Safety through enabling systems

Radical increase in mining productivity results in improved safety

In 2013, after spending many years doing manufacturing turnarounds, the world's foremost TOC in Mining consultant invited me to help and reduce his workload. In the late 1990's, he designed a powerful intervention called the Productivity Platform. It combines the best of Theory of Constraints (systems thinking) and Dialogic Organisational Development to improve production flow. This approach typically delivers 20-30% increased output (with same resources) within 6 months. Even more surprising is that the intervention requires one consultant spending two days or less per week with the client.

Near the end of my involvement with the first client, I noticed some unusual changes. The pressurised work environment had been replaced by one where "super flow in a spirit of calmness" was the norm, managers and workers now seemed to enjoy their interactions. Employees (and managers) became noticeable engaged and innovative in their approach. But more than that, it seemed that the safety performance was starting to improve. On asking my colleague about this improvement in safety he smiled and said, "when the productivity improves so does the safety". A year later I read the shareholders report and found that they had won almost all the safety prizes in their group. With the next client, the same relationship held, as productivity improved so did the attention to safety and safety record.

This I found surprising, substantial literature is available highlighting the trade-off managers and workers are constantly making between productivity and safety. There are numerous examples of accidents where, with the benefit of hindsight, investigators and researchers have pointed to the apparent focus on the productivity agenda to the detriment of safety. Professor Sydney Dekker[1] maintains that organisations that claim that "*safety is our number one priority*" are fooling themselves. "*And so, there's always a constant set of goals that are active at the same time, people need to be safe, but they need to produce, so that you can survive until the next day, the next year, the next quarter*".

I found this contradiction intriguing and started a journey to understand 1) why productivity improved so dramatically and 2) why improved safety, employee engagement and innovation emerge spontaneously because of the new way of working 3) why the traditional safety productivity trade-off seemed no longer (at least in the short term) to be in operation.

Safety in Australian mining

Prof Sydney Dekker of the Safety Science Innovation Lab at the Griffith University says about safety in mining[1] "*It was only when I came to Australia about four years ago…that I realised that the safety conversation here is dominated completely by a couple of big miners, who in turn have long relied on an ideology and recipes provided to them by, particularly, organisations with a very behavioural focus on how to create greater safety*".

"*That has certainly yielded results, but at the same time, I have seen an increasing impatience and disenchantment with the difficulty to get rid of residual injuries and incidents, as well as fear among those of a non-reduction in fatalities. So, we keep producing the same number of fatalities that we have been doing for years*"

"*the challenge is to step away from a recipe of overparenting, and when I say overparenting, what I really mean is an increase in monitoring, surveillance, coercive control of how people are behaving, where they stand, how they lift, which finger they use for which task.* "

The present management paradigm: Command and Control

In Freedom from Command and Control [2] John Seddon highlights the many problems caused by our command and control management paradigm. He says, "*The separation of decision making from work, the cornerstone of command-and-control thinking, has its roots in Taylorism (scientific management) and was developed through the work of Henry Ford (mass production) and Alfred Sloan ('management by the numbers'). The issue is not that command and control was without value, for it solved problems for each of these management pioneers in new ways. But we have not continued to learn; the basic precepts of command and control are unquestioned although the underlying paradigm has outlived its usefulness.*" "*Computers have become the cement for command-and-control management. It is an unquestioned assumption that managers should have and set targets and then create control systems—incentives, performance appraisals, budget reporting and computers to keep track of them all—to ensure the targets are met.*"

Seddon continues his book by explaining that the Toyota system is in stark contrast to traditional command and control, here workers are connected with the objective of improved flow in self-organizing relationships. In managing flow, the work itself is the information, and this, in turn, comprises the information required to direct operations in the work. There is no separate management factory which inevitably creates distortions in meeting the system goal (Separation of decision making from the work is the defining rationale for the management factory.)

The "Systems Thinking for Safety: Ten principles" describe the problems following from Command and Control management very well.

