



Kumba Resources

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Introduction

Kumba Resources is a South Africa-based mining company formed in 2000 out of the separate listing or resource assets of the former state iron and steel corporation, Iscor. Kumba derived its name from the Zulu word 'ukumba' which means 'to dig', and formulated the motto 'Harnessing the power of the earth'.

The roots of the high involvement innovation programme within Kumba go back to the mid-1990s and a programme called Total Operations Performance (TOP) whose goal was to reduce a significant portion of all 'compressible' or controllable costs.

It involved both re-engineering and a continuous improvement (CI) programme with the objective of ensuring incremental performance gains on a year-to-year basis of 3% in real costs. In order to ensure participation from the whole organization, a system of on-target bonuses was implemented to serve as an incentive for achieving the TOP targets. During the implementation phase of the project, the bonus system paid out 40%, 70% and 100% respectively of the proposed savings when (and if) targets were reached. Although the bonuses enhanced involvement, the savings also resulted in activities being reduced and, in some cases, less labour being needed. People were very much in two minds during the process.

The top-down approach of the TOP programme was a culture shock for the majority of employees. Having been a state-owned company for many years, the TOP approach created a level of resistance against 'any kind of improvement' from many of the employees. A concern arose during the process that this resistance would mitigate the effect of many of the savings of the project if, after the last bonuses were paid, nothing was in place to drive further continuous improvement. Although a formal CI organization was established, the envisaged savings of 3% annually on a real base were not realized.

In retrospect, the TOP programme delivered on its short-term promises. Unfortunately, owing to the top-down nature of the programme, only a selected group of facilitators was trained in the analysis and improvement techniques. Accordingly very little skills transfer took place during the process. The CI organization that was put into place after the TOP did not have a definite drive to empower the organization and instill a new performance culture.

In order to move towards a more effective approach for CI, Kumba embarked on a review of experiences in other companies. As an output from this process the 'back-to-basics' model was

conceived. It was an in-house model, constructed and refined in a joint effort by the corporate CI function, business unit CI personnel and line personnel. The model was based on the premise that a continuous improvement capability rests on two pillars, addressing the cultural/human side, but at the same time measuring 'hard' numbers i.e. the impact on the bottom-line.

The focus now included improving the 'capability to improve' on all levels through the organization. It was also realized that **the ownership for improvement** must be with the people that have **direct control over the costs or value levers**.



Figure 1: Continuous Improvement Elements: Four Bubbles

The 'four bubbles' were defined as the four basic elements or preconditions necessary to ensure a culture of continuous improvement for all employees. In a much simplified way the model requires everyone to **understand** why improvement is important and what exactly **his/her contribution should be**, people must have **the competence and skills to do problem solving, synthesise solutions** etc., there must be **support for employees that makes it easy for them to participate**, a system to measure their efforts and, lastly, employees must **be motivated** to put in extra effort to improve.

Testing the model

Kumba's 'back-to-basics' model was acceptable on paper but had to be tested to prove its validity and applicability. One of the smaller sites (Glen Douglas) was identified as a pilot site to test the model and also to obtain 'buy-in' from line personnel.

The methodology followed at the Glen Douglas site dolomite mine included:

- Assessment of current performance and improvement capability.
- Identification of gaps in performance and behaviour.
- Identification of potential enablers.
- Implementation of enablers.

In order to improve or change it was deemed necessary to determine a reference point. The first problem that the development team encountered was the absence of an assessment tool that fitted the reference model. An existing assessment was sourced from a consultancy firm that measured some of the critical elements of the model. Although the fit was not 100%, definite areas of underperformance could be identified. The assessment results were adapted to ensure a fair fit with the elements of the 'back-to-basics' model. This enabled a starting point for improvement initiatives to be determined.

Following the assessment, gaps were identified as well as potential building blocks or enablers. Each potential enabler was tested for fit with the pilot site's broader strategy and culture. Although the assessment did not identify all areas that needed improvement, it focused the priorities of mine management and changes that were eventually implemented facilitated a large improvement in performance. The enablers that were applied were the 5S Clean Up (visual improvement), a simple idea suggestion scheme providing monetary recognition for ideas, and visual performance measurement.

