

X. Sociotechnical Systems: Moving from the 20th to the 21st Century

Tails and Dogs: Who's Wagging? The Inversion of "Technical Conversion Processes" and "IT Technical Systems" in Designing Organizations

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Introduction

In an era of economic turmoil and ongoing uncertainty, we need all the help we can get to develop workable plans for creating, strengthening, and sustaining effective organizations. To solve the challenges created by this "turbulent field" (Trist 1981) in which we find ourselves, we must identify and sort the complexities and interdependencies that increase the uncertainty and focus more clearly on the root causes of the challenges presented. As we seek out areas in which we can repair damage done and/or improve our efforts and outcomes, we must start with a clear understanding of the systems that underlie our organizations.

In a recent *Harvard Business Review* article, Rosabeth Moss Kanter (2009) commented on what Peter Drucker might say about causes and effects of the massive global challenges businesses face today. She suggested that after saying 'I told you so,' he would then take "a broad look at the context surrounding organizations, noting the jarring events he called discontinuities. Next, . . . he might follow up by telling us, 'Look at the underlying systems.'" Kanter continued, writing, "Drucker rarely named or blamed individuals [for problems and failures]; he saw root causes in the design of organizations—in their structures, processes, norms, and routines." It is just this challenge, the impact of organizational design choice on outcomes, which is addressed in this paper. Design choices about systems and structure create the organization and define how it works; they drive performance and must, therefore, be selected carefully with specific performance outcomes in mind. If we can visualize an organization as a dog, for the moment, then we need to design the dog (the overarching organization) paying particular attention to how it can wag its tail (use the systems that are part of its design) so that the entire dog works effectively—the dog must be in charge of wagging its tail.

Organizationally, this means that we should design our organizations as whole systems whose parts work in concert to achieve the goals we define as critical to success. The systems that make up the organization should be jointly designed with these ends in mind. Socio-technical systems theory is an open-system design paradigm for organizations; its power is based on the concept that organizations are composed of both social systems (related to human efforts, relationships, and connectedness) and technical systems (processes and technology) that must be jointly optimized to create the most effective organizations. Organizations that favor one type of system over the other are unbalanced and will not achieve optimal performance or results. If the social systems are given design priority over technical system design, the organization will probably have strong values and high levels of participation among members and be considered a great place to work, though it may

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not achieve its desired performance and outcome results. If technical systems are given priority over the human systems, we find ourselves in a system that becomes so focused on process that it does not utilize the power of social systems to get the work done. This can lead to shortsightedness and a loss of focus on organizing systems to keep the organization strong, as well as poor results.

Dogs and Tails

We have spent the last 25 or so years chasing technology and the solutions it offers to our complex business problems. The proliferation of computer systems of all sizes and development of complex information technology (IT) systems has thrust us into spasms of technologically driven, adaptive change in many aspects of our lives and work. In some cases, these changes are absolutely right and necessary: they fit our goals and strategies, and they move us in directions consistent with our vision and values; they are designed to fit our systems and processes and help us achieve our goals. These are the technologically driven, adaptive changes we refer to as the dogs—those changes in which the animal as a whole (the dog) is consistent with and drives change in appropriate directions, directions that are consistent with our mission, goals, systems, and culture. In other instances, we find technology driving change in unanticipated, undesired directions: for example, we sometimes find that the centralization of information consistent with strong IT systems counteracts decentralized decision making, or that the cost of the technology far outweighs the actual benefit to the organization. These are situations in which the tail begins to wag the dog, and moves it along unintended paths, toward different goals than may be anticipated.

Consider, for example, the impact on our organizations of the adoption and integration of information technology systems. These systems provide great benefits, typically at a high dollar cost, and they often have an associated high opportunity cost that is hidden from plain view—a hidden cost that causes the tail to wag the dog instead of having the dog lead the initiative. To what extent does your IT constellation (hardware, software, and connecting-ware) require you to change your technical conversion processes, resources and desired outcomes, strategies in the marketplace, or social and organizational arrangements? Has it been designed as one component of a coherent system, or added on so that it forces unanticipated changes in other systems? Is it a dog or a tail impersonating a dog?

