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SYSTEMS DOING SYSTEM STUFF

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ABSTRACT
One of the elements of Deming's System of Profound Knowledge is systems thinking. During the past year or so, I have watched as several clients struggled with problems that seemed to defy resolution where the central issue turned out to be the lack of a systems approach. Our preferred approach to problem solving and process improvement is an analytical one. According to my Oxford, the word analysis means; *resolution into simple elements*, or to break things down into smaller chunks for study and understanding. Analysis is necessary, but by itself, is insufficient. We need also to use synthesis. The Oxford defines synthesis as; *combination, composition, putting together; building up of separate element, esp. of conceptions or propositions or facts, into a connected whole, esp. a theory or system.*

Businesses tend to naturally focus on an analytical approach, and this is a necessary element. However, we need also to understand the synthetic approach, or systems thinking. Much has been written on this approach in recent years, but in most companies much remains to be done to make this approach a living reality.

It is still common for different departments to be in pursuit of divergent aims. This in itself can be a significant problem. One of the first lessons in teamwork is that unless a common aim exists, where teamwork exists it does so not because of the management system, but despite it. There is little point in asking for better management of work processes which flow through several departments if the monthly reporting system, the key performance indicators and manager's accountabilities all occur in a functional, hierarchical framework. People hear the call for teamwork and a process approach, but what they see is how their performance is actually judged. They see what senior managers do, and pay lip service to what they say. Words beget words. Action breeds action. Rather than telling people what is required, management needs to show them. The phrase, "like this" is extraordinarily powerful when coming from a leader.

ONLY THE PROCESS COUNTS

The reductionist era is passing. With it is passing an era where the specialist ruled; where analytical skills were preferred to an ability to synthesise; to see a system as a whole. Already leading businesses are bringing much more emphasis to a multi-disciplinary, cross-functional approach.

As Dr. Deming, Dr. Ishikawa and Dr. Juran noted so often, the bulk of the causes of poor productivity or quality is usually found in the first few steps of the process rather that where the problems surface. Very often, these first few steps are off-line aspects such as raw materials, scheduling, recruitment/training and maintenance. Functional thinking locks operational managers into their own departments or areas, and

prevents them from tracing problems to their root causes which often will be upstream in another department or division.

The Australian and US automotive industries discovered that part of the reason that Japanese companies had such low assembly costs was that they had put enormous effort into the manufacturing of components in the upstream operations. The components were so uniform; so precise, that as one executive noted, the specifications had disappeared "over the horizon", and that the cars practically fell together.

When Australian and US automotive panel pressing plants were investigated, it was discovered that the variation in steel thickness, tensile strength and hardness were greater problems than the pressing process itself. It is worth noting that at the highly successful joint GM/Toyota plant in California, that the steel for body pressings is imported from Japan. One is forced to wonder why the operation would be willing to pay the extra cost of importing steel rather than using the less expensive locally made product. Could it be that the variation in US made steel is high enough to cause considerable losses at the manufacturing and assembly plants? Who measures such costs in our businesses? How?

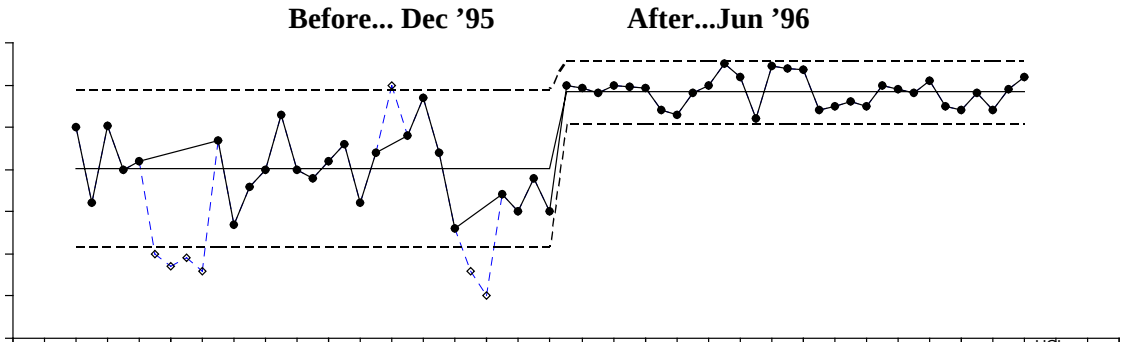
In one bank, it was discovered that the loan application process had a rework rate of seventy percent, something that had gone unnoticed until this waste was measured. The cause was found to be in the design of forms and computer screen layouts, and not at the workplace. A redesign dropped the rework levels to less than five percent, and allowed over half the staff in one department to be redeployed elsewhere.

In a host of manufacturing and distribution processes, one of the biggest causes of variation is the planning/scheduling process itself. Often the causes of major problems are not so much at the factory or in the distribution centre as they are upstream in the air-conditioned offices of the schedulers.

