustrial stage, wealth creation out of ideas was limited due to early saturation—for reliance on the art form of knowledge, tinkering and craftsmanship.
- Hence, market economy focused on transferring art into science, tinkering into systematic investigation, and craftsmanship into engineering.
- Therefore, for scaling up wealth creation out of ideas, smart market economy practitioners gave emphasis on Science and Technology R&D.
- Early demonstration of the role of R&D to scale up ideas during the dawn of the 20th century also encouraged public funding in R&D—giving birth to USA's large national innovation system, comprising of national laboratories, university R&D programs, R&D tax credits, collaborative R&D projects between public and private institutions, and venture capital fund .
- However, there is no natural correlation between R&D and wealth creation out of ideas in competitive market—due to the episodic nature.



A Section of Dr. Vannevar Bush's Report to the US President:

"**Science and Jobs**

- One of our hopes is that after the war there will be full employment, and that the production of goods and services will serve to raise our **standard of living**. We do not know yet how we shall reach that goal, but it is certain that it can be achieved only by releasing the full **creative** and productive energies of the American people.
- Surely we will not get there by standing still, merely by ***making the same things we made before and selling them at the same or higher prices***. We will not get ahead in international trade unless we **offer new and more attractive and cheaper products**.
- Where will these new products come from? How will we find ways to make **better products at lower cost**? The answer is clear. There must be **a stream of new scientific knowledge** to turn the wheels of private and public enterprise. There must be plenty of men and women trained in science and technology for upon them depend both the creation of new knowledge and its application to *practical purposes*.
- More and better scientific research is essential to the achievement of our goal of full employment."

https://www.nsf.gov/od/lpa/nsf50/vbush1945.htm

Creating opportunity of applying scientific knowledge to practical purposes is itself a tough call—particularly, in a competitive market.

Science, Market and Wealth Creation—Bumpy Relation

- Freedom of competition offered by market economy—due to the belief in invisible hands– is vital for growing great ideas, as embryonic form of beginning demands a flow of ideas for turning latent potential into quality advancement and cost reduction.
- On the other hand, science is needed for supporting the creation of flow of ideas.
- However, competition in pursuing ideas form rolling waves--generating pervasive uncertainties in profiting from ideas.
- Furthermore, the cumulative effect of incremental flow of ideas lead to growing wave, resulting in price setting capability for attaining the ability of offering the best quality at the least cost.
- As a result, the scalability of ideas out of science leads to formation of imperfect market—consequently, weakening the competition.
- However, the formation of next wave breaks the monopoly and strengthen the invisible hand.

Perfect market: a theoretical market in which buyers and sellers are so numerous and well informed that monopoly is absent and market prices cannot be manipulated—everybody is taker of the price set by the equilibrium of supply and demand of commodity products.

Imperfect market: Price setting capability of smart firm/s for making profit and compelling competitors to take lower price and incur loss.

The market's goods and services are heterogeneous or differentiated. This means that firms can charge higher prices as their goods and services are perceived as better.

Measuring and Increasing Economic Value:

- Until you can measure—you can't set target, monitor progress, control process, and find better means.
- Consumer surplus (CS) is an economic measurement of consumer benefits. A consumer surplus happens when the price that consumers pay for a product or service is less than the price they're willing to pay.
- In a simple form, consumer surplus is the difference between the willingness to pay and the actual price paid for.
- On the other hand, producer surplus (PS) is the difference between the price charged and cost incurred. Not always positive though. Particularly, start-ups begin the journey at loss.
- Both consumer and producer surpluses could be increased by ideas—leading to higher quality and lower cost.
- Hence, ideas create economic incentives for both the consumers and producers.
- Summation of CS and PS could be used as indictor of wealth creation out of ideas—W=CS+PS.
- Therefore, producers keep competing for ideas in offering higher quality products at decreasing price.