Examples of the Tail Wagging the Dog

For common examples to illustrate the tail wagging the dog, we need look no farther than two events that touched most of us in unintended ways.

The first example is Microsoft's conversion from Windows 97 to Windows Vista (2009). For Microsoft, the problem to be addressed was that the original Windows 97 operating system had too many bugs and failures and hence needed replacing or updating. It was decided that new code would be written to avoid replicating problems with the old system. Vista was installed on all new machines delivered after a particular date. Remember that the intent was to remove the bugs and limitations of Windows 97. The installation of Vista on new machines limited access to prior work for buyers of new/updated equipment. Microsoft did not support the conversion; they supported the two operating systems separately. Some third-party software was available that helped somewhat; but this transition was very difficult and frustrating for users. It added unintended time and expense to the transition process. This is a situation in which a technological solution (development of Windows Vista) to an existing problem (bugs and errors in Windows 97) created a whole new set of problems for users rather than solving the original problem. This is an example of the tail wagging the dog.

Another example is found in electronic voting systems in the United States, which were implemented in various places to eliminate problems with other systems of voting. As was discovered, though, there were many problems with the new systems. Look at the Gore vs. Bush Presidential race—the problem of the hanging chads and the difficulty of counting the Florida election results. The Supreme Court had to get involved to determine implications for a democratic electoral process. There were recommendations by the National Association of Secretaries of State regarding voting procedures, and some states changed their fundamental voting processes in reaction to these issues, a clear case of the tail (the solution) wagging the dog (driving unintended consequences and creating more work than anticipated).

The Technology Tail Wagging the Corporate Dog

On an organizational level, “tails wagging dogs” is not the intended outcome to design, change, or performance improvement initiatives. In fact, most change initiatives that result in tails wagging dogs are entered into because there is a significant problem to solve. Consider the case of a small multinational company (whose identity it has asked us to withhold) with manufacturing plants scattered throughout the United States, Canada, and Great Britain. The company has spent more than a decade developing its manufacturing and sales organizations into what was then called a “high performance—high participation” system. Decision-making responsibility had been pushed to the lowest level having adequate information to make appropriate decisions, a team-based system of operation had been implemented in most sites and at headquarters, on-site ownership of outcomes and results was high, and the systems in place had been designed using an approach that balanced the needs and capacities of the social system with the technical system of the operation. The system had been designed in good times, where it appeared to work well, and had not been tested in a tight economic environment.

Over a couple of years, as the business climate tightened, cost control became a clear priority for the organization. Senior leadership determined that implementation of an enterprise resources planning (ERP) system would give everyone in the corporation better insight into their costs and better inventory control; they envisioned a system that delivered cost and profit information on a just-in-time basis. They selected a system and vendor and proceeded with the implementation. Problems began to crop up almost immediately. The technical ERP system had been designed with the goals of cost and information control as central tenets; code had been written; the system had been implemented. At each “go-live” date, individual plants began to lose control of their own inventories, their costs, and their ability to manage their own work within the network of the organization. Installation of the ERP system technology recentralized decision making and control and worked against the structure and systems that had been designed to decentralize operations. The multimillion-dollar investment in the ERP technology was too large to abandon, and in the end it was allowed to drive a decentralized organization with a participative organization structure and systems into a centralized command-and-control operation. The tail (ERP technology) here too clearly wagged the dog.

Examples of the Dog in Charge

While some projects end up in different places than intended, there are good projects in which IT is brought in as one component of a large-scale change and carefully integrated into the process, rather than driving it. Despite evidence to the contrary, it is possible for a large IT system to become one with the dog instead of becoming the tail that wags it. In the computer world, look at Mac versus Windows. The Mac (and its operating system) is designed to enable the user’s work process rather than to force the user to conform to the software’s constraints, and it functions this way. Windows seems much the opposite, with many comments from users about the challenges of having to conform to idiosyncrasies in the software. One has only to look at the differences in current ad campaigns for Mac and Windows to see this difference. In addition, as Apple developed new technology and new products, it designed them to be consistent with existing platforms, creating nearly seamless introduction and application in the marketplace. It takes a solid and effective organization, clearly focused on its own strengths and designed to deliver what its customers need and want, to create this kind of success in today’s operating environment. Through attention to good design, Apple has done well at making sure the dog is wagging the tail.

