The SEAM Four-Leaf Clover, Revisited

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Abstract

Implementation of new technology is among the most costly investments that an organization can make, and cost-conscious managers are employing models of organizational change to ensure delivery of intended benefits within expected timelines. Organizational change models are applied proactively to identify potential project risks that may add to implementation timelines or increase costs. SEAM theory can also be applied to highlight some important factors that should be considered in planning and assessing the results of technical implementations. The SEAM four-leaf clover emphasizes that the inter-relationships between people, technical and organizational structures are a key factor driving the economic performance of the organization. Inter-relationship means that people, organizational structures and technology are not separable phenomena in organizations. Thus, when any one variable changes, people, structures, or technology, the changes can result in unintended consequences that may add to costs. These costs may be hidden in the sense that they are only indirectly related to the solution, and because the costs are difficult to measure with accounting systems alone. SEAM theory regards these unintended impacts as organizational dysfunctions, and advocates for active management of hidden costs to improve performance. SEAM theory also emphasizes the idea that technology is an inert ingredient of change. People are the active ingredient of change in technical implementations; that is, people have the potential to leverage new technology to create value for the organization.

Key words: SEAM four-leaf clover; hidden costs, organizational structures, technology.

Organizations have increasingly focused on use of technology as a source of organizational change and renewal. There are many ways that technical solutions can significantly benefit organizations. Technical solutions can be applied to reduce operating costs or as a way to gain the attention of customers by differentiating the organization from its competitors. Product offerings can be customized, and inventory can be more carefully managed if the organization has the capability to analyze real-time demand from customers. Internally, information flows across the organization can be improved so that stakeholders have ready access to dashboard displays of key performance indicators and on-demand reporting. Cross-functional workflows and processes can be accelerated by careful application of analytics. While these are just a few examples of the technological capabilities that may benefit an organization, there is an all-too-common problem that planned benefits to the organization can be offset by other, unintended impacts of technical implementations. There can also be other competing interests within the organization that slow the pace of a technical implementation, or

groups within the organization who seemingly come out of the woodwork to challenge the purpose of the project itself.

Sustained competitive pressures on costs, along with the rapid pace of technological change, is driving the need to implement new technology at a faster pace. Information Technology (IT) managers regard it as part of the work effort to avoid unnecessary delays caused by people who resist planned changes. In addition, new technology must interface with other tools and applications, and there is a need to fully review all of the technical changes required to support the implementation. Because of the technical complexity of the work involved, there are new IT roles for people who are dedicated to these assessments, along with new accountabilities to manage project risk and costs. Within mature IT service organizations, there is increasing use of organizational change management models to frame the scope of work that must be done to implement the new technology, and to identify potential issues that could affect timing or costs. Many change management reference lists include models originally developed by William Bridges, John Kotter, Harold Leavitt, Kurt Lewin, and Everett Rogers. These models are listed alongside more contemporary organization change models developed by consulting organizations such as Boston Consulting Group, Deloitte and McKinsey.

Given the use of models of organizational change as a way to speed up implementation of new technology within organizations, the time seems right to review SEAM theory and revisit the nature of technical change in organizations. SEAM theory highlights important ways that models of organizational change can be misunderstood – and consequently misapplied – in a technical context. The principles of scientific management, outlined by Frederick Taylor and developed in an industrial era a century ago, are still impacting the organizational mindset – even in high-tech, knowledge-based organizations. SEAM theory shows how the benefits of technical changes that the organization wants to make can be offset by unanticipated and hidden costs that create a drag on economic performance. SEAM reinforces the idea that people have the potential to add value – along with the related idea that people, not machines, are the active ingredient of change.

The Four-Leaf Clover

The four leaves of the SEAM clover represent the organization as a complex set of interactions between people and the structural elements of the organization. At the center of the clover, there are arrows between the behaviors of people and the organizational structures that people interact with. The arrows go both ways, meaning that structure can affect the behaviors of people, and the behaviors of people can impact the effectiveness of the structures that the organization creates. Figure 1 shows how these interactions can have an impact on the economic performance of the organization. When people use their informal power to either speed up or slow down the pace of changes to structures, the planned benefits of change are offset by costly dysfunctions related to delays or resistance. These costs can be *visible*, in the sense that negative

impacts can be seen in monthly financial reporting, or *hidden*, in the sense that the overall performance of the organization has suffered but the root cause is not apparent.