Development of four bubbles assessment tool

Following the Glen Douglas exercise, a tailor-made assessment tool was developed for utilization during the next assessment. This tool used the four bubbles notion and focused on stabilizing the environment and developing facilitative behaviours. Results were plotted on a five-point scale. A detailed matrix was developed to identify what actions were needed to advance to the next level for each element.

During the next six months Iscor's largest coal mine, Grootegeeluk, was assessed with this newly-developed assessment tool model. It provided much clearer results than the Glen Douglas case.

CI Maturity Model

While applying the 'back-to-basics' model in practice, internal research on the theme of Continuous Improvement continued. The work in Europe around the CIRCA project appeared to have a great deal in common with the approach that was followed by Iscor Mining at the time (J. Bessant, S. Caffyn and M. Gallagher, 'An evolutionary model of continuous improvement behaviour', *Technovation* 21(3) (2001), 67-77).

These researchers defined CI as an organization-wide process of focused and sustained incremental innovation, and suggested that it offers mechanisms whereby a high proportion of the organization could become involved in its innovation and learning processes. A critical attribute of the model developed by CIRCA was the two-tier approach that focused on performance as well as practices. These two elements also formed the foundation for Kumba's CI framework.

The CIRCA research on the capability dimension was more advanced than the four bubble model, and there was also a library of experience and case studies to back it up. Kumba subsequently adopted this framework as an enhancement of their model.

CI: A Kumba Strategic Initiative

After the split into a separately listed company, a decision was taken at Kumba executive level to establish Continuous Improvement as a strategic capability throughout the organization. The challenge was set to have all business units (BUs) on a level 4 (as defined by the CIRCA CI Maturity model) in three years.

In order to evaluate the maturity of the new company, it was decided to assess formally all business sites within the first six months of the existence of the new company. The assessment would not stop or interfere with any of the current 'back-to-basics' or other programme running at that time but would give a new focus to all existing CI activities.

Establishing CI in the new company

Development of the new assessment tool

Progress was made from the Glen Douglas assessment to the next assessment at Grootegeluk in terms of the fit between the assessment tool and the model. The acceptance of the eight dimensions of 'maturity model or matrix' as the new 'official' capability measurement reference posed the same challenge as was experienced prior to the Glen Douglas assessment. Although the dimensions to be assessed were known, it was to a large extent unfamiliar to the Kumba CI team. New questions had to be developed to measure behaviours and the responses had to be interpreted in terms of each maturity level.

The fact that the company decided to establish CI as a competitive capability implied that assessors from all over Kumba had to be trained in the new tool (a tool never used before). The developers of the model were contracted to train the first group of assessors with the specific focus of knowledge

transfer – enabling the group of assessors to develop the tool to fit their specific environment and purpose and to enhance the tool every time it was used.

Assessment tool enhancement

As CI was seen as a strategic capability for the whole organization, knowledge sharing and training in the use of the model became a priority. Each assessment on each business unit was considered to be a training opportunity. A team of assessors from all over Kumba was involved in each assessment, and CI facilitators and line managers became familiar with the use of the tool. ‘Cross-pollination’ between the different business units in the application of the assessment tool and other CI practices was a valuable spin-off of the multi-team assessment approach.

After each assessment the team would focus on difficulties experienced with the use of the assessment model regarding the questions or the focus group methodology. Enhancements to the assessment tool were implemented immediately and every business unit was supplied with the new version.

Although an official assessment of each BU’s CI capability takes place on an annual basis, only a portion of the BU is actually assessed. It is becoming standard practice in Kumba that the CI managers at each BU continue with the assessment throughout the year on all levels and in all departments. The aim is twofold, namely to sensitize every line manager about the use of the tool and, most importantly, to allow them to become familiar with the model and start ‘living the values’ and adopting facilitative behaviours.

Implementation challenges

In carrying out this work a number of particular implementation issues have emerged and it will be useful to mention some of these here. The first point refers to the specific firm and regional context and the need for adaptation. The Kumba CI assessment was, so far as is known, the first time this assessment was done in a mining environment. Furthermore, South Africa is a developing country and employees’ educational standards range from illiteracy to highly-qualified personnel. A third factor was language – South Africa is the only country in the world with 11 official languages. In common with many other sectors in South Africa there is also a suspicion about motives and workers’ unions are generally very wary of ‘management initiatives’.

