EDITORIAL

Our Accomplishments – Your Legacy

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Many recent editorials in this space have begun with some reference to being "older." This one will not be an exception. As the proud owner of my old college slide rule, Dietzgen drafting tool set, naval signal flag flash card set, Plexiglas rotary screw compressor model, variety of failed turbine blades, selection of obsolete accelerometers and countless lifelong treasures that will never be used but can't possibly be thrown away, I too am succumbing to old age.

The thought has other elements. My parents spanned the Wright Brothers to Neil Armstrong. (If you haven't read the new book by David McCullough, *The Wright Brothers*, you should – it's a must-read for the technologically inclined.) At a homecoming my first year at the Naval Academy, I recall looking at graduates celebrating their 50- and 60-year reunions and thinking how "old" they were! Some had been at Annapolis during the Spanish American War; those who were not there were close. All experienced WWI. Some of their parents, all their grandparents, were alive during the civil war. Some may have been casualties. Today, I'm one of them!

My and the generation before have seen massive changes. When I graduated, a well respected analysis predicted a "total" requirement for about a dozen computers worldwide! If you wonder why this wasn't seen immediately as an outlandish prediction, take a look at just a portion of a first-generation computer in the Smithsonian. The PC was introduced in the early 1980s and quickly overwhelmed the mini and all that came before. Few today even recognize the term minicomputer, much less know what one looked like. PDP-8 anyone?

At the time no one even remotely anticipated all the varied applications of the microcomputer and how it would reshape so many activities and endeavors. "Why would ayone want to type a letter on a computer" was asked by an early manufaxcturer of word processors – who is no longer around! A couple of weeks ago while dining at a local restaurant, we noted at least half of the dozen or so people sitting at an adjacent table, probably an office party, not conversing but texting! The TV ad showing two teenage sisters texting each other sitting either side of their father on the same sofa is probably not too far from reality.

Is there another, larger issue here? A good case can be made that inventions from the industrial age to at least the 1980s expanded the distribution of wealth, improved industrial safety and the quality of life.

As an aside, there was a wonderful exhibit in the London Science Museum displaying models of mechanisms that made the industrial age possible. In 15 minutes or so, a visitor could trace the beginnings of mechanisms we take totally for granted today. Converting reciprocating to rotary motion, a task most of us utilize daily without any thought, required more than 80 years and a lot of really weird attempts before arriving at the cross-head followed quickly by the wrist pin.

As automation first assisted and then replaced a great deal of human activity, many hazardous and repetitive tasks were minimized or greatly reduced. Automobile manufacturing, as just one example, is highly automated today. A large percentage of the massive number of assembly line workers performing mind-numbing, repetitive tasks have been replaced by robots. Robots produce far more consistent quality, don't daydream, need breaks or vacation. Productivity, defined as hours required to produce a given product, is way up.

When I joined the industrial world, local control rooms were required in each processing unit due to the limited range and performance of pneumatic control systems. There were lots of people operating machinery, turning valves, etc. With modern electronics, digital controls and control systems, a single control center may control an entire manufacturing complex and doesn't even have to be inside the complex itself. The number of operating people on a shift has probably been reduced by 80 percent or more.

Somewhere in my unindexed archives is a video of a movie shot in the 1940s where a routing clerk describes the importance of accuracy in her job and the hundreds of clerks in the background to assure shipments reach their intended destination. Today, that job is largely automated. Bar codes enter, direct, track and report a shipment's location in essentially real time. FedEx is a perfect example. Current volume would be impossible without automation.

I remember telephone operators and party lines. Today's volume of telephone and data communications would be impossible without automation. But what happened to the opportunities offered to thousands of telephone operators?

Early in my career I witnessed a similar example, although the full ramifications did not register at the time. A building housing approximately a dozen reciprocating compressors manned by three or four people in four shifts 24-7 was replaced by a single centrifugal compressor operated from a unit control room. What happened to the 12 or more shift workers suddenly replaced by technology?

Another example: only about 30 years ago, engineers who seldom knew how to type (males who took typing in high school did so largely to meet girls) and didn't have access to a typewriter (remember those – you can find them in museums!) had to throw themselves on the mercies of a typing pool to convert a handwritten draft into a typed memo for distribution through the company's internal hand delivered mail system.

In those days, the typical typing pool consisted of a half dozen or so very stern older (to me at least) ladies. Cigarettes, chocolates and a big smile entering the smoke filled domicile were the currency to assure your draft reached the top of the stack sometime within the foreseeable future. (Yes, it was common for people to smoke on the job). Changes or alterations once typed; even if an entire line in the draft had been omitted – fuhgeddaboudit!

