

The Electronic Desktop and the Future of Work
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During this decade, we have seen a great deal of interest in a concept called "Client-Server Computing." What is this phenomenon and why is it so important? *This paper will argue that client-server computing brings together the person, the work and the technology for the first time since the early days of the agricultural economy and represents a tremendous potential for the worker to use the technology to transform the very nature of the work to be performed.*

What is client-server technology? Essentially, client-server technology involves a desktop computer (client), connected via a communications line to another computer (server) which provides various services to a number of desktop devices. These services can include access to shared databases, communications routing, print services, etc. One could argue that in previous computing generations minicomputers and host mainframes were also servers, and therefore, client-server technology is not really new. If one amended this latter argument to add that the desktop devices are now much more powerful and the servers are much smaller, then one could almost buy this line of reasoning. The difference as we shall see, however, lies not in the physical configuration of devices, but rather, in how much the technology "empowers" the worker.

This paper will examine the main theme by taking a historical look at the nature of work over the centuries. We will start with the agricultural economy and continue through our present day. As well as examining what has happened to work, we will look at the attendant social and cultural shifts during the past four decades. Oftentimes, these provide us indepth clues to the underlying mechanisms which are occurring.

1. The Agricultural Economy

A number of authors have described phases of history in terms of "economies." According to these authors, history can be divided up into the hunting and gathering economy, the agricultural economy, the industrial economy, and most recently, the information economy. Stan Davis in his book, *2020 Vision*, expands upon this theme by describing each economy, in turn, as being made up of discrete stages of development.

In the early days of the agricultural economy, we saw the person, the work and the technology all co-located. Whether the technology was a hoe or a plow, it could be used by the worker to better perform his job. The key was that the individual worker had control over the technology and could creatively direct it in ways he thought would contribute to the work to be performed. As a result of this creative application of the technology, over time, new and more effective ways to farm were discovered. Later developments improved upon the technology, and in many cases, this technology now did the work of many people.

But already, as a result, we see the individual worker beginning to lose control over the technology.

2. The Industrial Economy

With the advent of the Industrial Economy (1760s in Europe, 1860s in America), we continue to see advances in technology, as means of automation and mass production permeate the industrial scene. We see something else, however. Under the influence of Frederick Taylor and others, the work of the individual worker becomes largely manual work. The thinking portion of the work is stripped away and becomes the province of those better equipped to deal with these matters. As Frederick Taylor was to argue.

"Now one of the very first requirements for a man who is fit to handle pig iron ... is that he shall be so stupid and so phlegmatic that he more nearly resembles ... the ox than any other type ... he must consequently be trained by a man more intelligent than himself." (F.W. Taylor, *Scientific Management* [New York: Harper, 1911, p. 59.]

The individual worker, in many cases, uses the new technology to perform his job, but with a loss of control over the thinking part of this job, we see a further erosion of the individual worker's control over the work to be performed.

3. The Information Economy

The beginning of the information economy can be placed somewhere around the end of the 1940s, or the beginning of the 1950s. The first electronic computer, the ENIAC, was actually introduced in 1946. With the advent of the information economy, we do a further disservice to the individual worker. We now remove the technology of this new economy and place it behind formidable glass walls, guarded by people in strange attire, who speak "funny" languages. Enter the era of the large, monolithic mainframe computer. We could describe this mainframe phase as the first phase of the information economy.

The second phase of the information economy is characterized by attempts to move the technology back closer to the individual worker. You might argue that this philosophy, which was to become known as "distributed computing," was Ken Olsen's major contribution, as he sought ways to bring the power of computing down to the individual worker. But while it brought computing closer to the **group** level, it still had a long way to go before it would be under the control of the individual worker.

During this period, we also saw a significant value shift in society from "authority-centeredness" to "person-centeredness." This shift was manifested in many different disciplines---from the "client-centered therapy" of Carl Rogers, to the employee-centered organization of our modern day. It also influenced and enabled distributed computing, as the person became more central in the "computing universe."

