



EDGE: Wealth Creation Strategies from Doyletech

Why Technology Takes Time to Break Out: Culture's Role in Commercialization



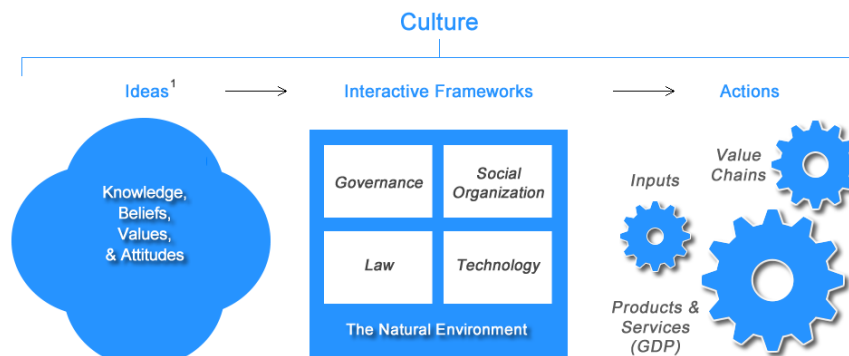
By Dennis Senik, Doyletech Corporation

A recent article, "Why 40-Year-Old Technology Can Sometimes Beat the Cutting Edge,"¹ partially answers the question of why new technology is often bested by the tried and true. The full answer is that new technologies always face an uphill battle against the old.

THE ANSWER LIES IN CULTURE

Culture is simply the sum of how we live and work. It is the learned patterns of behaviour that choreograph our lives. Because technology continually changes how we live and work, it is part and parcel of culture.

The patterns that mould our actions begin with *ideology*: society's prevailing idea of how life ought to be. In fact, culture (below) is the enactment of ideology; it is an imperfect realization of human vision and values, shaped by the hard realities of time and place; influenced by the sway of society's institutions.



¹Collectively, ideas form ideologies. Knowledge includes science; beliefs include religion.

Institutions are powerful; they have their own goals and internal dynamics. Society's four major institutions are: *governance*, *social organization* (e.g. families, companies, and universities), *technology*, and *law*. Governance, the overriding institution, resolves conflicting frameworks in the common interest – all subject to the limits imposed by the natural environment.

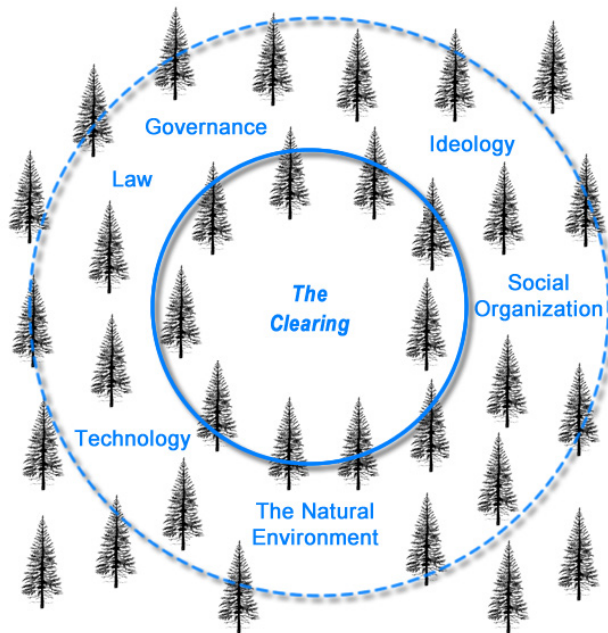
The *value chains* that apply technology to make our goods and services are compelled to align with these interactive frameworks in order to work efficiently and effectively. New value chains – if they are to succeed – must find a small clearing in this thick web of well-established connections to build a new presence.

¹ www.linkedin.com/pulse/why-40-year-old-technology-can-sometimes-beat-cutting-dylan-tweneey

THE CLEARING METAPHOR

The *clearing* represents society's limited freedom of action within the status quo to change deeply ingrained patterns of living and working. But there are always a venturesome few among us (about 1 in 40) who will defy convention to seize new possibilities: the *innovators*. If all goes well, it takes about twenty years for innovative technologies to spread beyond this initial clearing. During this time, pioneering producers master the demands of real world applications and innovative users learn what products can do. But wider adoption requires enlarging the clearing. Quite literally, the surrounding forest has to be cut back.

The *clearing*² is the small space (below) encircled by the solid blue line of established practice, 'buttressed' by institutional arrangements. The dotted blue line represents the much larger realm of technology's *potential* applications – if institutional frameworks adjust to a new way of doing things.