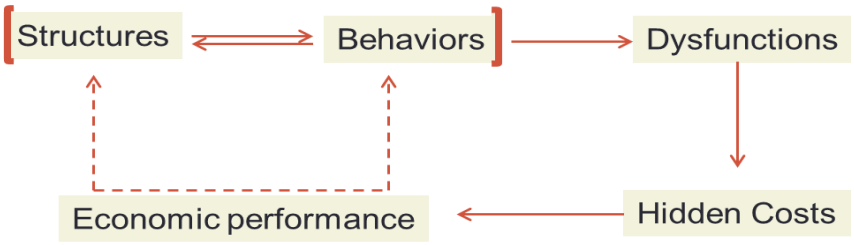

Figure 1. Adapted from Savall, H, & Zardet, V. (2008), p. 8. This model shows the interaction between structures and behaviors, and the idea that people can use their informal power to either speed up or slow down the pace of change. Economic performance within organizations is driven by the aggregated quality of these interactions across the organization.

The SEAM four-leaf clover emphasizes that the inter-relationships between people, technical and organizational structures are key factors driving the economic performance of the organization. Work by Harold Leavitt explained the nature of these inter-relationships. Leavitt observed that people, organizational structures and technology are not separable phenomena in organizations. He saw that a change in any one of the three variables will trigger changes in each of the other variables, and may ultimately feedback on the problem itself. Taken together, SEAM and the work of Harold Leavitt emphasize that when we introduce changes to any one variable -- people, structures, or technology -- the changes can result in unintended consequences that may add to costs. These costs may be hidden in the sense that they are only indirectly related to the solution, and because the costs are difficult to measure with accounting systems alone. SEAM theory regards these unintended impacts as organizational dysfunctions, and advocates for active management of hidden costs to improve performance.

In SEAM theory, the word "structure" is a concept that includes physical characteristics of the organization like space, atmosphere and other attributes such as noise, heat, lighting, and – in the SEAM language – work conditions. The idea of physical constructs as "structure" makes intuitive sense. Beyond the physical characteristics of the work environment, however, the SEAM conceptualization of structure also includes other, less obvious structures such as the organizational division of labor and functional relationships – where cross-functional processes and hand-offs are regarded as part of the structure of work, and referred to as work organization in the SEAM language. In addition, the concept of structure also includes demographic characteristics of the working population – as well as the mental characteristics such as the organizational mindset, such as management styles and the general atmosphere of the work environment.

In addition to physical, organizational and mental forms of organizational structure, there are also technological structures that include equipment and automation. These days, "equipment" within a large organization can include a large infrastructure of inter-connected data centers, servers, personal computers, and printers -- just to name a few examples. Technical infrastructure is inter-connected in the sense that there are dependencies across systems, so that a change in the data/ information/ status on one system will impact other systems. Equipment is not only connected with cables, but the data exchanged between systems can create a web of dependencies, where – for example -- one system depends on the output from another system before it can execute an automated task. The SEAM reference to "automation" is a similarly conceptual form of structure. The concept "automation" refers to the idea that tasks and cross-functional processes are fully developed through a suite of programs or algorithms that do not depend on people at all. Automation can also be applied selectively – for example, at key points in a process – in order to accelerate decision making or replace a repetitive task.

Perhaps most people employed in an organization have encountered organizational structures that are incompatible with their personal sensibilities. Even in daily life, outside of the work environment, there are many examples that can illustrate the nature of conflicting inter-relationships between people and structures. Consider the simple example of a highly-automated consumer service center that does not provide a caller with the opportunity to talk with another person – but instead commands that callers enter numbers on a smart phone keypad, or type personal information into a chat window. Just when the caller's issue is about to be resolved, the caller is transferred to a "live" customer service associate who knows nothing of the caller's initial work effort driven by the computerized commands. The caller bristles at this needless inconvenience, and silently adds up the cost of the personal time, and – in exasperation with the entire situation – silently vows to shop somewhere else next time.