Some lessons learned during the assessment are:

- Make sure the focus group understand what is meant, in terms of the model and in terms of their working environment.

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- At least one facilitator/moderator should have a clear comprehension of the group's frame of reference.
 - Use a common language/relevant terminology.
 - Make use of translators to improve effectiveness.

Language/cultural barriers

Kumba's Business Units are spread over a wide geographical area throughout South Africa and into Namibia (Rosh Pinah Zinc and Lead Mine). Each of these business units aspires to keep the demographics of their workforce the same as the specific area they are operating in. This naturally results in a 'mine specific' culture but also a combination of different cultures on every mine. For example, Sishen Iron Ore mine in the Northern Cape has a majority of Tswana-speaking employees while the majority at Grootegeluk will be Northern Sotho.

In developing the assessment tool for a specific mine, it is very important to identify translators who were familiar with the culture and language of the majority of the employees. Most African languages are rich in images but a concept like 'continuous improvement' is not part of their day-to-day vocabulary. It is therefore very important to familiarize the translator with what exactly was meant by a concept like continuous improvement. The facilitator then has to translate the meaning of the concept to the group. In most cases the use of a translator results in either extended discussions or periods of silence. With an effective facilitator an immense amount of detailed information can be gathered from the multicultural focus groups.

Minimizing variability between assessors

A critical element of the assessment is the level of experience of the assessors in interpreting the answers from different groups and identifying the key issues. A focus group approach was employed, which used open-ended questions. Interpretation becomes difficult when the questions are not limited to 'yes'/'no' answers. The Kumba team identified this as a potential limiting factor in:

- the validity/repeatability of the assessment results;
- the rate with which line managers throughout Kumba could apply the model with confidence.

The advantage of questions with only 'yes'/'no' answers is obviously the increased reliability of the assessment results. There are some disadvantages though, one being that with the development of these questions meant the existing assessment questions had to be expanded to four or five additional questions in order to cover the total concept tested. Another disadvantage is the potential loss of rich data, which could only be discovered through the use of open-ended type of questions, as this type of questions stimulates discussion.

The Kumba team decided to change their current model to accommodate both approaches, i.e. expand concepts to 'yes'/'no' questions but keep some open-ended questions to ensure the additional rich data is captured. One person in the assessment team will constantly be focusing on the 'yes'/'no' answers and another one will probe the group for information not covered by the 'yes'/'no' questions. The powerful forcefield analysis technique could be used for analysis of the data when open-ended questions were asked.

Case Examples in Kumba

Through the focused CI drive, as well as through specific individuals understanding the concept and driving CI on their own, a number of successes were achieved in Kumba through CI activities. A reverse analysis was done to determine if CI successes were due only to the parameters as defined in the model, or if there were additional factors contributing to success. The sequence of implementing CI enablers was considered to be important as well.

The implementation of the 'back-to-basics' model on most of Kumba's business units and the subsequent enhancement of the model by the maturity model has resulted in centres of excellence of CI at different business units in Kumba.

Four of the success stories at different business units or operations within Kumba were studied in order to identify:

- The real success factors that enabled improvement of performance.
- The link between these success factors and the dimensions of the CI maturity model.

Whether the order of events had an influence on the eventual success.

Four Kumba sites were analysed as to what contributed to CI success, and these factors were mapped against the behavioural elements of the model, namely Glen Douglas, Grootegeluk, Sishen and Thabazimbi mines.

Glen Douglas Dolomite Mine

Glen Douglas embarked on its journey of improvement as a result of negative market conditions. The case for change was clear: it needed to adapt or die.

As a result of CI actions, Glen Douglas improved its operating income during deteriorating market conditions by 23% within one year. A very strong improvement culture was established throughout the organization with ownership of continuous improvement adopted by line managers.