All these improvements in productivity have come with a societal cost. Like it or not, there are many people who fit comfortably into the "older" way of doing things and are not well equipped for whatever reason to fit into the "new" order. Can all the people who manned an assembly line competently operate a modern assembly or process control room? People no longer perform most of this work; they monitor and control the automation and machines that perform the actual work. The day when a high-school graduate or even dropout could go to work in the "factory," joining father, uncles and perhaps even grandpa to build a solid middle-class life for themselves and a family is now largely gone.

Further, and far more important, do Google, Facebook, Twitter and their social-media many counterparts contribute the same value in terms of societal good as many earlier inventions? How do Mark Zukerburg, Elon Musk, Sergey Brin, Larry Page, Jeff Bezos and even Steve Jobs compare in terms of societal value to Orville and Wilbur Wright, Thomas Edison, Alexander Graham Bell, Nicolai Tesla, Henry Ford, Hans von Ohain, Kelley Johnson, Ed Heinemann and William Shockley to name just a few?

A recent article in *The Atlantic* described a likely jobless era where automation and productivity improvements would eventually eliminate the opportunity for "work" as it is generally known today for a significant segment of the population. Further, how could/would these "workless" people find happiness and fulfillment?

Needless to say the forecast isn't particularly optimistic. Can a society thrive with a significant segment of the population supported by government subsidies

sleeping, gaming and texting as their sole activities? What happens to ambition and self worth? Is the discipline of "work" and resulting accomplishment necessary to realize happiness, or can the same be gained by advancing to a higher level in a video game or assuming the identity of a superhero? Undoubtedly a lot depends on the individual, but how about society as a whole? Can a society thrive if a primary accomplishment of a significant segment is video game expertise?

Here's a small story illustrating one aspect of the issue: Sometime in the past, it was logical to promote an electronic assembler to a purchasing position. Importance and use of components were well known. One individual promoted in this way was obviously unhappy in a purchasing position. When queried, the answer was that as an assembler, accomplishments for the day were visible and tangible and that was the primary source of job satisfaction. In the purchasing role there wasn't any real way to judge whether the day and individual had been successful!

Many technical people transitioning to a managerial position experience the same lack of job satisfaction. Some may compensate by issuing strict instructions to subordinates "do it this way." That in itself can be demoralizing, limiting to the growth and experience of the subordinate and not at all conducive to self worth.

Perhaps an even larger issue is how a society in which a significant number contribute no societal value will be managed and financed and by whom? The *Atlantic* article freely admits that if allowed to loaf, many will. Some might say we are on that road right now. Watch Jesse Watters on FOX television some evening with the realization that these people have one vote just like you and I!

As a long-time advocate of productivity improvement, I stated as succinctly as possible in a book I published last March (*Operational Excellence, Journey to Creating Sustainable Value*) that I have been well aware of the societal dangers of our current technological and societal trajectories. With (little interest?) no answers at hand from the technical community, these issues have been largely sidestepped.

What will happen when an increasing segment of our population, many with college degrees, can't find interesting, challenging work and a promising future? What happens when the middle-class lifestyle enjoyed by their parents generation is out of reach?

Television home improvement programs are increasingly emphasizing mini (tiny) homes that are just a bit larger than high school bedrooms. Government regulations to force people into smaller, clustered dwellings and discourage automobile ownership in favor of mass transit and bicycles is clearly on the table in California. Will those who seem so excited about their minimum footprint and green existence be satisfied in the long term, particularly in restrictions on personal freedom they took for granted as children? And what about the tradeoffs to achive a "green" sustainable existence? If someone went out with a shotgun and killed eagles, hawks, bats and other flying animals that are allowed to be "taken" by California's "green" wind and solar generating facilities (Ivanpah, as one example of the latter) they'd be confined in jail for many years to contemplate trangressions against nature.

What happens to demographics and a national economy when people find families impractical, unaffordable or just plain unwanted? Germany seems to be leading the way toward an answer to this question. More important, if this is a predictable course, will the anticipated result be acceptable? For if it isn't satisfactory for most, the results are likely not to be very pleasant for everyone concerned.

For those of you under 30, this will be your challenge. My generation, for all that we accomplished or didn't, is exiting stage right, going west as some say. We've had our turn, now it is yours. Our accomplishments, memories and treasures will be gone but, they are your legacy. It is easy to identify the challenge; the industrial revolution began with the necessity to keep water out of ever deeper coal mines. The challenge was solved, and so yours will be as well.

Good luck and best wishes! S&V

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