When people within organizations interact with technological structures, the negative experience of the interaction can be similar to the call center example, above. These adverse reactions result in hidden costs in the organization. ISEOR[1] research has found that there are many potential sources of hidden costs – so many, in fact, that ISEOR has developed a typology specifically for dysfunctions related to technology. For example, there is a typology just for the problems that people encounter when trying to create information. Technology-related dysfunctions related to information can include issues such as inaccurate data that is used in decision making, non-production because computer programs did not execute, mistakes in downstream reporting if the data sources are incorrect, lack of controls on data, insecure data, and inconsistent data across the organization. These dysfunctions result in hidden costs in the sense that the costs are not itemized on financial reports. Even the most contemporary

[1] The Socio-Economic Institute of Firms and Organizations (ISEOR) was founded by Henri Savall in 1975. ISEOR is a research and teaching organization that works closely with the University of Lyon (Université Jean Moulin Lyon 3).

accounting systems are not designed to capture costs at such a granular level of detail. More than that, the hidden costs become more systemic when people begin to accept the dysfunctions as "*that's just the way it is around here*" and costly problems persist for years without being challenged.

Leavitt's Diamond Model

Similar to the SEAM conception of the organization as an aggregate of inter-relationships between behaviors and structures, Leavitt also thought of organizations as inter-related systems designed to perform complex tasks. Leavitt, a respected scholar who published the classic book *Managerial Psychology* in 1958, wrote extensively about the inter-relationships between people, structures, and technology that are featured so prominently in the SEAM four-leaf clover. Leavitt was also an astute observer of the early impacts of technology on organizational structures and on the behaviors of people. Levitt developed the Diamond model to show that there can be unintended and unanticipated consequences when technical solutions are implemented. Leavitt's model represents the idea that a change in technology ultimately affects (sometimes adversely) organization structures as well as the behaviors of people. Even after decades of technological advancements, Leavitt's model is still an important presence in the literature used by IT change management professionals. In order to avoid unnecessary project costs, the Diamond model still frames the scope of work required to attend to behavioral and structural changes when technical solutions are implemented.

Although the contemporary use of the model is appropriate, it is also important to recognize that Leavitt originally developed the model to show what happens when different groups of people in organizations bring different kinds of solutions forward to solve problems. For example, the operation of the customer service center (referenced in the previous section) may have been the focus of organizational debate and discussion about alternative ways to manage customer call volumes. Perhaps a senior executive had framed the problem of customer call volumes to be solved efficiently and at the lowest possible cost. One group in the organization may have brought forward a technical solution to fully automate responses to customers, and presented automation as a way to reduce the number of calls that would need to be handled by a customer service staff member. Another group may have emphasized the importance of personal interactions as a way to ensure customer satisfaction, and presented an option to increase staffing in the customer service area. A third group may have expressed concern about the disconnect between the customer service organization and the marketing and sales organization, and presented an option to re-organize the two functions under the same leader.