SOME EXAMPLES

Metallurgical. In metallurgical plants vast quantities of money and many man-years of work are expended in an attempt to improve yields, quality and productivity. Most of this work is happening within the metallurgical plants themselves, which probably accounts for the lower than anticipated rate of success. At Leinster Nickel Operations the Resident Manager, Mr. Peter Smith, changed the focus to inputs; to the incoming ore itself. Blended stockpiles that gave the plant uniform raw material to work with and the removal of over-control resulted in many millions of dollars worth of productivity improvement. Figure 1 shows the improvement in yield achieved.

FIGURE 1
TRANSFORMATION AT LEINSTER NICKEL OPERATIONS
Daily composite samples - recovery of nickel from the ore

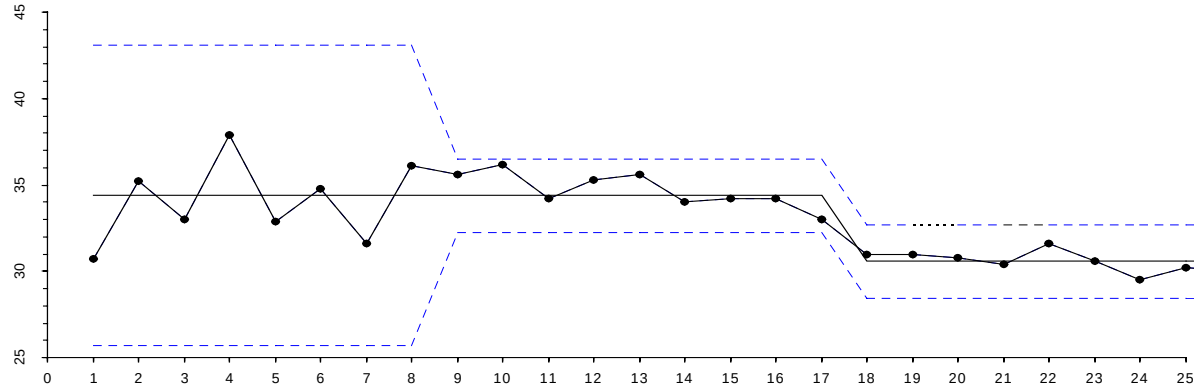


No amount of work at the plant could have achieved this result. It was necessary to see the entire system, and to work at the upstream end of this system.

HOSPITALITY INDUSTRY

A hotel chain in North America was concerned with costs in the restaurants located in its hotels. Much had been done in an attempt to reduce costs, but most of these efforts seemed to be short lived. Then a director took a personal interest, and he changed the focus to the hotel as a whole and its marketing. He reasoned that the productivity of the restaurants was inexorably linked to the hotel itself, and he changed the marketing and productivity efforts to re-combine these elements. The fruit borne of his change in focus can be seen at Figure 2 below.

FIGURE 2
MONTHLY LABOUR COSTS - ONE RESTAURANT
(Expressed as a percentage of revenue)



This reduction in costs was achieved not by studying the restaurant's operations, but by seeing it as part of a larger system, and addressing that system (from a marketing perspective in this case).

HIGH SPEED ASSEMBLY

A factory in Europe assembles plastic components into a medical device. The assembly process is both complex and high speed. The major productivity issue was stoppages, and much effort had been expended to reduce them. The improvement approach was focussed on engineering studies and changes, a most common approach in a modern, technologically advanced operation. Stoppage data was collected on each element of this highly sophisticated, state of the science process and Pareto type analyses conducted to find the major problems. About ten engineering studies that focussed on a single element had then followed. Many of these studies resulted in engineering changes that clearly improved the performance of an important element of the process. The local, functional data were clear; the engineering changes to these elements had worked.

The stoppage data for the entire assembly process were then plotted onto a control chart. Whilst several small drifts (both up and down) were evident in the data, there was no overall improvement in the stoppage rate. None of the successful engineering changes could be identified on the control chart.

The system was doing system stuff. It was behaving like an enclosed fluid. When one spot was pressed, a new bulge occurred somewhere else. When this bulge was pressed in turn, yet another bulge appeared. This type of behaviour is common, especially in complex and/or close coupled and/or high-speed processes. The assembly process under examination exhibited all three characteristics.

Now the engineers and managers at this plant are taking a more synthetic approach and are studying incoming components, production scheduling and planning, machine set-up and several other characteristics. At last report, this facility had improved productivity by over fifty percent. If you note that some elements of your process have undeniably been improved, but the overall performance remains largely unchanged, is can be a good idea to look for systematic problems that are either off-line or upstream, or both.

PHARMACEUTICAL

In this case several pharmaceutical sites exhibited a common problem that they called deviations. In essence, a deviation is any departure from standard operating procedures or any measurement that is outside specified parameters. Every deviation is fully investigated, and corrective action to prevent recurrence is the norm. The chemists, engineers and biologists at each site had made changes in an attempt to design these problems out. Again, when each aspect was examined in isolation, it was clear that many of them had worked.

However, a control chart of total deviations for each site showed pretty good stability. This indicates again that the system is doing system stuff, and that the current level of deviations is likely to continue until the

system is addressed as a system. Again, in these circumstances it is wise to step back, look at the larger system and to focus initially on upstream and/or off-line characteristics.

