A World Transformed: What Are the Top 30 Innovations of the Last 30 Years? by Knowledge@Wharton

Imagine this is 1979: If you were reading this article back then, chances are you would have read it on paper — with a printed newspaper or magazine in your hands. Today, you are probably reading it on a desktop computer, a laptop (or as a printout from either of these), or perhaps even on your Blackberry or iPhone. The pace of innovation has been so hectic in recent years that it is hard to imagine which innovations have had the greatest impact on business and society.

Is it possible to determine which 30 innovations have changed life most dramatically during the past 30 years? That is the question that Nightly Business Report, the Emmy Award-winning PBS business program, and Knowledge@Wharton set out to answer to celebrate NBR's 30th anniversary this year. NBR partnered with Knowledge@Wharton to create a list of the "Top 30 Innovations of the Last 30 Years." The show's audiences from more than 250 markets across the country and Knowledge@Wharton's readers from around the world were asked to suggest innovations they think have shaped the world in the last three decades.

After receiving some 1,200 suggestions — everything from lithium-ion batteries, LCD screens and eBay to the mute button, GPS and suitcase wheels — a panel of eight judges from Wharton reviewed and selected the top 30 of these innovations, which were revealed on air and online February 16.

The list is as follows, in order of importance:

1. Internet, broadband, WWW (browser and html)
2. PC/laptop computers
3. Mobile phones
4. E-mail
5. DNA testing and sequencing/Human genome mapping
6. Magnetic Resonance Imaging (MRI)
7. Microprocessors
8. Fiber optics
9. Office software (spreadsheets, word processors)

10. Non-invasive laser/robotic surgery (laparoscopy)

11. Open source software and services (e.g., Linux, Wikipedia)

12. Light emitting diodes

13. Liquid crystal display (LCD)

14. GPS systems

15. Online shopping/ecommerce/auctions (e.g., eBay)

16. Media file compression (jpeg, mpeg, mp3)

17. Microfinance

18. Photovoltaic Solar Energy

19. Large scale wind turbines

20. Social networking via the Internet

21. Graphic user interface (GUI)

22. Digital photography/videography

23. RFID and applications (e.g., EZ Pass)

24. Genetically modified plants

25. Bio fuels

26. Bar codes and scanners

27. ATMs

28. Stents

29. SRAM flash memory

30. Anti retroviral treatment for AIDS

Before the winners could be selected from the vast number of entries, the Wharton judges first had to define what innovation means in an age dominated by digital technology, medical advancements and mobile communications. The judges included Ian MacMillan, director of the Sol C. Snider Entrepreneurial Research Center; Thomas Colligan, vice dean, Wharton Executive Education; Kevin Werbach, professor of legal studies and business ethics; Karl Ulrich, chair, operations and information management department; Franklin Allen, co-director of the Wharton Financial Institutions Center; George Day, co-director of the Mack Center for Technological Innovation; Lori Rosenkopf, professor of management; and Mukul Pandya, editor-in-chief of Knowledge@Wharton.

“Innovation is a surprisingly hard word to define,” says Werbach. “Everyone thinks they

know it, but when you ask them to explain exactly what an innovation is, it gets very hard." In order to achieve the best results and narrow down the most authentic list of winners, Werbach and his fellow judges defined innovation as more than simply a new invention. "It's something new that creates new opportunities for growth and development," he says, citing cellular technology, which ranks three on the list. "We've gone from zero to close to three-and-a-half-billion people who have a mobile device and are connected to each other."

Another qualification the judges used to highlight the most sophisticated, powerful innovations was problem-solving value, says Ulrich. "Almost all product design is in fact innovation, but the converse is not true," he adds. "Many successful innovations begin with a user need. Some innovations occur because of some serendipitous event or some scientific discovery. The innovator goes and looks for the user and looks for an application of the technology."

An example in the pharmaceutical industry is the development of new chemical compounds to treat medical conditions, as seen in number 30 on the list, anti-retro viral treatments for HIV and AIDS. "We don't think of that as a product design," says Ulrich, "but we would think of it as an innovation."