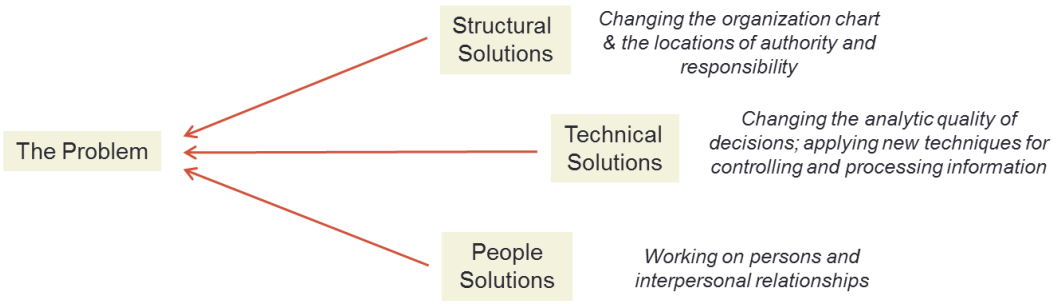

Figure 2. Adapted the book *Managerial Psychology* (1964, p. 321), by Harold J. Leavitt. Leavitt's Diamond model is a representation showing how different groups of people bring different solutions forward to solve a problem. Leavitt pointed out that every solution is incomplete because each solution will affect the factors that are important to the other groups. Leavitt also emphasized that structure and technology are not separable phenomena in organizations.

Leavitt also emphasized the inter-related nature of organizational change, and the idea that a change in any one of the three categories (people, structure, or technology) inevitably impacted the other two categories – sometimes with unintended consequences. Leavitt's point was that it does not matter which option is selected, because each option is incomplete; that is, no one of the options presented by the three groups will affect the way an organizational task gets done without involving each of the other groups. As Leavitt put it, everything triggers everything else. For example, if a structural solution is selected (such as the idea to reorganize departments under one leader), then the solution will not only affect the problem but may also affect the attitudes of people and interpersonal relationships, as shown in Figure 3. In the customer service example, the group of people bringing forward the solution to reorganize may have envisioned the benefits of closer ties between customer service and sales. However, the group may have overlooked other important and existing relationships. For example, the change in structure could adversely impact the relationships between customer service and other parts of the organization such as production or delivery.

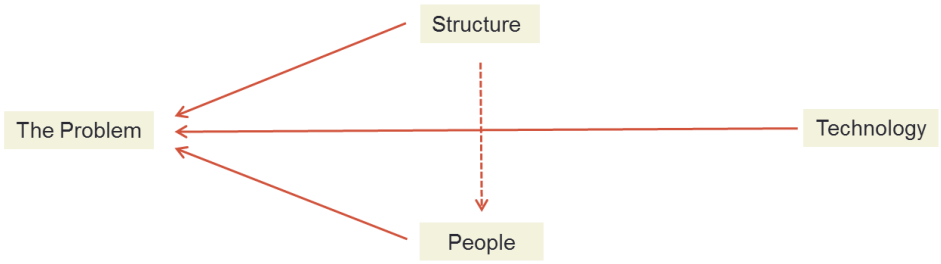

Figure 3. Adapted from Leavitt, *Managerial Psychology* (1964, p. 322). Leavitt pointed out that if structural solutions are applied to solve a problem, then the structural solution will not only affect the problem but will also affect and interpersonal relationships and personal behaviors.

In addition to the impacts on the behaviors of people, technology could also be impacted because the organization's accounting systems would need to be changed to meet the needs of the expanded marketing and sales organization. Leavitt observed that technology has the capacity to change the flow of information in organizations. With that shift, the locus of control would also shift; that is, decisions could be made in different places in the organization than before -- which in turn has an impact on structures. Leavitt described how the unintended impacts of change continue to reverberate – pinging back and forth between people and technology, between technology and organization, and so on -- ultimately impacting the problem itself. Those unintended consequences could result in costs that completely offset the intended benefits.

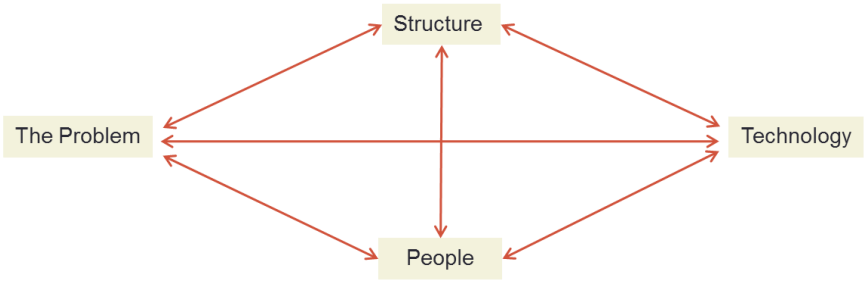

Figure 4. Adapted from the book *Managerial Psychology* (1964, p. 323) by Harold J. Leavitt. The diamond shape of Leavitt's model is intended to represent the idea that different solutions to organizational problems will impact other areas of the organization, and that the change will continue to reverberate over time.

