Technology Generalization is the Rule: A Study

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Abstract

This paper proposes to test Peter Drucker's hypothesis from his 1999 book "Management Challenges for the 21st Century" that the assumption that 'technologies and end-users are fixed and given' is incorrect in the current era of business. To use a statistical analogy, this hypothesis could be referred to as technology generalization. This hypothesis will be tested by analyzing two information technologies that are up-and-coming and tracing their roots to determine if they are still primarily utilized in the industry for which they were developed or if their uses have extended to new industries and applications. Examples and recent applications where these information technologies are having an impact on businesses are cited.

Keywords: Drucker, information technology, generalization, innovation, business

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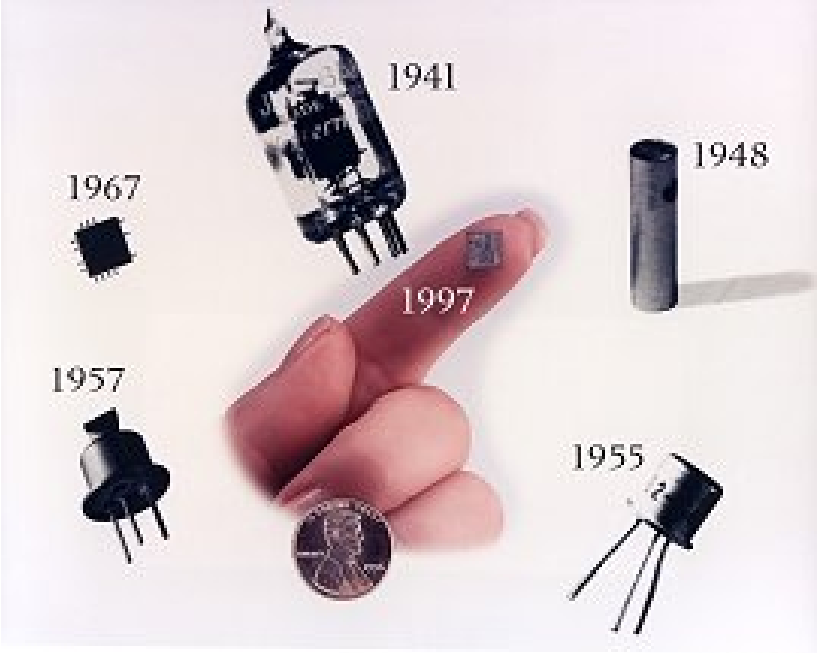
Peter Drucker is considered "the major management and business thinker of the century" (Crainer & Dearlove, 2003). His writings (a sample- The Practice of Management, 1954; Managing for Results, 1964; The Effective Executive, 1966; The Age of Discontinuity, 1969; Management Challenges for the 21st Century, 1999) and thoughts have proven to be both prophetic and practical. His fourth hypothesis, from Management Challenges for the 21st Century (1999) that 'technologies and end-users are fixed and given' is incorrect in the current era of business, will be tested in this study. To use a statistical analogy, this hypothesis could be referred to as technology generalization. This hypothesis will be tested by analyzing two information technologies that are up-and-coming (see below- includes Radio Frequency Identification and Bioinformatics) and tracing their roots to determine if they are still primarily utilized in the industry and by users for which they were developed for or if their uses have extended to new industries, applications and/or users.

Drucker gives as an example the transistor which was developed by John Bardeen, Walter Brattain and William Shockley in December 1947, while the three were members of the technical staff at Bell Laboratories in Murray Hill, NJ (website- http://www.bellsystemmemorial.com and see Figure 1 below). Although these men were awarded the Nobel Prize in physics in 1956, the transistor technology (US Patent #02569347) was sold very cheaply by Bell Labs for the paltry price of $25,000 (Drucker, 1999). Even though this technology was developed for the telecommunications industry it found wider uses in other industries particularly the consumer and industrial electronics

industries. Transistors are now used in millions of products (e.g., radios, microprocessors, computer chips, sensors, etc.) that, in many cases, have absolutely nothing to do with telecommunications and the most typical user is a consumer with little or no telecommunications experience (e.g., such as person turning on their AM/FM Radio to listen to their favorite sports team). This would then obviously support Drucker's hypothesis that in the current era of business that the original purpose of a technology will quickly diversify to include new and innovative uses within a very short period of time.

