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September 25, 2005
17.312/ESD.85/STS.461

Response Paper for Thomas P. Hughes' Rescuing Prometheus

Despite the diversity of the four case studies presented by Tom Hughes in Rescuing Prometheus, there are several recurring themes and questions that would make great starting points for discussion.

Behind all four projects were strong leaders who, whether they were aware of it themselves, behaved as system builders. For people such as Simon Ramo, Bernard Schriever, and Fred Salvucci, a combination of their background (including their family history and childhood environment) and experiences cultivated them to think in terms of systems and to navigate complex technological and political landscapes. All of them had a rebellious streak and intuitive mind that may be personality traits rather than learned abilities. This begs the question of whether systems thinking/systems engineering can really be taught at an educational institution. According to William S. Flynn, who was involved in the CA/T project, leadership qualities are more important than an engineering degree. I do not necessarily agree with this because having an engineering degree grants credibility among other engineers, but educators should consider the importance of creating situations for students to exercise leadership in addition to learning analytical tools. Perhaps it is more important for people at organizations to identify these types of individuals and then offer them opportunities to develop their skills. Based on this book, it seems that a true systems engineer can only emerge after years of proven experience and perceived credibility by his/her peers.

In the same vein, only a highly trusted and experienced organization can be given the responsibility of performing a systems engineering role. For instance, in seeking a group to take on that role for the Atlas project, Ramo would not allow his well-qualified but new Ramo-Wooldridge Corporation to take on that role, because he feared any failure or obstacle could spell the end of the new company. When we took Prof. Ken Oye's Science, Technology, and Public Policy course, the same was said about organizations conducting knowledge assessments. They had to establish a proven record before taking on large, highly controversial tasks.

The implementation of dramatic changes, whether with technology or organization practices, seemed possible only in the face of crises. The SAGE and Atlas projects occurred during the Cold War, when America was threatened by the possibility of a Soviet attack. This forced people in the military and government to listen more carefully to unconventional styles of management or unusual technologies. Hughes argues that it was difficult to transfer systems principles from the military to the civilian context because of the open systems and "messy complexity" characterizing civilian problems. However, another explanation is that there was not the same sense of imminent threat with problems of poverty, pollution, and urban congestion as there was for nuclear attack. Normally, "conservative momentum" plagues institutions that fear revolutionary change could marginalize entrenched interests and open doors for competitors. The Air Force resisted the long-range ballistic missile project because of concerns about bomber pilots being replaced by missiles. However, reports that Russians were ahead of Americans in

developing intercontinental ballistic missiles gave the necessary push for the Atlas Project. Hughes writes, “A crisis mentality, justified or not, helped break the inertia of bureaucracy” (83). This type of crisis mentality makes people more receptive to seeking outside advice or relying on experts outside the organization. Without the crisis mentality, James McCormack may not have had the support from others in the SAGE project to assign the systems engineering function to the newly created MITRE rather than a pre-existing organization.

When trying to transfer systems engineering from military to civil sector problems, TRW was supportive of Ramo and Brown’s efforts because an aerospace industry recession was affecting the company (another type of crisis). Showing others how to use a systems approach would give the aerospace companies new work, but the transfer to government and commercial problems was not very successful. Hughes suggests that civilian programs often lacked a single focus and adequate funding, which led people to think that systems engineering works for technical problems but not social ones. The practitioners of system dynamics showed that systems thinking can offer insights into social problems, but the lack of a crisis mentality may have hindered the implementation of any solutions. Governmental agencies have tried to artificially create a crisis mentality with the “war on drugs,” “war on crime,” and “war on poverty,” but these efforts have not seemed to mobilize people in the same way as national security threats. Does this mean that we have to wait for a crisis or life-and-death type threat to showcase the wisdom of systems thinking? Should we be poised to opportunistically take advantage of crises?

Hughes accounts for the greater emphasis on consensus and less emphasis on hierarchy on the mistrust of the government and technology after the Vietnam War. This leads me to wonder how the SAGE and Atlas projects would have progressed if they took place today rather than 50 years ago. Just as some of the SAGE and Atlas leaders had to sacrifice technological perfection for an earlier completion date, today we may choose to sacrifice the most technologically optimal solutions for one that most people can agree upon. An excellent example is the operations analysis group that recommended bomber pilots to continue flying their course after releasing bombs, since evasive tactics made it more difficult to take aerial photographs of target damage (p. 150). In the long run, this may have saved more lives in future missions, but trying to justify the sacrifice of some pilots to their families would be prohibitively challenging.

The positive experience of engineers and scientists who were able to take a break from hierarchical structures indicates that we should try harder to provide settings for experts to engage in informal exchanges. An energetic, exploratory setting facilitated the collaboration and creativity that characterized the ARPA project. This was also true of the “summer study projects” initiated by MIT and funded by the military to discuss the development of a missile defense system. These types of environments, less constrained by people’s everyday roles and responsibilities, offered them an outlet to explore unconventional ideas. These have served as a model for government, academic, and private sector leaders as they convene committees of experts to suggest solutions for society’s pressing problems.