Evolving Organization Development Theory

While Leavitt linked his research to the changing behaviors within organizations, he was also interested in organization development and the history of management thought. Leavitt saw that people, structure, and technology not only represented different solutions to problems, but also the way that people think about how to solve problems. Leavitt observed that the way people frame problems is informed by a succession of management thinking, theories and techniques that have evolved over time. More than that, he saw the historical succession of ideas as incomplete and conflicting theory. Writing in the late fifties, Leavitt (1964) noted that "these theories and techniques have not always been with us. They have appeared on the organizational scene mostly over the last fifty years; they have traveled over fairly clear routes, and sometimes they have bumped into each other" (p. 326).

In Leavitt's view, evolving management theory was still operating as separate disciplines in the organization. Each represented different ways of framing a problem. His model was intended to show that the three different disciplines were not only three ways of framing the problem, but also represented three different OD disciplines (and bodies of theory) that had not yet been integrated. The succession of ideas to which Leavitt was referring included scientific

management, participative management, and information technology – represented in his model as people, structure, and technology.

Contemporary SEAM practitioners are aware of the impact of Taylorism and the way that continued application of the principles of scientific management is like a virus that infects the health of many organizations. Leavitt (1964) saw Taylor as a curious and imaginative engineer, as someone who seems to have been a "scientist, a questioning man, a fact hunter" (p. 327). Leavitt noted that out of Taylor's observations of Schmidt, a man working in the Bethlehem Steel Works, came an influential set of ideas about how to define, measure and plan the work process. Leavitt described the "paraphernalia of scientific management" as including job descriptions, work standards, individual incentive schemes, organization charts, and work flow diagrams.

Leavitt also pointed out that the inherent conflicts between problems framed as related to people, structures and technology are due, in part, to incomplete and conflicting OD theory – and that the idea that the underlying principles of scientific management and participative management were in conflict. While Leavitt seemed to respect the contributions of Taylor's research and the ideas of other industrial engineers, who were actively working in organizations at the time, he thought of the *theory* as incomplete. Leavitt wrote, "The problem, of course, was the human problem. For what Taylor had done was to separate the planning, thinking, imagining parts of Schmidt from the moving, doing, acting-out parts" (Leavitt, 1964, p. 330). Even at the time when Taylor and other industrial engineers were implementing his ideas, there was strong opposition to the principles of scientific management, and a rejection of the way that an employee such as Schmidt was treated as unit of production. Critics of scientific management argued that Schmidt was not valued for his individual contributions as a human, his creativity or his potential to figure out the best way to do the job.

Leavitt (1964) argued that "Taylor and his colleagues were not unaware of such human needs. They simply had no very good tools for dealing with them" (p.334). Leavitt also pointed out that the resistance of workers was costly for business, and so were the costs associated with a tight authoritarian structure. Leavitt noted that the principles of scientific management had resulted in overlapping areas of authority and responsibility and formal, restricted communications across the organization (p. 332). Organizations had benefitted from scientific principles of management, but the human costs had offset many of the benefits.

The impact of scientific management on human costs led to the idea that people should be involved or participate in the decision-making and planning affecting their work. Participative management became a new wave of thinking that ran counter to scientific management, which held that decision-making and planning should be handled by management. Then, as perhaps even now, managers trained to apply the principles of scientific management felt anxious about the apparent loss of control as decision making and planning was pushed

down in the organization. However, Leavitt (1964) also pointed out that there were also benefits – including the idea that managers could interact with employees and other managers to talk things over. Other benefits included the development of training and management development programs, and attention to team spirit.

