

WHERE DO WE GO FROM HERE WITH AUTOMATION SYSTEMS?

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Our country is going through a rather profound and basic change that will directly and indirectly influence everything we do in the future of automation systems. We are undergoing a change in values and priorities. Quality is of greater importance now than quantity; more is not necessarily better. The broad social values, the quality of life, and the quality of the environment outweigh the more clearly defined economic values. The consequences of these changes and values are indeed profound, and we must take them fully into account.

It is not easy to adapt to these changes. We have all been conditioned by a heritage in which industrial and economic development was a near-sacred national goal. Progress was measured in economic terms and transportation development was the backbone of such progress. Indeed, in the past 50 years, the highway program has been in the forefront of the development of our country. The goal is now being changed somewhat, and the adjustments that we are faced with are painful, complex, and perplexing. Rather than fear them, however, I think we should take leadership in effecting them. We should be active students and active participants in these changes. These value shifts will not occur immediately, although some people are impatient and want to try to force that to happen. The changes will tend to be implemented during the 1970's and will tend to start to be reflected in the body politic as the full force of recent judicial and legislative decisions take effect. The "one man, one vote" decision and the decision to lower the voting age to 18 years are going to change the makeup of many legislative bodies. We should not fear this; we should anticipate it, take it into account, and not be surprised with some of the ramifications of it.

All of this may sound pretty far removed from "Automation Systems: Where Do We Go From Here?" I feel, however, that it is important that we understand the future environment within which we will work and that we have a proper perspective of those forces of change. Professionals in engineering and information systems tend to be somewhat preoccupied with serving top management. That concern for the chief administrator should be not just to meet his historical needs but to anticipate his future needs. Those of you responsible for highway automation systems should keep your top managers posted on such things, for example, as how many relocation family units must be provided in years ahead, what the rate of growth is of the noise level on certain urban expressways, and how many lawsuits are likely to result. Many types of information such as these are going to become more and more important in your work, and they are going to achieve the importance now given to financial status reports. That you should keep abreast of changes in computer technologies is obvious. Keeping abreast of social and value changes in this country, however, is much more difficult, but those changes may influence your future far more than technological changes.

I believe that we will agree that we have not quite finished the job in automation systems that we set out to achieve in the 1960's. We are continuing with that effort, and we must continue it. There is some danger in becoming absorbed fully in working on the problems as we defined them in the past and in trying to finish old jobs rather than in giving attention to new ones that are emerging as the missions of the organizations we work for constantly change. The considerable reorganization that will undoubtedly occur in the years ahead is going to be at the price of some confusion and uncertainty during the transitions.

Many organizational changes are made to integrate related functions and these offer a whole new source of opportunities for automation. Therefore, far from resisting those changes, people who are concerned with automation systems should be taking a certain degree of initiative and leadership in helping blueprint those kinds of organizational structures that are appropriate to our modern age. Bringing together various modes of transportation is simply a long overdue example of integrating related functions. Relating transportation in turn to regional and community development is also a logical move. In the process, data processing and automation can set the good example, for computers, procedures, and methodologies are neutral. They are equally adept in the planning, designing, managing, and operating of not only highways but also airports, public transit, urban renewal, utility resources development, and environmental monitoring control. In all of these areas, they can serve not only engineers but economists, sociologists, other kinds of professionals, and all kinds of managers.

Someone has to take the leadership in these moves to handle larger problems and newly defined arrangements. By default to a certain extent, this leadership is going to ex-aeronautics, ex-NASA people who are starting to occupy lots of top positions largely because they have self-confidence in being able to do most anything. I think that they can teach people in the highway field something about self-confidence. The people who have been working in the highway program for many years, in my opinion, have skills and experiences that are far more appropriate in solving social problems than those of probably any other professional segment. There has been a tendency, however, for highway engineers to maintain a narrow and often defensive view of themselves and to preserve the highway program at all cost. Such an attitude sharply limits the role that we could and should be filling as professionals in this country. We can indeed be proud of what we have accomplished in developing the highway system but there are now bigger and broader tasks that must be undertaken, and those of you associated with automation can assume a great deal of leadership.

