Aaron Greenspan
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Special Concentration Statement of Purpose

There is no question that in Harvard's classrooms, technology does not receive the attention that it deserves. Almost every student owns a cellular telephone, many professors communicate with their colleagues through e-mail just as often as in person, and administrators would be lost without the personal computers that reside on their desktops. Harvard's information technology infrastructure is certainly strong, but unfortunately, its curriculum is not.

Information technology is my primary interest in life. I am fascinated not only by the theoretical side of computing—functional flow charts, punch cards, and reams of C code—but also by the practical side. Technological developments over the last twenty years have had a profound impact on individuals and organizations alike, in the United States and elsewhere. Given the gradual nature of large-scale change, exhibited by phenomena such as Darwinian evolution and our anthropological progression from hunter-gatherers to farmers, the past quarter-century is thus a fascinating historical anomaly. Rarely has technology caused such rapid societal change. Surely such an unprecedented and momentous interval in the course of history deserves more in-depth study than the ten minutes or so devoted to "modern" computing in Harvard's introductory computer science course, CS50. For this reason, I am proposing a Special Concentration on Technology and Entrepreneurship in Society. In doing so, I hope to bridge a gap between computer science and economics in order to explore topics in the liberal arts that would otherwise remain largely ignored.

When I chose economics as my concentration during my freshman year, I began by taking Economics 1315, offered by Professor Dwight Perkins, on the topic of development in Southeast Asia. During the course, Professor Perkins often joked that unbeknownst to the rest of

the world, the busy professors of the Harvard economics department actually spent all of their time working on deciphering the meaning of a single variable. The Solow residual, represented by the term $\Delta A/A$ in the equation $\Delta Y/Y = \alpha\Delta K/K + (1 - \alpha)\Delta L/L + \Delta A/A$, is the sole determinant of long-run economic growth. Most economists equate it with technology. At Harvard, despite its profound importance to economics, technology is usually studied within the computer science or engineering science departments. In addition to the numerous research papers that exist in these fields, there are also myriad papers on the various aspects of technology in general economics literature, as we have learned from Economics 970 (Innovation, Information and Networks). Therefore, to learn more about technology than how it figures in theoretical models, or how it works in the first place—that is, in order to understand how technology affects people in modern society—one cannot rely exclusively on either field of knowledge. To really comprehend why information technology had a positive economic impact only after 1995, or the best way to design a new software program, one has to know quite a bit about both.

Unfortunately, the respective successes of the independent economics and computer science concentrations at Harvard have rendered them inflexible. Recently, I hired a friend who had completed both CS50 and CS51 to work for the computer company I have run since my freshman year of high school. Despite the fact that she had mastered the syntax of the Java programming language in CS51, she had no idea how to write a Java applet. She did not know how to use her knowledge on any system other than Harvard's, let alone know enough to begin asking crucial economic questions such as, "What are the effects of Java's platform-independent architecture on firms' cost structures?" or "Should I even be using Java to write this software?" Since CS51 students are only required to know how to use the language in school, its other features, such as platform independence, are barely emphasized. This example is one of many that demonstrate the narrow range of Harvard's computer science curriculum.

Technological developments of recent years, such as Java, in turn lead into the issue of the economic significance of high-technology entrepreneurship. Without Scott McNealy's entrepreneurial drive, Sun may never have gotten started in the early 1980s; Java and similar languages probably would not exist. Would the computer industry today still be dominated by several large firms, such as Sun, Microsoft, Dell and Oracle? Is Microsoft really a monopoly? What are the different ways to measure? These are all questions I hope to answer through research that would be severely restricted by concentrating in either economics or computer science alone. For example, as the Department of Justice discovered during the Microsoft anti-trust case, it is difficult to determine anything about Microsoft's monopoly power unless one possesses an in-depth understanding of their bundling methods. In turn, it is difficult to determine anything about software bundling methods on the Windows platform unless one knows about function calls between Dynamic Link Libraries (DLLs). While bundling is frequently discussed in economics literature, DLLs are not.

The overlap between the areas of economics and computer science are clear, interesting from an academic perspective, and important in everyday life. Nevertheless, their intersection at Harvard does not exist in a single pre-defined academic area or discipline. Cross-registration at Harvard's schools and MIT is the only way to access all of the course material necessary to form a coherent field of study. Harvard's economics and computer science departments certainly have much to offer, but having taken courses in each, I am convinced that my interests would be best served by a Special Concentration.