Doyletech Corporation applied these ideas to the *Wireless Technology Roadmap*³: an industry analysis for the Information and Communications Technology Council of Canada. We mapped out the skills that industry would need a decade hence: guided by the realities of culture and the clearing metaphor.

Canadian cellular service had begun in 1985. But it had been successfully piloted forty years earlier! Why had wireless technology taken 40 years to break out?

CELLULAR TECHNOLOGY VS. A FOREST OF INSTITUTIONAL CONSTRAINTS

In 1946, AT&T launched mobile radio telephony (essentially, a telephone in a car). By 1948, this pilot service was available in almost 100 U.S. cities and highway corridors. Innovative users included utilities, truck fleet operators, and reporters. Although vacuum tube technology required putting an 80-pound, suitcase-size electronics package in the trunk, customers loved it.

But in spite of this success, both AT&T and the telephone regulator, the Federal Communications Commission (FCC) hesitated. AT&T enjoyed a fat monopoly on landline telephones; it saw cellphones as an expensive sideshow that would require a big infrastructure investment.

The FCC was guided by ideology. Created in the depths of the great depression as part of President Roosevelt's 'New Deal,' it sought to use radio spectrum to serve the needs of the many: e.g., public broadcasting and emergency services, not a few 'rich' people. It decided to allocate a limited number of frequencies. This ensured that it would indeed be expensive: \$15 monthly, plus 30 to 40 cents per local call. (The average wage was \$300/month.) 'Service' was limited; in New York, 2,000 subscribers shared just three channels and waited 30 minutes to place a call.

But the technological constraints on cramming more calls into a limited number of frequencies were gradually resolved. Cellular systems do this by reusing the same frequencies over and over again with multiple short-range transmitters spread throughout a city in a grid pattern. As callers drive about, their radio link is handed off from one cell on the grid to the next. However, it wasn't until the 1960s that computers were applied to automate this juggling act.

Electronics advanced too. As bulky vacuum tubes were replaced, first by tiny transistors and then by even-smaller integrated circuits, it became possible to make a truly mobile handheld

² A concept coined by Philosopher Herbert Dreyfus, University of California.

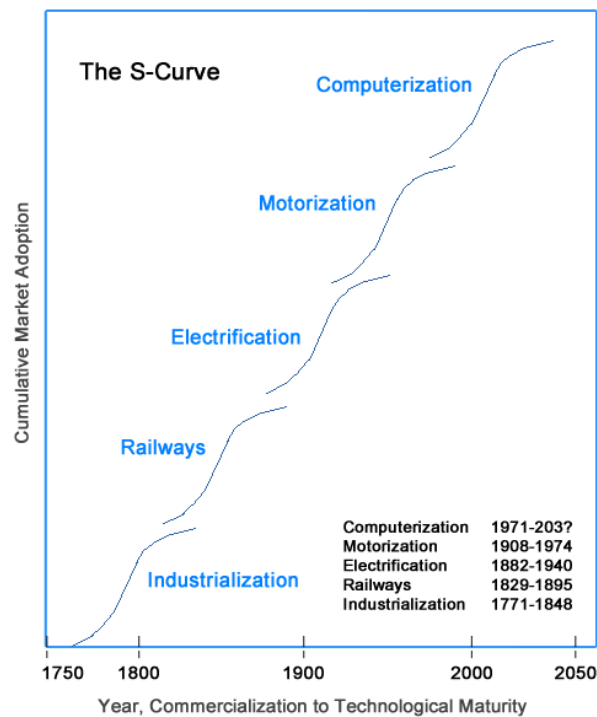
³ http://www.ictc-ctic.ca/wp-content/uploads/2012/06/ICTC_WirelessTRM_EN_03-07.pdf.

phone: Motorola succeeded in 1975. By 1977, AT&T had tested a prototype cellular system, subsequently authorized by the FCC in 1982; and Ameritech began the first commercial service a year later in Chicago.

By 1987, cellphone growth had outstripped network capacity. But the FCC fudged on providing additional spectrum. Seeking to stimulate innovation to carry more phone calls with limited radio frequencies, they allowed 'competing' (incompatible) transmission formats. In contrast, Europe developed a common standard to resolve such incompatibilities. The impact of a global standard on market penetration was huge. By 2005, 80 percent of European users carried cellphones vs. only 50 percent in the U.S.

THE BOTTOM LINE

Economics research shows that cutting edge technologies *always* take about two generations to win widespread adoption. Market penetration follows a highly regular pattern: the *s-curve* (below). Its connection with human life span is no coincidence; two generations mark society's 'speed limit' in adopting major change, the time it takes for new ideas to be enacted as culture – requiring significant renovations to the established institutional framework.



EDGE BY DOYLETECH CORPORATION

is a series of articles that explore how technology is reshaping the economy and serves to better inform decision making in business and government.

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