

# Handout 3: Is Technology Predictable?

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Recall the definition of technological determinism.

**Technological determinism (TD):** In a sufficiently liberal society with a free market, technologies will **fully** determine how societies and people will behave. Once we are sufficiently aware of certain technologies and have the *means* to make use of them, we cannot resist using them and these technologies coerce profound cultural changes, including determining our economic systems and social organization.

We have already looked at some criticisms of TD. One such set of criticisms contends that TD is false because environmental, cultural, and political factors play a role in whether certain technologies will be used, how certain technologies will be used, and what kinds of social, political, and cultural effects these technologies will have. TD stated in this extreme way seems false.

Recall too the definition of social constructivism:

**Social constructionism (SD):** Ultimately people, not machines, determine history<sup>i</sup> and they do this by freely choosing what technologies they wish to use. Technologies do not coerce human beings to behave in one way rather than another. Social change lies not principally with the technologies (or the engineers and inventors who make these technologies) but with ideological, economic, and political forces that support and aim to control technological development and investment.<sup>ii</sup>

We briefly noted some criticisms of this view, arguing that technologies do seem to play some kind of determining role in society. Some technologies seem to have a pretty irresistible quality to them (e.g. indoor plumbing, electricity, telephones) and some of these technologies seem to enact or even require certain social changes whether we like it or not.

But let's consider another objection to TD.

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## THE ARGUMENT FROM PREDICTION

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- P1 If TD is true, then we should be able to predict which technologies will emerge with reasonable accuracy.
- P2 We cannot predict which technologies will emerge with any reasonable accuracy.
- C Therefore, TD is false.

With respect to **P1**, the idea is that if certain technologies are irresistible and determine how societies and people will behave, then there must be some way to predict (with reasonable accuracy) which technology will get developed and used by societies. That is, if technology X is introduced to society Y and X has the effect of coercing Y to use X, then we ought to be able to predict that X will get used by Y.

**P2** contends that we cannot predict which technologies will emerge with reasonable accuracy as there are wide array of cultural, political, ethical, and aesthetic forces in play as to which technologies get developed and which ones get used.

Before we consider this argument any further, let's pose the following question:

**Question 1:** How well can we predict which technologies will emerge?

In asking these questions, it will be helpful to give a more precise account of what we mean when we use the word "predict".

FORM OF PROGNOSTICATION	PERSONS INVOLVED	TYPE OF PREDICTION	TIME FRAME	EXAMPLES
Prediction	Inventors, Utopian/Dystopian Writers, Futurologists, Academics	inventions (ideas for new products & processes)	long term	light bulb, telephone, computer
Forecasting	Engineers, Entrepreneurs	innovations (reduction of an idea to its first use) & significant improvements or accessories to technologies	Less than 10 years	improvements on the light bulb and telephone
Projection	Designers, Marketers	diffusion (widespread use in a market) & new styles / models	Less than 3 years	iPhone 3 to iPhone 4

**Table 1.** Adapted from David Nye's *Technology Matters*, p.34 and James Utterbeck's 1994 *Mastering the Dynamics of Innovation*, p.193

Given this clarification of the different forms of prognostication, we can now clarify Question 1:

**Question (Q) 1.1:** How well can we predict which technologies will emerge?

**Q1.2:** How well can we forecast which technologies will emerge?

**Q1.3:** How well can we project which technologies will emerge?

Intuitively, we might contend that prediction would be the least accurate while forecasting and projecting more accurate.

With respect to **Q1.1**, George Wise found **one-third** of 1,500 predictions between 1890 and 1940 were accurate. With respect to forecasting, there are several famous examples of accurate and inaccurate forecasts.

**Example 1 (Moore's Law):** Forecast that computer memory will double every 18 to 24 months. *Accurate.*

**Example 2 (Demographics in the US):** Forecast that population in the US would slowly decrease in the 1950s. *Inaccurate.* Baby Boom!

**Example 3 (Automation):** Forecast in the 1960s that automation technologies would reduce average workweek to less than 25 hours. *Inaccurate!*

**Example 4 (Automobiles & Trolleys):** Forecast that trolley would increase and expensive automobiles would not catch on. *Inaccurate:* advances in engineering and assembly made long-distance transportation possible and automobiles less expensive.

With respect to **projection**, we might adopt the method that whatever people currently want, they will want more of in the future. They will want better phones, better cars, more electricity. However, there are many well-known examples of false projections:



Figure 1: 1958 Ford Edsel Corsair, Wikipedia (CC)

**Example 1 (Ford Edsel):** The Ford Edsel was a mostly conventional car designed in the 1950s (although there were some distinctive design aspects to it), heavily marketed, and so the expectation was that it would sell. *Inaccurate:* failed, costing Ford millions.

**Example 2 (More Electricity, 1960s-1970s):** Utility companies expected increases in consumption in the 1960s. *Inaccurate:* Energy Crises.

In looking at the various examples of prediction, forecasting, and projection, the answer to question 1 appears to be this:

**Question 1:** How well can we predict which technologies will emerge?

**Answer:** We can predict the emergence of technologies to an extent, but our predictions and projections are often wrong.

**CDQ:** What I would like you to do in a group is make a prediction or forecast. State the technology you think will emerge, pick the date it will emerge, and try to explain why you think it will emerge then.