Technology as the Third Wave

At the time when Leavitt described the Diamond model, so much of the technology that is taken for granted today was still on the horizon. And yet, even then, Leavitt thought of technology as a third wave in the sense that it would have a significant impact on management of organizations. Leavitt (1964) pointed out that technology would bring new problems that had not yet been subjected to analysis and that the "manager's problem is somehow to cope with these overlapping waves of progress" (p.341). In describing the three different waves of management thinking, however, Leavitt was optimistic about the future. Leavitt was not wringing his hands or suggesting that with so many issues to deal with, managers might simply give up. Instead, he made the point that there has been progress. And even though theory is conflicting, it is informed by valuable research. Solutions to problems that are related to technology, organizational structures, or people are in and of themselves meaningful frameworks for decision making and problem solving.

Leavitt's work suggests that the cross-currents of inter-relationships between people and structures are more than a set of personal behaviors to control; rather, the interactions are a result of the way the problems are framed in the first place. Perhaps more to the point, when problems are framed as technical problems, that doesn't necessarily mean that the *solutions* to the problems are solely technical. When new technology is implemented, there can be impacts to other technical structures used within the organization. In addition, the skill sets required to implement new technology may be very specialized – and the organization may need to recruit people that possess the specialized expertise. Depending on the technology, other technical capabilities within the organization could be affected, and there may be a need to review flows of information or to assess changes in cross-functional processes. Investments may need to be made to develop the skills of people, or to ready the organization for the impacts of the new technology. In a cost-conscious environment, the additional costs related to skill development or organizational readiness may appear to be unnecessary. However, the costs are better managed deliberately as visible costs, rather than after the fact as a new set of hidden costs associated with dysfunctions.

Discussion: A Return to the Four-Leaf Clover

SEAM theory provides critical perspective about the reasons that organizations fail to achieve expected results from technology. When solutions to problems are framed as technical solutions, then the potential contributions that will need to be made by people are sometimes overlooked. SEAM is clear that technology is a structure that does not by itself add value to the

organization. Only the creativity and initiative of people can activate the potential value of technical investments. In order to get the hoped-for returns from the technical solutions, management beliefs and values will also need to change. First, people should not be regarded as interchangeable with technology or financial capital. Second, people should be regarded as a source of value and the active ingredient of change, rather than a potential reason for cost over-runs or delays due to resistance to change. Third, managers should focus on management of dysfunctions in the organization that lead to hidden costs before concluding that costs (especially people) need to be cut.

Technology is a structure. Technology does not represent just one structure that people encounter in the work place each day – but rather a multitude of structures that are in an almost continuous state of change. The number of technical structures that people encounter in their daily work has only grown with automation of tasks and processes, along with the ongoing introduction new equipment and systems. In order to get work done, people must comply with the implicit demands of each structure – and there may be many structures associated with a single task. The number of technical structures is compounded by the number of organizational structures, and people must deal with all forms simultaneously.

When people become over-powered by the sheer number of structures that they must interact with, they can become indifferent to the directives of management, slow the pace of implementation, or actively resist change. These behaviors can create hidden costs in the form of absenteeism, low productivity, accidents, sub-standard work, and turn-over. There may also be an increase in hidden costs in that appear in other areas of the organization – but that are actually related to the introduction of new technology.

People are not interchangeable with technology or financial capital. There is also a de-humanizing quality to the imbalance of structures vs. people – almost as if people and structures are managed as an integrated whole, and people are thought of as interchangeable with the technical structure. This is particularly true when people are an integral part of a cross-functional process. In most organizations, people are still accounted for as costs, no different than other sources of technical of financial capital. Salaries and benefits make up the largest share of an organization's expenses – especially in knowledge-oriented businesses. As a result, there is a tendency to weigh the cost of people vs. the cost of automation or systems development. When people are accounted for as costs, it may seem cheaper to solve a problem by *"just throwing people at it*". The idea that people are not interchangeable with technical or financial capital is clearly expressed by SEAM; that is, technology is inert, and the knowledge of people is the creative force that activates it.