To ensure that the dog is in charge, it is imperative to pay careful attention to the design of an organization, making it consistent with the overarching mission, vision, values, and goals. Design builds, supports, and enhances organizational culture by creating operating systems that get the work done in the most effective way possible. One powerful design methodology that focuses on creating effective organizations through development of clearly focused operating and technical systems and strong supporting cultures is socio-technical systems design.

Socio-technical Systems Design

Socio-technical Systems Design (STS) is a whole-systems approach to designing organizations. It takes into account both the social systems (people, relationships, policies and procedures related to managing people) and technical systems (tools, methods, and means of production and delivery of product or service) of an organization in order to jointly optimize the entire system for peak performance and outcome. Many other design processes focus on one element of an organization and maximize that element's contribution over the contributions of other elements. STS, however, seeks to jointly optimize both social and technical systems to improve overall performance throughout the entire system and simultaneously improve the quality of working life in that system. It is a design approach driven by values, principles, and results.

STS designs are developed according to a clear set of principles. The STS process creates organization designs for system optimization and designs all systems simultaneously (joint optimization). It corrects for errors as close to the source as possible (variance control). It addresses multiple goals with each design choice (multifunctionality), it specifies only those design elements that are critical (minimum critical specifications), and it makes design choices that work to maintain alignment of all system elements (system alignment). STS design relies on a number of tools and methods to achieve effective organizational designs. It works from both top-down and bottom-up perspectives in order to capture the variety of experiences in a system. STS design begins with an environmental scan that informs the design with current internal and external contextual data that will have an impact on the work of the organization. Variance analysis, social system analysis, and technical system analysis are performed to best understand challenges within the system as well as challenges with its external environment. These analyses are used to perform the whole system design and contribute to the ongoing, continuous renewal process.

STS design has been used successfully in a wide variety of organizational settings and types ranging from for-profit to not-for-profit, from manufacturing to service sector, and from very old coal-mining operations to brand-new knowledge work applications. It may be especially appropriate in knowledge work settings since these often tend to be driven by the technological imperative rather than a more effective whole system approach.

STS is a proactive design process that seeks the best joint solutions for the entire enterprise. It pays attention to the entire system simultaneously to ensure solutions for part of the enterprise will not do damage to another part. It essentially scans the environment (internal and external) to understand the context for operation, utilizes that information to create a vision of the future and the environment in which the organization must operate, and makes design recommendations based on the needs of all systems within the organization. It is a holistic approach to design.

IT-Dictated Design

In contrast to the approach of STS design, IT-dictated design (design by default) often creates challenges and unexamined, unanticipated, and unintended consequences. Too often, technical systems are the first to show stress in an organization that needs design help. An organization, for example, discovers that it needs new capacity or new information in a new market segment. A common approach is to go out and buy new software or even a new IT system in an effort to resolve the problem, and then to believe the problem has been solved or the organization designed. Instead, the new IT system has dictated the new design, and leaders have neglected their stewardship of designing the organization. Embedded within the new software is a set of assumptions, premises, and trade-offs that define the associated processes and arrangements of the IT package. These assumptions and premises will define the major support system that is in operation, and will therefore make choices that define processes and arrangement tradeoffs, thereby constraining design choices. Just look at the earlier examples of the corporate technology tail wagging the dog.

That organization has spent nearly a decade creating a decentralized, fully coordinated system of operations based on a particular set of values that included the concept of trusting organization members at all levels to make decisions that directly affected their work. The operating systems had been designed to provide appropriate information to organization members to enable them to make good decisions at the

source. The system design also created supportive structures to help organization members work together well and to achieve results through tight coupling with the customer. Instead, the technological imperative drove information higher in the organization, took control out of the hands of those who were in the best place to make decisions, and moved much of the joint work of the teams in the organization to higher decision levels. This became an exercise in design by default, and the organization lost much of the deliberate design strength and culture it had spent years developing.