"*…management focusses on component performance/efficiency. At an individual level, it includes incident investigations that focus only on the controller's performance, behavioural safety schemes*

that observe individual compliance with rules, individual performance reviews, incentive schemes, etc. The assumption is that if the person would try harder, pay closer attention, do exactly what was prescribed, then things would go well. However, as the management thinker W. Edwards Deming observed, "It is a mistake to assume that if everybody does his job, it will be all right. The whole system may be in trouble". Organisational theorist Russel Ackoff added that "it is possible to improve the performance of each part or aspect of a system taken separately and simultaneously reduce the performance of the whole". A focus on components becomes less effective with increasing system complexity and interactivity."

"Treating a complex sociotechnical system as if it were a complicated machine and ignoring the rapidly changing world distorts the system in several ways. First, it focuses attention on the performance (efficiencies managed through KPI's) of components (staff, departments, etc.) and not the performance of the system. We tend to settle for fragmented data that are easy to collect. Second, a mechanical perspective encourages internal competition, gaming, and blaming. Purposeful components (e.g. departments) compete against other components, 'game the system' and compete against the common purpose. When things go wrong, people retreat into their roles, and components (usually individuals) are blamed."

Acting on the system

From the article Systems Thinking for Safety: Ten Principles we get the following description of organizing work as a system. "*A systems viewpoint means seeing the system as a purposeful whole – as holistic, and not simply as a collection of parts. Improving system performance – both safety and productivity – therefore means acting on the system, as opposed to 'managing the people'. As design and management become more inclusive and participatory, roles change, and people span different roles. Managers, for instance, become system designers who create the right conditions for system performance to be as effective as possible.*"

John Seddon says "*Forget your people. Real leaders act on the system. Real leaders redesign the system to meet demand. When leaders act on the system, customers cheer, costs fall, and the culture change comes free.*" [5]
The systems approach employs the ingenuity of workers in managing and improving the system. It is intelligent use of intelligent people; it is adaptability designed in, enabling the organisation to respond effectively to customer demands. What all need is a working understanding of the system, including the end-to-end flow of work.

The Safety Differently movement

Professor Sidney Dekker has been instrumental in making the principles of Safety-II more accessible. He calls it Safety Differently. Safety Differently says people are the solution, people know very well what to do and how to create safety. Rather than trying to foresee and predict and control their every move, use them as sources of resilience. It is the opposite of traditional safety where people are seen as the problem to control (you control this problem by wearing yellow vests, by monitoring their compliance, by surveilling their moves, because otherwise, they will cause problems).

Safety Differently also says that people should not intervene in other people's behaviour – we need to intervene in the conditions of their work. Rather than telling them what they need to do, we need to ask them what they need to do something well, and, we need to maximise the number of things that go right. When we ask those that do the work for examples where Work is Difficult we start to get a glimpse into "Work as done".

Managers are often surprised when they are confronted with answers to the above question. They become acutely aware of the difference between "Work as done" vs Work as imagined" within their own and other departments. In most organisations, competitive/operational strategy is developed at the top and then devolved to departments that need to operationalise and make it happen. They are also given KPI's to meet to monitor the effectiveness of their departments and their actions. There are several problems with this approach.

- In modern work environments, no manager has control over all the resources (IT, Engineering, Maintenance, Logistics etc.) required to meet their targets. Pressure is applied downwards to ensure that these targets are met, but the lower we go, the less the opportunity to collaborate effectively across functional lines to achieve the overall purpose of the system.

- No manager will admit that they are unable to achieve their mandated targets or that problems are developing that they cannot handle, that would be career limiting. After all, we promote people for their ability to solve problems or to bring a solution to the table. The result is that bad news does not travel to those with authority to act on the system, and the knowledge of mismatch between "Work as done" and "Work as imagined" stays with those doing the work. Management loses the opportunity to identify constraints affecting the overall flow of work and to transform the system.

- If the KPI's measure activity standards for departments originating from the budget (not related to the overall purpose of the organisation) it is likely that the emphasis will be on fixing the parts in isolation while ignoring the overall system. We are guaranteed suboptimum overall results and continuous trade-offs between productivity/safety and innovation.