Given this answer, we may ask the follow up question:

**Question 2:** Why is it so difficult to be certain about what will happen?

**ANSWER 1 (PRICE):** Developments in the *means of production* can drive down costs and make technologies that were previously expensive, less expensive. (Conversely, some developments might stall, making other technologies expensive).

Example 1 (Trolley vs. Automobile): See above

Example 2 (Airplanes): An optimistic outlook above advancement in the means of production might lead us to say that *everyone will have an airplane in 2016*. But, airplanes remain expensive.

**ANSWER 2 (IGNORING THE CONSUMER'S WANTS/NEEDS/VALUES):** Consumers play a role in determining what technologies get used and how they get used.

**Example 1 (Videotape Format War: Betamax vs. VHS):** In the 1970s and 1980s, there were two main formats for personal recording: Betamax (produced by Sony) & VHS (produced by JVC). Betamax owned most of the market, its technology was capable of producing better picture quality, and was widely believed to be the *better product*. Projection is that Betamax would continue to dominate the market as they have the superior product, marketing, etc. *Inaccurate.* Betamax only had one-hour playback time, while VHS had



two-hour playback time. Consumers wanted two-hour playback time so that they could record sports events or watch movies at home.

**Example 2 (AT&T Picture Phone):** Early picture phones were developed in Germany in the 1930s. In the 1960s, AT&T developed picturephones for commercial use. However, consumers did not want it for a variety of reasons: (i) *too* expensive (ii) privacy concerns, (iii) no eye-to-eye contact.



Figure 2: 1969 AT&T Picturephone (Wikipedia, CC)

**ANSWER 3 (WHAT'S THIS FOR?):** Inventions are fundamentally new devices and so initially individuals may treat them as curious, strange, and so fail to know *why* they would ever want a given technology and various institutions might be reluctant to incorporate these technologies unless they are strongly compelled to do so. In addition, there is the misperception that what technologies will be incorporated into society is determined by scientists, engineers, and marketers. However, consumers won't use a technology (and so there will be problems with prediction, forecasting, and projection) if they don't see a need for it.

**Example 1 (Telegraph):** Samuel Morse had to spend five years lobbying until the U.S. Congress would pay for a long-distance telegraph line

**Example 2 (Telephone):** Alexander Graham Bell couldn't find investors for his telephone

**Example 3 (Phonograph):** Commercially marketed to deliver lectures, businessmen could use it to dictate letters, tell time, advertisements; but people wanted it to play music

**Example 4 (Personal Computer):** Initial use for the personal computers were for "shut-ins"

**ANSWER 4 (ENVIRONMENT & SYSTEMS):** Once a technology is created, it doesn't live in a vacuum. Rather, it is put into an *environment* and incorporated into a *network of existing technologies*. Despite a technology fulfilling some want or need, it might be rejected for environmental concerns or it might not "fit" into the existing network of technologies

**Example 1 (Great App Bro):** Applications for different smart phones and tablets are created using different programming languages, e.g. iPhone apps are written in Objective C while most android apps are written in Java. So, you might create the best app ever, but if it is written in another language (e.g. Python), you won't be able to distribute it.

**Example 2 (Larger Cars! No!):** Forecasts in the 1970s were that Americans would want larger cars, but increasing concerns about energy shortages led to demand concerning fuel economy. Today there are similar concerns with the increase in gas prices; also, pollution concerns.

**Example 3 (Segway):** Some municipalities ban the use of Segways on sidewalks.

**ANSWER 5: (PATH DEPENDENCY):** Some individuals are overly committed to their product. When a new invention or innovation is present, rather than contributing to its dissemination and development, they "dig in" by trying to manipulate the market or perfect their existing product. This can *slow* down the rate at which certain technologies get developed.

**Example 1 (IBM and personal computers):** IBM: large expensive work-related computers vs. personal computers.

**Example 2 (Photochemical Film vs. Digital Recording):** Directors want to be able to shoot scenes without having to change out film, they want to be able to playback recordings rather than wait for film to be developed, and they want to manipulate film with special effects.

Thus, in short, it is difficult to make predications about what new inventions and innovations will emerge because there are *so many factors* (economic, technological, ethical, environment, practical) and these factors are *interrelated* (complicating the problem of prediction).

With this in mind, let's return to an argument considered earlier:

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In criticizing this argument, we might say object as follows:

**O1:** P2 is false because it is impossible to predict which technologies will emerge.

But this just seems like it is a swing in the opposite direction. Just because it is *extremely difficult* to predict which technologies will emerge and just because the history of technologies is filled with countless examples of false predictions does not mean any of the following:

- (i) trying to predict is pointless,
- (ii) every prediction is equally as good
- (iii) there is no practical or rational criteria involved in making predictions

Instead, what the above seems to reaffirm is that prediction and forecasting are precarious processes about which we cannot be certain.

**CDQ:** Recall earlier that I asked you to predict / forecast the emergence of a specific technology, state when it will emerge, and why you think it will emerge then. Given the five reasons above, tell a story of how your prediction / forecast might turn out to be false. What sort of factors made your technology fail to emerge? You can pick some far fetch ones but also try to pick some likely ones too!

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<sup>i</sup> (1994:227)

<sup>ii</sup> (see 1994:225-7; Mumford 1964).