

# Introduction to Emerging Technologies

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## EMERGING TECHNOLOGY

Emerging Technology is innovative technologies that are at some stage of the 'development process'. They are either currently under development, have been recently developed, have been developed and are at the very early stages of adoption, or the technology will be developed in the near future.

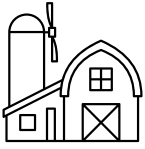

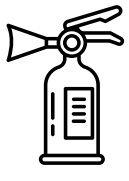
## DISRUPTIVE TECHNOLOGY

Disruptive technology is a technology that has either created opportunities or challenges for different markets, industries and businesses. It changes the way how current technologies are being viewed, used, and how they're functioning. Disruptive technology is getting a reputation for replacing either older technologies, replacing jobs, or they're altering some parts of economic-society- for better or worse.

## IS THERE A DIFFERENCE?

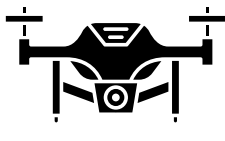
The notable difference between Emerging Technology and Disruptive Technology is that ET refers to technology that isn't accessible to the general public quite yet. It's still in its infancy stages, it's being developed, or it is at the very early stages of adoption. Disruptive Technologies specifically refer to technology that disrupts existing business, markets and industries. At some point in time, all disruptive technologies were once emerging technologies.

## EXAMPLES OF EMERGING TECHNOLOGY

- **Floating Farms:** Floating farms involve building huge complexes that sit on the surface of the ocean. They can be moved to where they're needed and would make use of areas that wouldn't be used for anything else. "This will reduce transport costs, it will help to move farms to regions that have suffered from disasters, helping food to get up and running much faster than would otherwise be possible" (TopFives, 2021). Not to mention, that the idea of floating farms is a creative way to solve possible food shortages, which could begin to be an issue as the world's population only continues to grow.  

- **Self-Healing Concrete:** This emergent technology (which is still in the research stage) is designed to imitate the automatic healing of body wounds by the secretion of an adhesive liquid that will be dispensed (as capsules) into the concrete mix. The idea is to add "bacterial spores to the concrete mix along with a food source like yeast extract so that when the 'crack' happens, the bacteria is exposed to oxygen and water and it will begin to consume the food and multiply, which will produce calcium carbonate or limestone as a by-product" which will help to seal the 'crack.' (TopFives, 2021).  

- **Sound-Wave Fire Extinguishers:** This is an emergent technology because it's actually quite complicated to replicate on a bigger scale so it's still at the research stage. The idea behind the sound extinguisher is that it "generates sound from a typical stereo speaker and amplifies that sound through something called a collimator - a funnel that shoots sound waves at the fire" (Xploration Station, 2017). In theory, it's a smart way to put out fires as we have a water shortage, and we also don't want to dump foam made up of chemicals on the ground because it's not ideal for the health of the environment.  


## EXAMPLES OF DISRUPTIVE TECHNOLOGY

- **3D Printing:** 3D printing is a process of making three-dimensional objects from a digital file. It can create a wide range of objects that are both simple and complex. 3D printers can make "anything from simple plastic objects, to complex metal pieces. They can print things like small toys and useful gadgets all the way up to full-scale architectural models" (There You Have It 3D, n.d.)  

- **Drones:** Drones are machine aircrafts that can either be controlled remotely by a person or by a computer program. "They can be used for a variety of purposes such as aerial photography and videography, surveying and mapping, delivering goods, and military operations. They come in a wide range of sizes and can fly for long periods of time and many of them are equipped with sensors and cameras that provide real-time information and imagery." (Seotechwriter, 2022).  

- **Airbnb:** Airbnb is a website that enables people to list, find, and rent vacation homes, apartments and other types of living spaces. Essentially it's a platform that connects property owners and renters. Property owners can list their homes on the website and renters can search for and book those properties that are available to rent. The website provides information like price, location, and types of properties and it also includes reviews from previous renters. Airbnb is beginning to be more of a DT because of the housing shortages and rental property shortages being seen across the country.  


# The Diffusion of Innovations

Everett Rogers Theory

## SO, HOW DO PEOPLE DECIDE ON EMERGING TECHNOLOGIES?

In 1962, sociologist and communications theorist Everett Rogers developed a theory on how new ideas, practices, or technologies are adopted into the social systems they are introduced to. The Diffusion of Innovations Theory explains the process of how a new practice or technology, for example on-line learning or e-commerce, is adopted into use by examining why individuals and groups behave the way they do when encountering a new innovation or emerging technology.

The goal of an innovation, or rather the innovation's creator, is for that innovation to be diffused throughout an industry, consumer market or social system, so that it becomes a part of it. For example, when the Interact banking and digital payment systems were first introduced in Canada in the late 1980s/early 1990s, few businesses, especially small ones, accepted that form of payment. A little more than 30 years later, there are businesses that do not accept any other form of payment than digital.