The Productivity Platform – Enabling the system through a system-based adjustment to command and control

At the start of our mining interventions, we typically find a distorted system as described in the previous section. Amidst poor overall productivity, we have internal competition, gaming, blaming. Departments compete, people retreat into their roles and the level of employee engagement is poor.

The stop-start nature of the flow, blaming and gaming generates a tremendous amount of wasteful activity which needs to be managed consumes management attention. Often management tries to deal with this by setting aside a substantial proportion of available time for management meetings. These can easily take up 20% of available time. Furthermore, most of the issues discussed are raised and dealt with by functional department. At this level of seniority, the knowledge of Work as Done is

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closer to Work as Imagined. Senior Mine Management's span of attention is overloaded and focussed on the wrong activities.

We are not advocating the abolition of hierarchy and command and control. Attempts to introduce alternative, more humanistic ways of management have mostly ended in failure. To ensure mines are efficient in the long run and to ensure mines meet their obligations to various stakeholders we need many elements of Command and Control management and Hierarchical structure. We do argue that with the advent of ERP systems, more information available from Information Systems the pendulum has swung too far towards Command and Control. What we are proposing is a platform where we can ameliorate the most significant negative outcomes from this way of managing, where managers and employers can safely practice and perfect the new way of doing.

This is where the Productivity Platform (PP) comes in. In more than 80 interventions it has achieved output increases of 20%- 30% and have reduced operating cost per tonne by 10-30%, typically within 3-5 months. Inside the daily Productivity Platform Meeting it unshackles employees and managers from the worst consequences of Command and Control. By providing managers and employees with a common visual representation of the flow of work and bottlenecks it becomes possible to align departments and to coordinate work across departments at the level where work is done. When a problem develops in a department (which can affect flow) it remains the relevant manager's responsibility but now departments able to help are expected to do exactly that. After delivering feedback to the group on their department's performance the previous day the final question is "What help do you need to make sure that your section can maintain the overall production flow in the next few days." This not only aligns everyone's performance to the overall goal but builds relationships and trust. In this manner, we stimulate dialogue and ensure that responsibility can be safely delegated to the lowest level possible. Continuous improvement and innovation cannot happen without alignment and trust.

The joy managers and workers experience from becoming successful ensure that we get culture change without the need for a culture change program. To maintain the new culture, we change the way we measure our employees and departments- we focus on System KPI's not departmental or individual ones.

Immediate benefits are:

It stabilises the production chain at a higher level which substantially increases profits. It also reduces cognitive load on managers and employees, frees up time and helps to focus the innovation process in the areas where it will have the most immediate returns. The previous tendency to game the system, apportion blame and retreat into functions disappear. Employees become engaged and volunteer their energy for spontaneous continuous improvement efforts, the mine becomes attractive to prospective employees. Since there is no need to force processes above their inherent capability, and since time pressure and cognitive load on managers reduce safety automatically increases.

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How the Productivity Platform enables productivity, safety and innovation

The Productivity Platform is based on principles of TOC and Dialogic Organisational Development and embodies many of the principles of Safety-II[3] (Safety Differently). Because safety is endangered when work becomes difficult to do we need to create an environment where

- We can see the problems and ask people what they need to do something well
- We can intervene in the conditions of work to make it easy to do
- We realize that "work as imagined" is different from "work as done" and that those doing the work should decide how to do it
- We can provide autonomy, purpose, mastery while maintaining command (not control)

The Productivity Platform makes the overall goal of the system clear, it identifies and communicates the role of each person and department in achieving that (by getting work to flow faster through bottleneck areas) and changes the management paradigm to one where we manage the overall system for greatest effectiveness and efficiency. The increased clarity of purpose, advance warning of problems, alignment and trust enables production flow to increase by 20-30%, using the same resources. Superflow in a spirit of calmness (work becomes easy) makes more time available and takes away the need to force work through the system faster than it can safely handle it.