During an investigation into the factors that made the turnaround possible, the business unit managers and the team involved in the 'back-to-basics' programme highlighted the following elements (in order of importance). These are related, where appropriate, to the particular CI behavioural dimensions in the model (in brackets):

- 1. Buy-in from the total management team to the case for change was the first key to success (*understanding CI behaviour*).**

It was considered that the behaviour of management would only change if they believed in the reason for change and the stated course of action. Messages reinforcing the need for change were conveyed non-verbally as well as verbally by all members of management.

- 2. Targets were very clearly defined and cascaded down to every first line supervisor (*strategy deployment behaviour*).**

Key performance indicator trees were developed for every section on the mine. Each line manager knew exactly what his was impact on the bottom line, as did every supervisor. Annual targets were broken down to day-to-day and shift targets, and every supervisor took responsibility for the improvement of his value drivers or physical standards (e.g. ton/hour or litre/ton). These actions created a clear understanding of the business amongst all employees.

- 3. Performance feedback was given to the unit manager by the employees themselves, rather than only by the management team to unit manager (*strategy deployment behaviour*).**

A very successful action was the change in reporting methodology. Instead of getting feedback only from reports via the management team, the unit manager visited the whole mine on a weekly basis and asked anybody from a specific section to explain to him what was happening to the performance and the main reasons for variances. This created a sense of ownership of performance amongst everyone employed in the mine.

- 4. The improvement process was kept simple but focused.**

In order to get people involved in the process of idea generation and problem solving, the management team followed a structured and visible process. The focus was on three main actions:

- a) 5S (a well-known housekeeping process to create stability);
- b) formal idea management scheme;

c) visual performance measurement.

5. Visible, line-of-sight measurement was regarded as very important (strategy deployment behaviour).

Visual performance measurements played a major role to keep the workforce focused. The most critical value drivers in every section were visually displayed and every person (even shift workers) knew exactly what the current performance was. Caucuses (daily team meetings) and production team meetings were also focused on these visual displays.

6. A formal idea management system was implemented (participation in CI).

The transfer of knowledge, especially best practices, did not happen spontaneously at first. A formal system was needed to log ideas. This system had to be accessible to everyone on the mine. In order to change the behaviour, the focus was at first to get everybody to think about improvement. People were rewarded for taking part in the idea scheme, even if their idea(s) were not immediately implemented. The CI team implemented a process of evaluating the ideas and capturing it in the system.

Grootegeluk Coal Mine: haul truck maintenance section

Grootegeluk is Kumba's largest open-cast coal mine with approximately 2000 employees and an annual production of several million tons. They embarked on the 'back-to-basics' process during May 2001. The initiative was officially called 'Genesis', as it was intended to be the start of a new era – and so it proved to be. The in-house-developed 'back-to-basics assessment model' was utilized to assess Grootegeluk's CI status. The Genesis programme included an assessment of a representative portion of the mine's employees. A structured programme of detail assessments of every first-line supervisor followed this first assessment. Deficiencies were identified within each organizational area, and action plans for every supervisor were drawn up with the help of the existing mine CI team.

Concurrently with the assessment, a detailed analysis of all critical value drivers for every section was completed. Each line manager had to know what his impact was in relation to the bottom-line performance of the mine. All current projects and initiatives in each section were mapped against the value drivers for the section. Every line manager could thus reorganize and prioritize projects for maximum impact on performance of the section and mine. The principle of 'no energy wasted' was followed. An illustration of the analysis methodology applied (called the 'CI WHEEL') can be seen in Figure 2.