What's the Problem?

Some might suggest that the differences in the design approaches for the organization and for the technology are not significant enough to matter, or that it is simply another choice of approach. We contend, however, that the core difference here is the challenge that arises with a design-by-default approach (tail wags dog) versus a design-by-choice approach (dog wags tail). Implementation of information systems as a response to the challenges of organizational design needs results, most often, in design-by-default; it takes an information processing technology, overlays it on an existing system and culture, and allows it to drive the design and operation of the organization in a direction different than what was planned. This gives rise to a set of unintended, unanticipated, and unexamined consequences that derail or prevent the careful design of systems and operations. STS design, on the other hand, is a cognitive-processing approach to organization design, requiring a thorough analysis of all systems within and outside the organization that will be used to support informed cognitive choice around all design elements. This includes anticipating and designing to the desired outcomes. It is design-by-choice. The problem for our organizations is that we stand to lose a great deal by falling into design-by-default.

Large IT systems (e.g., ERP systems like SAP, Baan, PeopleSoft, JD Edwards, Oracle, etc.) can become the tail rather than the dog if not handled appropriately as a segment of a larger integrated design process like STS. These systems can move from enabling the technical conversion process of a large-scale design to strangling it, and they can do so quickly and without planning. In fact, all types of electronic interventions that fall under the definitional umbrella of IT (and not just the category of IT known as ERP or customer relationship management [CRM] or human resources information systems [HRIS]), can hamstring whole-system design in this way if not utilized appropriately. Such interventions can enable (automate) processes to enhance design efforts and performance, or they can replace existing work systems and organizational processes. If they replace such processes and systems without exploring the implications and consequences of those choices, then design-by-default has occurred and may cause significant unexpected damage to the organization.

Over the past 15 years or more, we have seen much about the reengineering of work processes. In too many instances, these reengineered processes have been created to solve specific problems and address crises of the past. Hence they are not always well crafted or designed to fulfill the organization's vision, mission, and values or to be aligned with the customers and marketplace of today or tomorrow or to achieve results. Automation for the sake of automation has often automated inappropriate or outdated processes that should have been replaced instead of automated forward—much like the old adage “garbage in, garbage out” from early computer days suggests, if one automates trash, one gets more trash faster. To avoid such dilemmas, organizations need to take more care to design (or redesign) processes to fit our needs now and for the future.

Likely Outcomes of IT Primacy Over STS

As one designs, configures, and implements new software (and hardware) solutions, it is common to discover that existing work processes are not doing what they are supposed to do and that they are getting in the way of desired outcomes. Yet too many continue forward with the IT projects, ignoring the systemwide implications of not revising processes that no longer fit. Today's large organizations cannot get into the game without ERP systems for managing their supply chains; they need such systems to manage the data required to compete on a global basis—there is too much transactional data to manage in any other way. The trend in the market has been to turn over business process management to contractors who have these ERP systems

rather than using the contractors as enablers to get the processes needed for success up and running internally. Too many organizations think a large IT system will solve their organizational design issues (and, in fact, many companies selling these IT systems deliberately sell them this way), so those organizations needing ERP solutions do not take ownership and their performance outcomes are suboptimized or their operating designs are compromised.

In addition to the simple fact that these systems are not always compatible with existing whole-system designs, ERP systems are so complex that they create a barrier for organization designers who do not always understand the structures of the IT constellation or the software code, so they abdicate or simply lose their design responsibility. The reality is that few people understand the big picture of the entire IT constellation, and few broadly understand the structure of the software modules in large enterprise-wide systems that enable supply chains. The magnitude and scale are difficult to comprehend, and our design approaches and methodologies have not kept up with the scale of the organizational design task. Complicating this, the primary way that consultants with behavioral science backgrounds have been brought into such projects is as change agents rather than as designers, so they become perpetrators and co-felons rather than the design consultants they were invited to become. Even where they do understand the full implications of a massive ERP implementation, they are often the lone voice of caution on a train running full steam ahead.