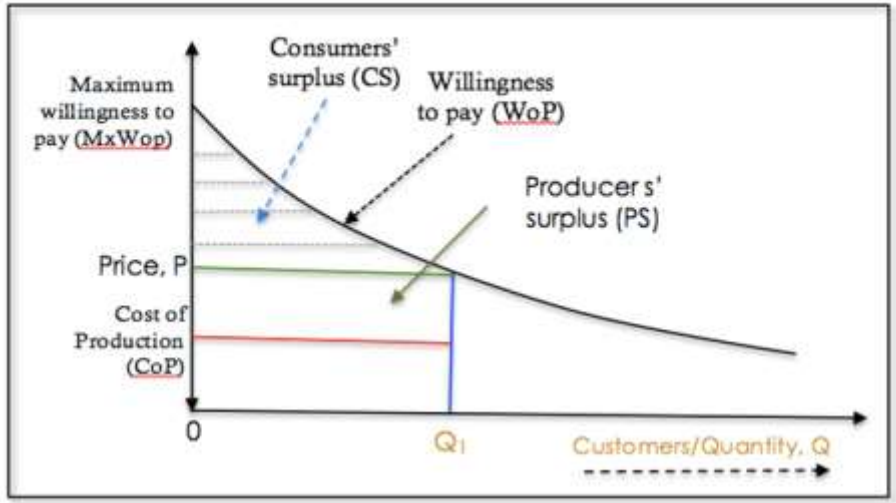


Figure 1: Concept of consumer and producer surpluses

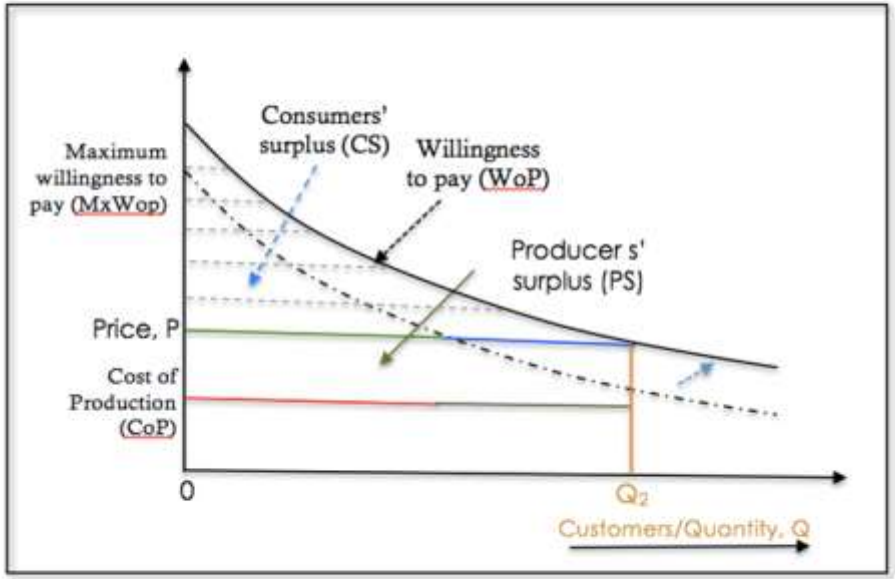


Figure 2: Consumer and producer surpluses increase simultaneously

Getting Jobs Done better at Less Cost—Example of Microwave Oven

Quick heating has been a great convenience for benefiting from food preservation through freezing, and saving time in having hot food.

But the idea of 750 lb machine requiring 3kw energy and plumbing emerged in a primitive form at a price of $5000 in 1946—creating a very little consumer and producer surpluses. Perhaps, producer was incurring a loss, despite charging a staggering price as hardly there were customers—resulting in very limited scale advantage.

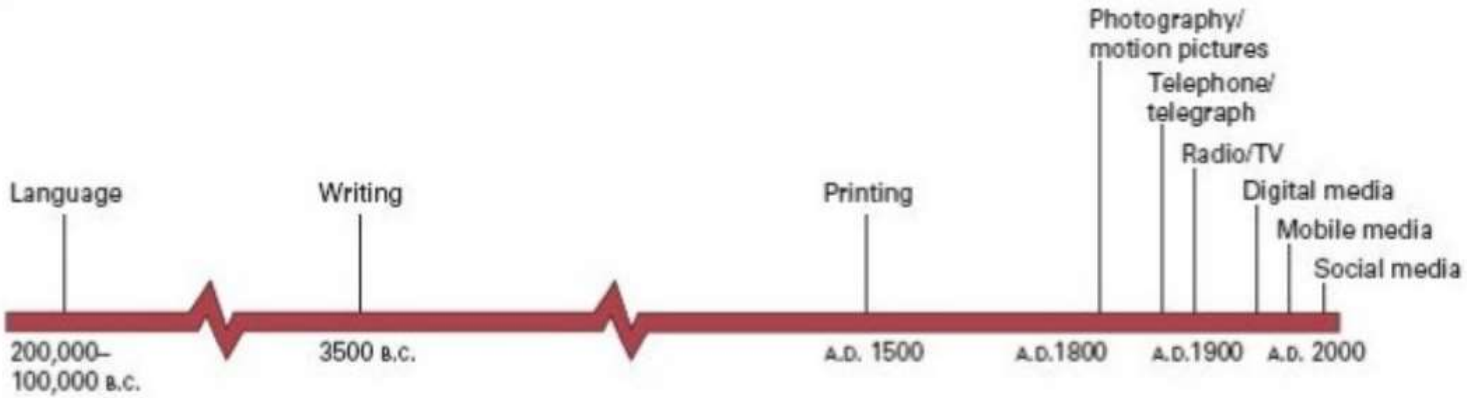
Hence, this idea failed to produce much economic value.