- After a few months of running the daily Productivity Platform Meeting the bottlenecks have been identified (problems making work difficult),
- The departments/managers/workers are aligned to get increased, stable flow through the bottlenecks
- Through daily dialogue, all involved understand the work as done characteristics in all areas. Every part of the mining production chain has an effect (with a time delay) on every other part since we continuously cycle from blasting to load and haul, to staking and block preparation, drilling and charging, and back to blasting. This makes the dialogue about issues experienced relating to flow crucial for managing the overall system.
- The visual picture of production flow is visible to all and enables a shared vision of what needs to be done, especially in the short to medium term. Managers are thus able to delegate to subordinates without losing touch with what is happening. Employees now see the purpose of their work and can improve their mastery every day. This environment is also excellent for leadership training and development.
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As production flow stabilises at a higher output the critical boundary where safety issues start appearing shifts outwards, allowing a larger safety zone. The law of stretched systems is still at play which requires that buffers and excess capacity must be maintained to ensure the new level of productivity and safety is maintained. Apart from the inherent improvement in safety originating from superflow in a spirit of calmness, the managerial span of attention frees up, more focus and resources can be allocated to the remaining "when work is difficult" areas. This further increases the zone of safety without decreasing productivity.

Conclusion

Mining organisations generally plan and organise work according to Command and Control principles. There is great value in this way of structuring operations, but when it goes too far, it leads to a focus on the activities and performance of individual departments and employees at the expense of overall system performance. As stated in "Systems Thinking for Safety: Ten Principles "..*a mechanical perspective encourages internal competition, gaming, and blaming. Purposeful components (e.g. departments) compete against other components, 'game the system' and compete against the common purpose. When things go wrong, people retreat into their roles, and components (usually individuals) are blamed."* Under these circumstances, unity of purpose and trust disappears.

In this manner, managers destabilise the flow of work and overload their cognitive abilities since everything becomes important and in need of constant attention and adjustment**. Work becomes difficult** for them and their subordinates.

The information factory (information on work is sent away to be processed by people not involved in the daily work and returned in the form of control measures), which is a consequence of Command and Control management, follows from "work as imagined" at senior level being considered the same as "work as done" at the coalface. Given that the work environment in mining is dynamic and shows a high degree of variability and interdependency, efforts to control work remotely shackles the ability of subordinates to compensate and adjust properly to the situation as it unfolds.

The most powerful management efforts focus on changing the accepted best practice management paradigms. Seddon says "Forget your people. Real leaders act on the system. Real leaders redesign the system to meet demand. When leaders act on the system, customers cheer, costs fall, and the culture change comes free."

The Productivity Platform enables mine management to work according to systems principles. It creates a platform where managers and employees can safely practice the new way of managing, without getting rid of the beneficial characteristics of Command and Control and Hierarchy.

It reduces the levers to control to the absolute minimum and unshackles employees to do what needs to be done for the good of the whole. It creates an environment where employees have a purpose, can achieve mastery and have more autonomy.

It exposes the difference between work as imagined and work as done. This is a crucial step towards improving the overall system.

Managing according to the new paradigm creates superflow in a spirit of calmness and expands the capabilities and outcomes of the system under management control. In other words, **work becomes easy.** Managers and employees can coordinate across functional departments and deliver exceptional results with current resources. The critical boundary where safety issues start to appear shifts outwards, allowing much higher productivity while improving safety. More time is available to discuss the effect of operations on safety and to find innovative ways of mitigating these issues.

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It is possible to radically improve productivity, safety and innovation in mining. But to do this we have to adjust our management paradigm. This is much harder to do than getting a Tier 1 consultancy to launch a Productivity, Values, Safety, Digitization initiative for us, but the rewards are so much greater. This article dealt primarily with mining, but it is possible to adapt the productivity platform to project, service and supply chain environments also.

References

1) Sidney Dekker, Q&A with Professor Sidney Dekker, Australian Mine Safety Journal, October 2015.

2) Seddon, John, Freedom from Command and Control: Rethinking Management for Lean Service , CRC Press, Kindle Edition.

3) Eurocontrol, Systems Thinking for Safety: Ten Principles (Moving towards Safety-II), August 2014

4) Eurocontrol, From Safety-I to Safety-II, September 2013

5) Seddon, John, Forget your people-real leaders act on the system, Reluctant Management Guru, Systemsthinking Review, June 2010

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