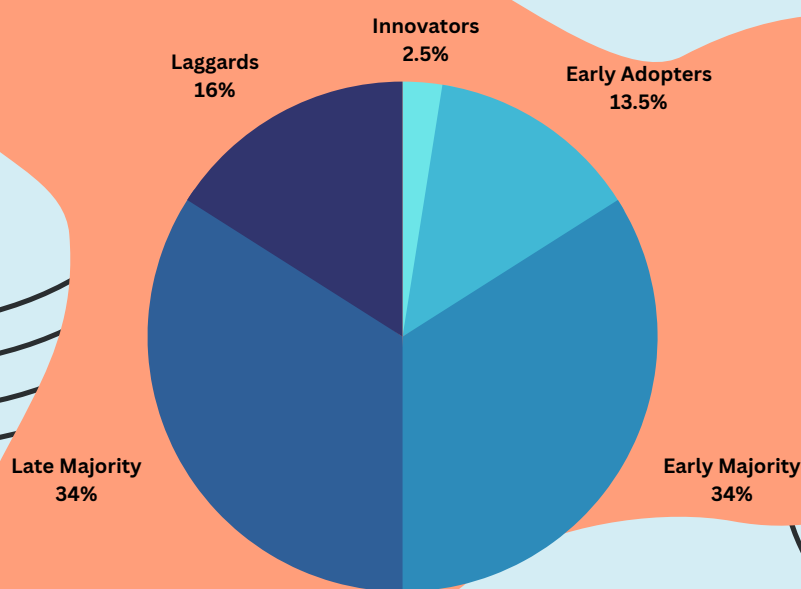
Communication is the avenue through which adoption of an innovation is achieved.

## COMMUNICATION CHANNELS

The primary means of introducing a new innovation to society is done via two main channels of communication: mass media and interpersonal relationships.

**Mass Media** - Information about a new innovation is spread by news stories, advertising and marketing campaigns, educational information and entertainment media. The communication here is a direct, one-way dissemination of information from the developers of the innovation (senders) to the public or targeted market (receivers). Whether it is the placement of a new product in a movie - do you remember the strangely rounded Ford Taurus used in RoboCop (1987)? - or the latest slick Apple campaign, mass media is most important in spreading the initial awareness of a new technology, design or idea.

**Interpersonal Relations** - This is the most critical communication channel in the adoption of new technologies. Unlike the mass media channel, the exchange of information involves a back and forth between individuals that can gradually influence and change an individual's knowledge and perception of a new innovation as well as impact their decision on whether to adopt or reject it (Singer, 2020). How often have you sat down with a friend or relative and discussed the merits, and negatives, of a new piece of technology one of you has acquired? Being able to talk with someone about their experience with their new iPadPro, drone, or 3D-printer, and perhaps use the technology, gives you an opportunity to confirm or refute expectations you may have had and ultimately, whether you will adopt that technology for yourself.



## ADOPTION CATEGORIES

Rogers identified five adopter cohorts defined by both when and why they adopt new technologies.

**Innovators:** Individuals who have the financial capital, technological knowledge and comfort with risk-taking will adopt a new innovation first, prior to any testing or seeking other's opinions. They communicate with other innovators to bring forward new ideas to their peer groups and networks.

**Early Adoption:** Close on the heels of the Innovators, Early Adopters have seen that the product has been well received by the first group and now act as evaluators and role models for adopting the technology. They are usually well-informed about the technology and their opinion is respected by others as considered and sound. This is where the mass media channel is most evident.

**Early Majority:** As the technology becomes more mainstream, the Early Majority gets involved. While they do not lead the adoption, they are influenced by both the mass media and interpersonal communication channels and hold a critical role in spreading the adoption of a new technology further.