The third phase of the information economy is that of client-server computing. While still in its infancy, we see an incredible amount of interest in this style of computing. Originally viewed as a way to cut the cost of computing, we are now seeing evidence that, if anything, client-server computing will raise the cost of computing---at least in the short run. So, what is the real value of client-server computing?

In my introduction, I stated that client-server computing brings together the person, the work and the technology for the first time since the agricultural economy. Let's examine this phenomenon.

Client-server computing brings together at the desktop, the person, the work and the technology. The technology we are talking about is the personal computer. Again, since the early days of the agricultural economy, when the person could use his farming tools in creative ways to better perform his work, we have not enjoyed this same potential. We see now, however, that a shift has occurred. Whereas in the agricultural and industrial economies the work was largely manual, the work to be performed today is largely "knowledge work." One could argue, therefore, that the potential for worker creativity is even greater in this "knowledge work." Let us look at a number of things that need to be present, however, for us to enjoy this potential.

4. Enabling the Client-Server Vision

While we have done a pretty good job of training individuals on how to use computing tools, *we have never trained workers on how to use computing tools to better do their jobs*. We assume that they will figure this out for themselves, but what we are seeing is that workers use computing tools to continue to do their jobs in the way that they have always done them. So, the first thing we need to do is to teach workers how to use computing tools to improve their work. Involved in this step is a knowledge of process improvement methodologies, redesign techniques, etc.

A second thing which needs to be present for us to realize the potential benefits of client-server computing is an enabling culture. People will not work together collaboratively and as part of cross-functional teams unless the organizational culture supports collaboration and teaming. There are some positive signs on the horizon, however. As with the earlier value shift toward "person-centeredness," we are currently seeing a societal shift toward greater interdependence. This shift is being seen in everything from our concern for the environment, to the global economy. As well, this shift should serve as an enabler of interdependent organizations, and even, interdependent computing.

If the worker is going to be trusted to use the technology to change, in many cases, the very nature of his/her work, then the culture should also support worker empowerment. A study which was performed at the MIT Sloan School shows the importance of this last point.

Professors Perin and Carroll, from the MIT Sloan School, describe two organizations in which the expectations and trust of senior management greatly influenced the resulting

outcomes from personal computer implementations. In the first company, personal computers were introduced into the accounting department with the expectation that they would be used only for short-term reports previously prepared manually. The manager forbade, for example, the accountants to use the PCs for writing their analyses and memos. As might be expected, the PCs in this first company remained a minor factor in their work processes; they were generally seen as being an efficiency tool.

In the second company, the expectations about PC use were clearly different. In this latter company, senior management had an image of a "leaner company whose future and productivity are to be enabled by new technology." The resulting encouragement for everyone to develop new applications, was consistent with this image and reflected a high degree of trust.

The results in the second company were consistent with the expectations. Jobs were configured, repetitive tasks were reduced and workers came to a better appreciation of the meaning of their work. One "records clerk, previously untrained, created 42 applications immediately upon being trained 'just to get rid of the mounds of paper' on his desk. Having discovered this new competence, he was considering going back to school and making a major career change."

The third thing which needs to be present is a guiding corporate vision. Without this, the individual worker will not know what contribution on his/her part will be most valuable to the corporation. Is it most valuable to the corporation for me to reduce the **cost** of my work, to improve the **quality** of the products that result from my work, or to reduce the **time** it takes me to do my work? Which of these alternatives will allow my company to be more competitive and more profitable?

Each succeeding computing generation has brought with it the promise of new improvements in the way we do things. As with the previous generations, client-server computing is no different in this regard. There is one fundamental difference, however. Unlike previous generations of computing, client-server technology offers the promise of putting the total job once again under the control of the individual worker. If we are able to do this, we will see the creativity of the worker unleashed in ways that we have never seen before. And technology will serve not only the interests of the corporation, but once again, serve the talents, spirit and creativity of the individual worker.