With respect to highways, there is another factor that has come into reasonable focus and that is important in automation systems: We recognize that our main thrust in the past has been the building of highways. Most of our professional manpower effort has gone into creating highways: planning, design, and construction. Maintenance and operation have been secondary in levels of professional inputs. Clearly we are not going to stop building highways, but we are going to be much more concerned in the future with the efficient operation of the enormous investment we now have in highway facilities.

Automation of highway operations will be by far the big technical effort that many of you will be concerned with in the future. This constitutes a somewhat different kind of technical and computer problem than what we have dealt with before and is as much of a change in computer technology as going from the old tab operations to the stored program computer. I think that we can expect to see the forerunners of truly and highly automated highways before the end of the 1970's. The forecast is that they will probably be dual-mode facilities for small, publicly owned vehicles. One lesson that we should have learned from the past is that there is some danger that we are still making the basic mistake of trying to automate essentially manual procedures. What we automate and how we automate it are still subject to a lot of mistakes. I would like to use the analogy of automating garbage disposal. One form that such automation could take is to develop a mechanical man who would pick up the garbage can, empty it into the truck, and then bang it three times on the pavement. That would be automating the manual procedure. An alternative is to develop an electrically operated sink disposal, and to automate in that form takes somewhat of a redefinition of the problem, defined not as the emptying of garbage cans but as the disposal of garbage. The systems analyst or the automation expert must similarly seek new problem definitions and not merely automate what is currently being done. Indeed, if he did the latter, he would probably not come up with a better solution because automated garbage men are probably not cheaper than real garbage men. You probably could not improve on the manual method, and you would make an expensive, clumsy use of automation. The sink-disposal approach itself may not be cheaper, but it may be justified in larger nonquantifiable terms such as being convenient or eliminating health hazards.

There have been hundreds of examples of automating manual procedures, and they have been a source of great disappointment in many highway departments. We must redefine problems in larger terms; we must evaluate the value achieved in terms other than simply money saved. I caution you also about looking entirely to management, or the people currently handling the problem, for the answers for what they want and how they think it should be done. What would you expect the management of a garbage collection company to come up with as a statement of the problem in automating the garbage collection? It would be quite different from the analysis that would lead you to develop the innovative sink disposal. The garbage man himself would probably not be too helpful in giving you the information you need to automate his function. The systems innovator must be far enough away from the problem to see it perspectively, and he must use a great deal of imagination, skill, and judgment in coming up with new solutions. He must fully understand the intricate interrelations that exist everywhere. For example, in automating garbage disposal, he may create a new problem in terms of overloading the larger sewage distribution-collection-treatment system.

I would like to return to my basic theme and try to summarize as follows:

1. Take a much broader view than has been taken in the past of what automation systems are all about and do not limit your role in data processing;
2. Be bold and have self-confidence in being able as professionals to play a much larger and broader role, and do not think and act like technicians or you will be so treated;
3. Be prepared to go beyond the traditional domain of the state highway department in serving the public; and
4. Anticipate changes in the environment and the organizational structure within which you will work and be aware of changing values in missions as well as in changing technology.

For the past decade and a half, automation has been a newcomer and has had to sell itself. Much time and effort have gone into selling computers and automation and in getting new methods used and accepted. It has not been easy, and a certain psychic has developed that automation is peripheral to the organization and the servant of top management and others, that automation personnel are not generally understood, and that we have to talk to each other to be understood. I suggest that we have to break out of that psychic (even though, admittedly, a great deal of selling remains to be done) and stop acting like salesmen. Where we should and can go with automation systems now is to the center stage as a mature, essential, and central function without which the mission of any organization cannot be accomplished. Accordingly, there is a call for a change in our mental attitude from servants to leaders.

My answer to how you get the attention or support of top management of the future is to start filling such ranks yourselves. The chief executive of the future can and many should come from your own ranks. This is already starting to happen in some industries. It came as quite a surprise in the rather staid conservative Boston community that the new president of the State Street Bank is a computer man. Lawyers and financial men are the people who have traditionally been able to move up into top positions while engineers stayed down. This is due partially to the opportunity they have had to cut across divisional boundaries, to get to know and understand the whole organization, and to be close to its basic mission at the top. You have that very same characteristic now in the nature of your work, and you should take full advantage of it.