People are a source of value. There is also a confusion about the idea that people are valuable. It is one thing to regard a person as 'valued' for their inherent worth as human beings. It is altogether a different idea to think about people as a source of value and way to improve the

economic performance of the organization. SEAM theory is built on the related ideas that people are the only source of value and the active ingredient of change and that technology by itself is inert. This means that the people have the capacity to add more value to organizations than the cost of their salaries and benefits. This capacity is freed up when people can work productively, and when they are supported by management with training, good working conditions, and other forms of support. While investments in technology can demand scarce funds, value is created only when people leverage technology in a way that is meaningful for the organization.

Focus on management of hidden costs. While cost-cutting strategies may include people, structure and technology solutions, Leavitt's work would suggest that pulling all levers at once will not necessarily accelerate implementation time or positively influence the behaviors of people. Instead, these levers of change may create a set of conflicting issues and adversely affect costs in unexpected ways. SEAM interventions are a way to resolve these underlying conflicts, and reinforce the potential of people to add value to the organization. SEAM interventions reconcile the creative tension associated with control vs. delegation by conducting interviews horizontally – across the leaders in the organization – as well as vertically among team members. SEAM interventions also engage employees to plan work that will reduce hidden costs. The work is tied to the organization's strategy, goals and objectives – which may also include technical components and plans.

Conclusion

Almost a century has passed since Frederick Taylor advanced his ideas about scientific management. Over that span of time, industrial design, technology and views about the value of people have changed radically. If Taylor were to have continued his research over the last few decades, it would be interesting to see how he would have adjusted and changed his ideas about efficiency and productivity within organizations. Taylor probably would have taken great interest in contemporary end-to-end automated processes that are accelerated by analytics. He likely would have been a great champion of process improvement and integrated quality controls. He would have been gratified to see the sophistication of management planning and decision-making processes. Taylor would likely have noticed the co-existence of technical and organizational structures, along with the placement of people within the structures.

One wonders though, what Taylor would have made of the current day knowledge worker who contributes to the organization through knowledge -- as opposed to the contribution of physical strength and stamina exhibited by the laborer named Schmidt in the Bethlehem Steel Works yard. In Taylor's day, there were fewer processes to follow – and work was divided into discrete parts to maximize productivity at each step in the process. People had only to repeat the process. Today's knowledge worker is expected to understand the complexities of multiple systems, work effectively upstream and downstream of those systems, and to analyze relevant inputs and outputs. Today's knowledge worker is also expected to work cross-functionally, to

understand the perspectives of multiple stakeholders, and to anticipate issues before they occur. In Taylor's day, these responsibilities would have been associated with management; today, they are delegated to people capable of dealing with the complexity and detail that is central to the operations of the organization.

If Taylor were to notice the contribution of knowledge and the location of that knowledge at the front lines of the organization (as opposed to the top of its hierarchy), how would he have adjusted the principles of scientific management that he espoused? Perhaps Taylor would have gone so far as to create a new edition of his principles. His new edition might even show an interesting set of data; perhaps he would have captured the incremental economic values associated with the contribution of the knowledge, creativity and initiative of people. This information would radically change the way that organizations are managed today: The focus would be on increasing the value that people bring to organizations, as opposed to accounting for people as cost or unit of input. Another way to answer this hypothetical question is to return to SEAM theory. SEAM represents the integration of management theory that developed over time – theory that not only revisited the principles of scientific management, but also reconciled those principles with the need for participative management and the importance of the potential of people. The SEAM four-leaf clover shows that the performance of the organization is influenced by the inter-relationships between the behaviors of people and the organizational structures that people encounter. Leavitt, too, emphasized the importance of the inter-relationships between the behaviors of people, organizational structures and technology. The view of management represented by both SEAM and Leavitt point to the idea that it is the knowledge, creativity, and initiative of people that adds value to the organization. Despite decades of progress, many of today's technical strategies still rest on Taylor's industrial-era view of the employee as laborer, strategically placed in a process – as if the process itself was the only way to improve productivity and economic performance. In order to realize the benefits of new technology, however, the organization's view of people needs to change from the idea that "*people are valued*" to the idea that people are not only valued, but also that "*people add value."*

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