Innovation No. 1

Hardly a surprise, the Internet — combined with broadband, browsers and HTML — was ranked first in a list dominated by technological and medical advancements. MacMillan notes that the Internet is an innovation that created an industry and subsequent new technologies, making it an especially important category. "Some [innovations] are more transient and come and go very quickly," he says. "To me, the ones that really matter are the ones that generate whole new industries."

Colligan credits the technology with improving communications and enhancing the standard of living and working regardless of one's location. "Technology has leveled the playing field," he says, adding that he is not surprised so many innovations fall under the technology category. "It's brought populations that were in poverty, frankly, up to certainly a better standard of living. It's allowed others to enter the workforce in the new global environment."

The panel of judges applied a specific set of criteria to narrow down the innovations in evolving technological and scientific fields. The innovations were selected based on how they impact quality of life, fulfill a compelling need, solve a problem, exhibit a "wow" factor, change the way business is conducted, increase efficiency, spark new innovations and create a new industry.

Day says the Internet ranked high, along with mobile computing and telecommunications devices, because of the way this collective of innovations connects people, saves time and creates mobile access points for knowledge. "The Internet took away a major constraint to accessing knowledge and sharing knowledge," he says. "But a bigger innovation is one that spawns other innovations."

Almost every aspect of business or social relations today is touched by the Internet and the subsequent industries the platform has created on an international scale. "It's hard to imagine tackling a challenge like bringing clean water and good health care to the largest number of people possible in the developing world without using the Internet and the technologies around it," says Werbach. "It's not just a business phenomenon. It's a

central organizing platform for anything you can think of."

Werbach also says laptop computers, ranked number two, are related to the Internet thanks to connectivity in the digital realm. "The computer is not something that is in a specific place (i.e., your office)," he says. "It changes the nature of interaction." And it connects with multiple devices that have been created in the last 30 years, including digital cameras, digital music players and wireless printers.

Innovations in Health Care

Many of the innovations capitalize on existing technology to flourish. In some cases, the results not only demonstrate measured success now among select innovations, but also focus on categories that promise even greater success in the future. Most of the scientific selections — including drug developments, surgical advancements and new diagnostic tools — have the potential to spur greater innovation within the next few years to extend life and cure disease. Within the top 10 alone, DNA testing and sequencing, human genome mapping, Magnetic Resonance Imaging (MRI) and non-invasive laser and robotic surgery (laparoscopy) are included.

"DNA has a huge promise to improve diagnoses," says Day, adding that DNA testing and sequencing ranked at number five because of its ability to enhance the pharmaceutical industry by spawning more effective drugs based on genetic factors that have been impossible to determine without it.

Many innovations on the list also subscribe to a "wow" factor, or characteristics that somehow make the innovation surprising, unusual or unexpected, which becomes more difficult to gauge the longer an innovation is used and the more familiar it becomes. But the wow factor, says Ulrich, is important for two reasons: to grab a user's attention and to erect a barrier between it and the competition.

Colligan says this form of competitive marketing and innovation is very much on the minds of the nation's top executives as a way to enhance business goals in a challenging economy. "Innovation creates new revenue streams," he says. "It's a mindset that needs to be started at the top of the organization to allow people to experiment and try different things. It's the opportunity to break through existing models that not only allow for new innovations, but also challenge executives in organizations that have that type of mindset to attract top talent."

Despite a few of the trends revealed in this listing, innovation is not restricted to consumer products organizations or the health care industry. "[Innovation] happens every day," says Colligan, "when executives are looking for solutions to a problem and consultants and professionals are putting together a team. The challenge that professional service firms have is that when good work is done, how do they replicate that?"

The current economic climate weighs heavily on the importance of these 30 innovations, especially as new technology is being used to preserve, and in some cases, revive the commercial landscape. "The innovations are in stark contrast to what we're going through in the economy right now," says Allen. "The innovations also point toward peoples' expectations about the future in the way they change the world." To this category belong the innovations in energy — such as photovoltaic solar energy, which clocked in at No. 18, and large scale wind turbines (No. 19).

Allen compares these innovations to important strides in the early-to-mid 20th century, like antibiotics, aspirin, automobiles and improvements in radio technology. “Some things are really fundamental in the way they change the world,” he says. “One would hope these 30 innovations would be just as important 30 years or more from now.”