Figure 1: Transistor History (www.bellsystemmemorial.com)



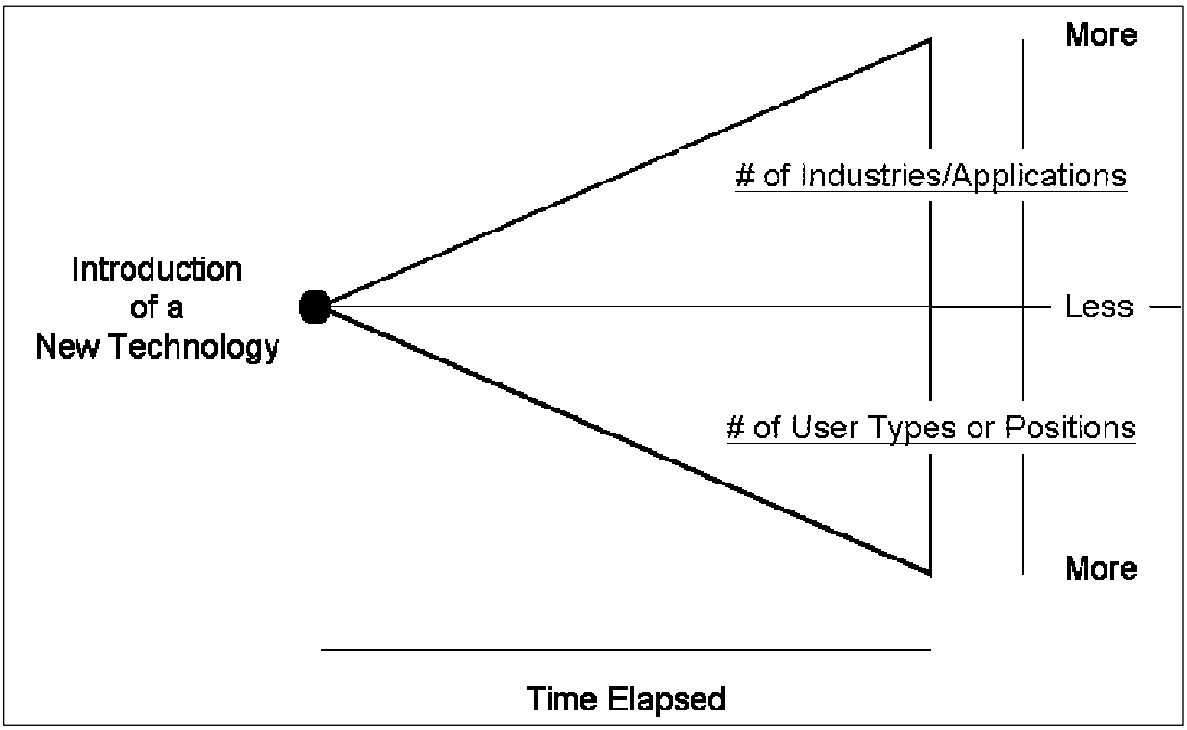
The examples of the information technologies that will be described in the paper are:

> Radio Frequency Identification (RFID)- "While they've been talked about a lot, RFID tags have yet to appear in a big way in the supply chain. Wal-Mart is making it happen: All its suppliers must use the tags for pallets and cases of merchandise by 2005." (Pescovitz, 2003)
>
> Bioinformatics- "Researchers, such as those at IBM Life Sciences, are finally getting a handle on building complex protein models to aid in drug discovery. The new, computationally accurate models mean that potential drugs can be identified more quickly and stand a better chance of working." (Pescovitz, 2003)

Methodology

This paper proposes to test Peter Drucker's hypothesis from his 1999 book "Management Challenges for the 21st Century" that the assumption that 'technologies and end-users are fixed and given' is incorrect in the current era of business. This hypothesis will be tested by analyzing two information technologies that are fairly common now and tracing their roots to determine if they are still primarily utilized in the industry or for which they were developed or still being used primarily for the end-user group it was developed to serve. Figure 2 gives a model to describe the expected 'diversification' of the number of industries/applications and end-user types and positions that should occur over a period of time.