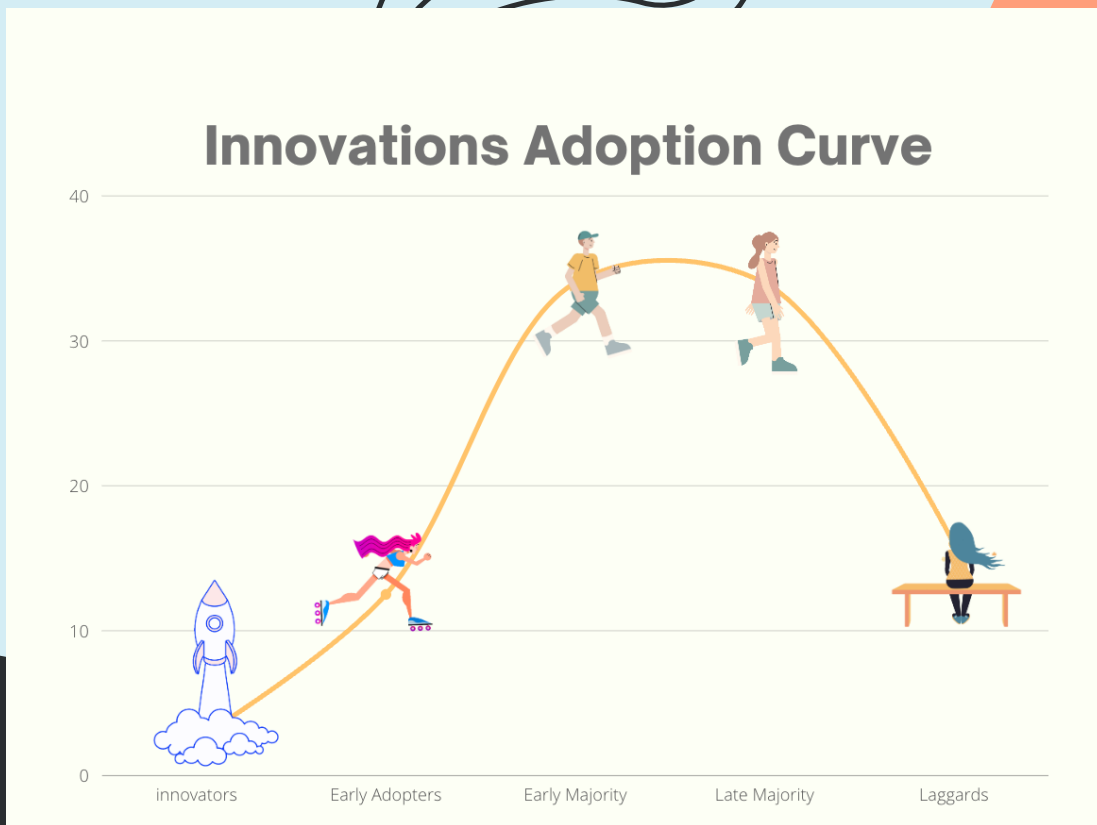
**Late Majority:** This cohort adopts the technology after it has become widely accepted by others and proven to be successful. Cost is also a factor here, where a new technology may not be adopted earlier due to an unwillingness to spend limited capital on an unproven product. New technologies are usually lower in cost the longer they remain on the market.

**Laggards:** These are the individuals that are the last to adopt new technology, if at all. It may be due to a lack of resources or interest. Typically, they are resistant to change and will interact with like-minded individuals, limiting exposure to new innovations.

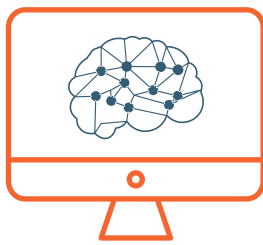
# Diffusion has a Pace

## THE ADOPTION CURVE

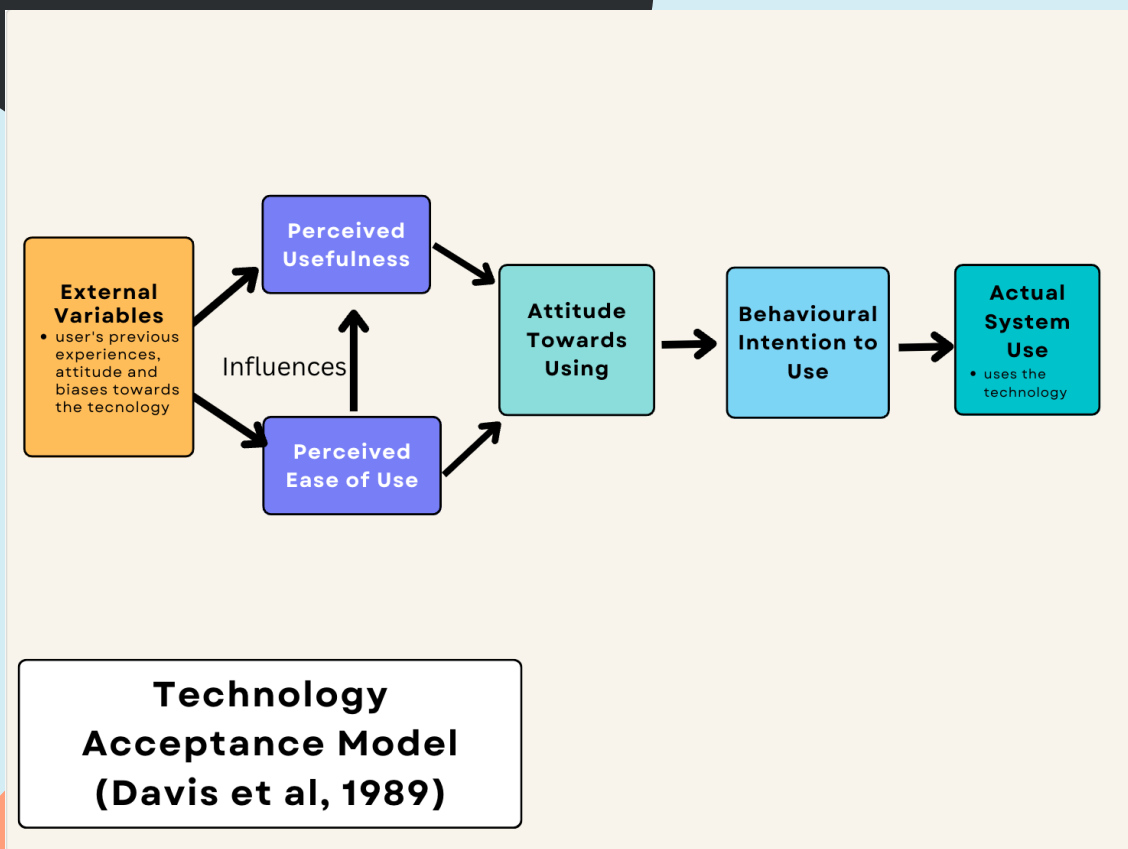
Using a bell curve to plot this out, Rogers was able to show the approximate rate of innovation adoption, a critical aspect for marketing and development of technologies. It is important to note that an individual may fall into different categories depending on multiple factors depending on the innovation being introduced, their background, economic status. Education, age, sex, geographic location and so on. For example, an artist might be an early adopter of digital art software, but a laggard when it comes to e-banking.