Discussion and Conclusions

It is not difficult, then, to see where the conflict comes from between organization design by choice and organization design by default. Yet how do we avoid the potential for design-by-default that accompanies large IT installations in many cases? How do we avoid the unintended consequences that often occur when we retrofit a complex IT system over our existing structures and systems?

We could look to Jim Collins's work in the arena of "Good to Great" for some initial insight. Collins tells us that companies that have gone from "good" to "great" think about technology and technological change differently than do other organizations. They select appropriate technologies carefully and apply them even more carefully, often pioneering them. These successful companies, which adopt a hedgehog approach, in Collins's terms, carefully define what they can be best at (the core of the hedgehog concept), and then determine whether there is a fit with the technology under consideration. If there is a fit, they move into application; if not, they are not afraid to leave it alone. For good-to-great companies, technology accelerates momentum; it does not create it. It is never a root cause of greatness or decline (Collins 2001). So for effective organizations, technology and technological decisions enhance the organization and its operations; they support the existing or desired systems and processes, rather than defining them.

To resolve the dilemma that allows IT technical systems to take over design in organizations, we also need a clearly defined organizational design system and process to help us ensure the efficacy of our design. Solid organizational design systems and processes are based on good theory and rely on solid methodology to achieve strong results. They must exercise both design discipline and creativity while holding tightly to organizational purpose and desired outcomes. The STS approach does this effectively.

The "socio" segment of STS refers to the design of the social system—the orchestration of people and organizations. The "technical" segment refers to the physical or knowledge-based conversion process by which inputs and resources are converted to outputs or outcomes. Once an organization (a system) is clear about its unique contribution to the marketplace, it can effectively assess and adopt appropriate application(s) of technology (IT) to support its organization's technical conversion processes with full understanding that the IT process helps support that conversion process—the IT process does not comprise the technical conversion process, but rather is a support system for it.

Lessons from the Dog and the Tails

The lesson for leaders, followers, designers, and implementers is not that IT and large IT system implementations are bad. In fact, these systems can provide significant, powerful, and critical data that supports organizations in achieving their goals. Some would say that large IT system constellations are "must

have” or “table stakes” in some lines of business. Yet the systems are only as good as the process that is designed to integrate them into an organization. And for the design to be a good one, it is imperative that it be a whole-system, deliberate design, not a design that occurs by default.

Designers and implementers of IT systems must pay attention to the intent of the design into which they are fitting their systems. They must look for the likelihood of unintended, unexamined, and unanticipated consequences and design around them. For anyone fortunate enough to be involved in the design, it is imperative to identify the dog up front, to understand the system as it is intended to function, and to maintain the values, culture, and operating principles of that system as designed through the whole design and execution process. It is just as important to identify the tail, and to identify any possibilities for the tail to take over the dog. This is the only way to ensure a system design in which the dog wags its tail.

A note of caution is important here. IT systems are, by nature, large and powerful, and they create a momentum of their own when implemented into organizations. IT system designers often respond to quite different design specifications and criteria than do organization designers, and many are simply not aware of the fundamental havoc an IT system can wreak on an unsuspecting, unprepared organization. Because the social and technical (operating) systems of organization are often designed separately from the IT systems (and by different people), there is high potential for conflict when the two are brought together: each group has a vested interest in doing its respective work well. And if the two groups cannot work together on a common design, this conflict often boils over, and people involved on both sides need to be prepared to face opposition to their ideas and potentially great turmoil during the planning and implementation phases. Remember, vested interests are not easily given up, no matter who holds them.

Success comes from clear and carefully planned collaboration in both design and implementation phases. Organization system designers and IT system designers must work toward the same mission, goals, operating philosophies, and values of the target organization. Organization designers need to learn more about the underlying assumptions and capabilities of the technological (IT) systems being implemented in organizations, and IT system designers need to learn more about the purpose, goals, and desired outcomes of the organization designs into which they are placing their systems. Only with such joint collaboration, and a clear sense of how the outcome will function, can all designers be certain that they are creating dogs capable of wagging their tails.

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