Figure 2: Model for Technology Generalization



Evidence will be collected from documented uses and applications that have been found in various media sources, both print and electronic forms. Also, new and innovative products/applications/uses that are available will be listed to serve as support for Drucker's hypothesis.

The information technologies that were selected were found in the magazine Business 2.0 list of the "10 Technologies to Watch in 2004". The researcher selected RFID and Bioinformatics which were under the Supply Chain and Medicine categories respectfully. The 2003 article was used as the researcher wanted to use technologies that had matured recently and had some time to be disseminated to other diverse industries.

Results

The two cases that were analyzed are found below:

Case #1- RFID

RFID is described by the Automatic I.D. News as "basically a form of labeling where electronic labels or tags are programmed with unique information and attached to objects that need to be identified or tracked, such as pallets, vehicles, automated guided vehicles, or animals" (Anonymous, 1999). The commercial application of this technology was developed in the 1960s as electronic article surveillance (EAS) equipment to counter theft and in the 1970s was being utilized for transportation purposes such as toll roads (Landt & Catlin, 2001). In 1999, RFID was being used for "transportation (vehicle and container ID), toll booth collection, security (access control), automated manufacturing and animal tagging" purposes and "automated storage and retrieval (AS/RS), tool identification, personnel monitoring, package and baggage sorting, vehicle monitoring and pallet identification" (Anonymous, 1999). Currently, new applications include "a low-cost radio frequency identification (RFID) tag and the data infrastructure needed to support it... the Electronic Product Code, or EPC" (Shulman, 2002) which could compete with the Universal Product Code (UPC) on most consumer products, library book check-out systems (Lichtenburg, 2004) and military tactical and logistic tracking purposes (Estevez & Geary, 2004). There is even some discussion about using RFID for medical and pharmaceutical purposes in the near future. It is expected that RFID applications will continue to explode over the next ten years. In an article in Intellectual Property & Technology Law Journal, Bednarek and Ineichen

suggest that “RFID (radio frequency identification) tags will be more ubiquitous than bar codes by the end of the decade. Most ‘things’ will be able to report their characteristics, status and location to the network” (2004).

Case #2- Bioinformatics

Bioinformatics technologies are described by an Industry Week article as “the application of information technology tools such as statistical software, graphics simulation, algorithms and database management for consistently organizing, accessing, processing and integrating data from different sources in a biology-based field” (2004). It appears that the term first came about in the mid-90s (Richon, 2004), some of the first integration between biology and information technology came about through the development of the National Center for Biotechnology Information (NCBI) in 1988 at the National Institutes of Health (http://www.ncbi.nlm.nih.gov/). Its stated goals are to serve as a “national resource for molecular biology information, NCBI creates public databases, conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information - all for the better understanding of molecular processes affecting human health and disease.”

Bioinformatics are currently being applied not only for its original purpose of determining the genetic indicators or predictors of diseases to helping in the development of state-of-the-art pharmaceutical products (Quere, 2003; Bialojan & Schuler, 2003), they are also leading to changes in processes and procedures due to the increasing productivity

and efficiencies realized in Research and Development (R&D) laboratories (Cockburn, 2004) and new statistical analysis methods (Lohr, 2004).

Just a few, of the current, fast-growing off-shoots of this technology are DNA microarrays (Studt, 2004), text-mining systems of medical documents (Uramoto, Matsuzawa, Nagano, & Murakami, 2004), and mass spectrometer (Sidawi, 2004) technologies. The future for bioinformatics is very bright, a researcher is quoted in a 2004 article that "bioinformatics and comparative analysis will drive the rapid advances needed to address the growing body of threats associated with (emerging and re-emerging infectious diseases)" and thus leading to the creation of many new vaccines and drugs (Anonymous, 2004).

Summary and Conclusions

The results suggest general support of Drucker's hypothesis. Although these information technologies were developed with particular industries and end-users in mind, the current and future applications tend to be broader than what they started out serving. In order to completely support this hypothesis, a larger sample of technologies should be reviewed and it would also be very interesting to determine what other types of factorial constructs underlie the current wave of technologies. It is this researcher's opinion that additional analysis will continue to support Drucker's hypotheses, whose predictions have proven, over time, to have great amounts of reliability.

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