However, profit making possibility led to the further scientific investigation--particularly by the Japanese, led by Sharp corporation. This led to much smaller magnetron and Sharp Corporation's introduction of the first microwave oven with a turntable between 1964 and 1966.

Subsequent journey of continued refinement led to smaller less costly model—leading to $100 by the end of the twentieth century.

This idea has been showing an unstoppable diffusion—increasingly creating economic value by contributing to both consumer and producer surpluses.

In getting communication job done—evolving technology cores, reinventions, and innovations



This chapter steps back and takes a broad view of media history, emphasizing major events and general trends.

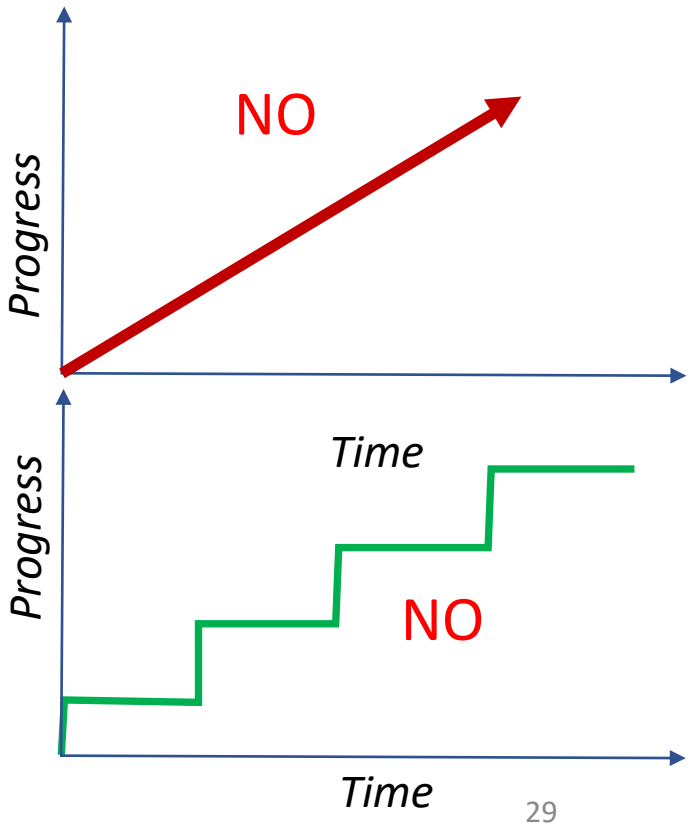
Seven milestones in the development of human communication: printing, telegraph and telephone, photography and motion pictures, radio and television, digital media, mobile media, and social media

https://www.slideshare.net/valeriebello/chapter-3-historical-and-cultural-context-14331917

But the evolution did not happen as linear progression or staircase steps.

Not random sparks either.

Instead, it happened in an episodic form—as a reoccurring pattern.



Pursuing invention and innovation--have we come to the end?

- Since 1899, we have been repeating a famous quote: "everything that can be invented has been invented."
- But since then, we have been witnessing a flow of ideas in the form of new products or advancement of already invented products. Despite it, we repeatedly recall that quote and ask ourselves: is there anything left to invent? what are great ideas? or have we reached the end of improving existing inventions and innovations?
- Our inventive thinking or idea generation is not a random process for facing the Eureka moment. We are driven by an endless urge of getting our jobs done better, at less cost. In doing so, we are after ideas for inventing means and keep improving them so that we can innovate and deploy enhanced products in helping us getting jobs done better.
- As there is no end of our desire of getting jobs done better, human beings will be always after ideas--whether for inventing new means or improving existing ones. Hence, we are after the endless journey of improving our quality of living standards out of ideas.
- We need to focus on getting our jobs done to figure our limitation of the already attained invention and innovation progress, and to systematically generate ideas--as opposed to waiting for random emergence of Eureka moment.

In pursuit of great ideas: There are no great ideas?
All of them emerged in primitive forms, and many people overlooked or rejected them. Starting from digital camera, smartphone, transistor to the photocopier, the list goes on. Their embryonic emergence demands a flow of ideas to grow as great

Our approach of understanding how ideas are shaped into wealth or waste in a competitive market, and taking rational decisions:

1. We analyse a body of observations in detecting patterns which will lead to synthetization of general principles, forming a model (inductive), in establishing cause-effect relations.
2. We will apply that model to derive or predict likely future due to the change of candidate variables (deductive).
3. Upon doing that we will be recommending change or actions or decisions for having expected outcome.