Ford Australia made similar discoveries in the early to mid eighties. They had a strong focus on the warranty repair rate. Many issues had been addressed and in some cases certain types of failure all but disappeared from the warranty claims. The fix had worked. Nonetheless, the overall warranty repair rate remained at a fairly stable level. In this case, most of the problems had variation and/or poor design as root causes. When one issue was addressed, the system, behaving like an enclosed fluid, produced either new problems or increased the level of old ones.

PLASTIC EXTRUSION

A company making a complex set of plastic extrusions had for a long time struggled to improve quality and productivity. Quality and productivity problems manifested themselves most commonly in rejected coils of product, claims from users of the product, and low production rates. Nearly all the improvement work was focussed on the production process itself. Not much improved.

Then a new executive with experience at a quality approach to management was appointed. He immediately shifted the focus to production scheduling and to incoming raw materials. Close work with suppliers and changes to delivery schedules for raw materials were implemented. Production scheduling was changed to minimise disruptions to the manufacturing process. New approaches to maintenance were examined and several other initiatives were launched. In the following six months, the number of claims paid to users fell to zero and not one coil of product was scrapped.

This executive knew his system was doing system stuff. He knew that those people studying the production line were too late in the process. By moving upstream and off-line, this executive had precipitated a profitable metamorphosis. In addition, customers were better served and employees no longer needed to fight with the process to make good product.

TERMINOLOGY AND MENTAL MODELS

One of the problems oft encountered in consulting work is terminology. Words can and do have different meanings as one moves from one company to another. To illustrate, if one visits Sola Optical Australia, it soon becomes clear that the word “process” is all encompassing. It includes not only the people machines and methods actually making the lenses, but also the uniformity of the raw materials, production scheduling and planning, the levels of operator skill and training, maintenance and the design and suitability of the machines used. However, one can then visit another client and discover that when they use this word, they mean only that which happens in the manufacturing area. Sometimes, all the off-line activities (including scheduling, design, maintenance, raw materials and training) are called business processes, along with pay and other administrative processes. Also, the words process and system tend to be used interchangeably in most places, but not in all.

It can be helpful when thinking and talking about, say, manufacturing processes, to make it clear that when you use the word “process” you mean all elements including raw materials, scheduling and maintenance. One helpful way to do this is to prepare an outline flow diagram of the entire process. Such a diagram is not a panacea. How, for instance, do we include effective maintenance or skill levels or whether all departments have a single common aim in such a diagram? Systems thinking is a mental model, and can be annoyingly difficult to explain to people whose thinking is locked in their own department or section.

Sometimes a consultant will visit a facility and a short time later see what appears to be a fairly obvious cause for a chronic problem. It is truly amazing the number of times the response from the local manager is a puzzled expression followed by yet another explanation that that is not in his area, and the comment: “Could we focus there for now?”

For instance, during a plant tour of a bottling facility, I asked for some dimensional data on the bottles. The manufacturing manager did not have any, but told me the purchasing folk might be able to help (they could not). He then left me to chat with a couple of supervisors. Within an hour the supervisors and I had liberated a vernier gauge and measured several dimensions of about 150 bottles and made an average and range control chart with the data. Observing some odd patterns, we then made some distributions and

discovered a bimodal distribution. About one bottle in five or six was larger than its mates. By the end of the day we had managed to speak by telephone to the manager of the manufacturing line that made the bottles and discovered that they were made in a die that had six cavities. The implication was obvious.

We then found the manufacturing manager and told him of our discoveries, thinking he would be pleased with our work. He was not. After dismissing the supervisors, he explained how disappointed he was, and left me in no doubt that if my fee was coming out of his budget, he expected me to work in his department, solving problems there.

I have never returned to this plant.

This is an extreme case. However, this lack of system thinking is very common, although happily it is less extreme in most cases. Most managers are willing to look at an entire system once they can see the value in doing so. It is not always so easy to get the necessary levels of cooperation from other managers, particularly if they have different objectives.

SUMMARY

It is axiomatic that systems thinking will be integral and automatic in a world-class business. The challenge for those who know their businesses have some way to go is to understand why people do not think that way currently and what might be done to improve matters.

Firstly, the psychological literature indicates that the proportion of people who use system thinking quite naturally is lower than is the proportion of those who do not. Moreover, those who are natural system thinkers often are unaware that they are in a minority. They seem to think most people, and certainly most managers, use systems thinking naturally.

Secondly, as mentioned earlier, most corporations have in place organisational structures, accountabilities and reporting systems that actually discourage systems thinking. Until managers address these issues, these corporations will struggle to make systems thinking a natural and everyday occurrence.

Finally, there is much that managers can do to encourage systems thinking in the short term. They can visit the manufacturing facilities and encourage people to look upstream and off-line, as discussed here. If managers ask to see the data on incoming raw material so they can better understand it in terms of uniformity, they stimulate different behaviours as well as attend to their subordinate's education. If managers will plot out data such as warranty repair rate, deviations, claims, reject coils and see that it is fairly stable, this gives them clues as to how they might steer their subordinates in the right direction, particularly if they know much improvement work has been undertaken. At the risk of being boring, **get upstream and get off-line.** There is a great deal more to systems thinking, but this would be a good start in most corporations.