## THE TECHNOLOGY ACCEPTANCE MODEL



The Technology Acceptance Model (TAM) developed by Fred Davis, Richard Bagozzi and Paul Warshaw (1989) focuses on the adoption of technology in the workplace. They pinpointed two main reasons that impact an individual user's willingness to adopt a new technology: perceived ease of use and perceived usefulness.



## MORE ON THE TAM THEORY

The studies the model is based on were conducted when desktop computers were starting to be introduced to the workplace on a larger scale and users were reluctant to shift from the previous way of doing things to the new, for example, paper correspondence rather than electronic mail. In particular, the easier a new technology was perceived to be to use, would influence its perceived usefulness.

These two factors then result in a changed attitude towards the technology, which would then influence behaviour and hopefully, result in the technology being adopted and used.

The theory is limited in that it focuses on the perceptions of the users, which would be different for every individual and may not always be rational. My mother was initially reluctant to use our home computer to write her papers because the keyboard was subtly different from that of a typewriter and it slowed down her typing speed.

# Variables that May Affect How We Adopt and Implement Technology

## IN 2000,

Davis and Venkatesh (Allen, 2020) extended the TAM model to include additional variables that affected perceived usefulness and ease of use, for example, **social influence**. In addition, relevancy to the **job and support/commitment of administration** could also have an impact on the adoption of new technologies.

## SOCIAL INFLUENCE

Social influence can cause us to adopt a behaviour, idea, or practice in order to impress or attract attention from others. For example, when I was in high school having a Guess purse or a Lululemon hoodie was a ticket to belonging. While I didn't use a purse, so many of the girls had them, and I wanted to feel like I belonged. My motivation to save up money to buy a purse and beg my parents for that hoodie had nothing to do with its usefulness; it had everything to do with my ability to stay up-to-date and current with what was "cool". I was influenced to adopt these products.

I found the same thing happened in my first year of university. If you were serious about school, you had a Macbook Pro laptop. Another variable that the TAM theory doesn't mention is that sometimes the motivation to adopt new technologies, is around caring about what others think and about how you are being perceived.



## JOB RELEVANCY & ADMINISTRATIVE SUPPORT

In the workplace, whether a technology is relevant to your job can have a strong impact on whether you are willing to adopt and implement it. In the early years of my teaching career, computers were largely used for word processing and research. Smartboards were installed and my board had invested in a learning management system (D2L), but training sessions were either informally provided by peers who had attended an afternoon workshop 5 years prior or non-existent. Administration was constantly pressuring teaching staff to develop online resources, websites, blogs, and so on with no support or time provided to learn and develop the skills needed to effectively use the technology, both hardware and software, that were provided. There was extensive pushback on using these technologies as they were perceived as not being relevant to our jobs in that we could effectively engage students without using them, and we felt there was no support from administration to enable us to be successful in using them effectively.

As a member of both the early adopter and early majority cohorts when it came to new digital technologies, I was surprised at how resistant I was to adoption in these instances. It wasn't until I secured the opportunity to learn how to use D2L over the course of a semester with administrative and peer support, that I was able to fully accept the technologies, rather than grudgingly, and implement them effectively into my teaching practice.

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