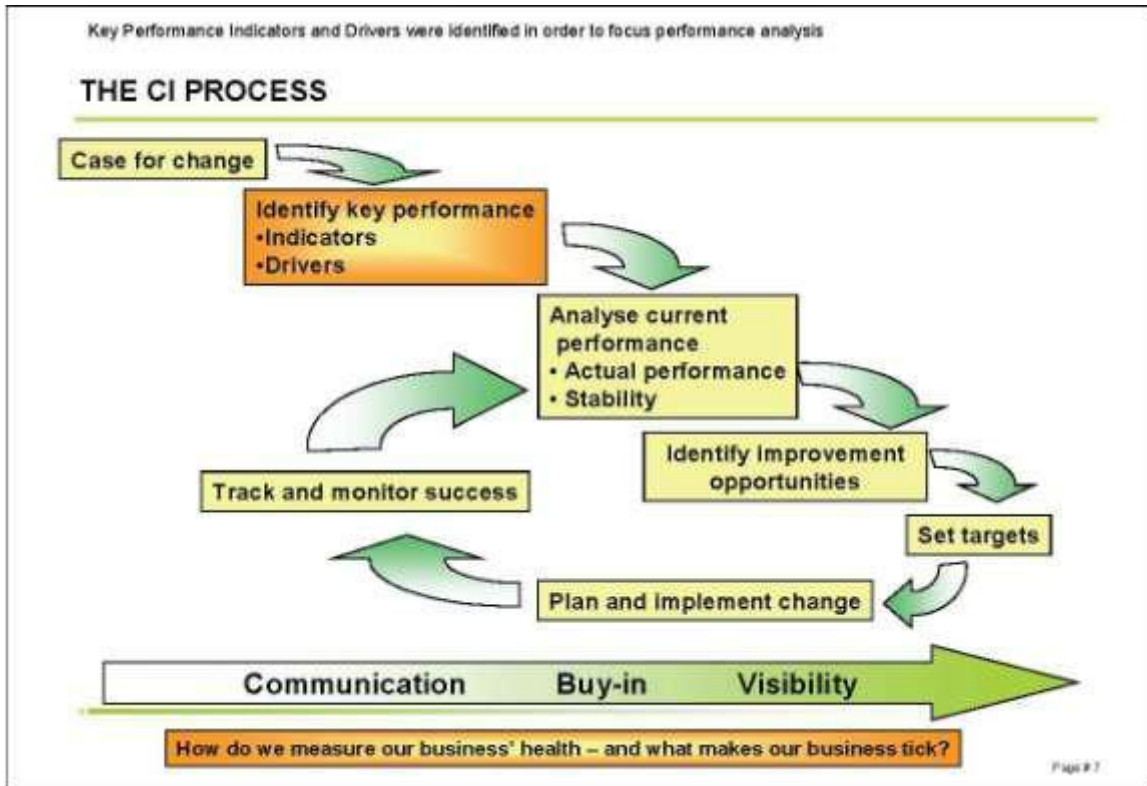


Figure 2: The CI Wheel

Linked to the process, a culture change programme was initiated. The focus was primarily on the establishment of a high-performance culture. This was excellent timing to ensure important elements of CI like CI leadership were addressed.

One of the most successful sections on the mine, the haul truck maintenance section was analysed to determine the critical success factors. This section maintains a fleet of fourteen 180-ton haul trucks. The average fleet availability was increased by 7% and sustained thereafter. With increased utilization of the trucks, they were able to withdraw a truck from operations. The following success factors resulted from the investigation, again in order of importance and linked to the CI model behaviours where possible:

1. Early successes are contagious (success breeds success).

The haul truck section was the first of several successes in the mining maintenance department of Grootegeluk. This specific section was chosen because the team was difficult to manage, apparently due to many employees aspiring to play a leadership role. The supervisor of the section recognized the potential of the informal leaders and suspected that a breakthrough would lead this team to greater success. The risk was that the informal leaders could undermine the supervisor's efforts if they did not buy in.

The gamble paid off and when the team made the breakthrough, and success spread to other teams quickly.

2. The principles for CI are constant, but the application thereof may vary because every organization/suborganization has its own dynamics (CI leadership).

As previously mentioned, the maintenance team included a group of very strong informal leaders. The section head, a mechanical engineer who had been part of the corporate CI group for two years, followed a much more indirect approach to CI at Grootegeluk. He showed CI leadership through making it clear that he trusted his subordinates. They did, however, need a form of visual measurement that would show the critical performance drivers of everyone in the section. The supervisor started off with high-level measurements, which were not ideal, but created ownership of the process and the measurements from the start. The process and measurements were upgraded only when buy-in was confirmed. The lesson learned is that one standard recipe is not the answer – treat every section/area as unique. Let the team take ownership of what is theirs.

3. Leadership, informal and formal, was vital to create focus and sustain it (CI leadership).

This section experienced that informal leadership was an important part of their success. Once the group defined their performance drivers and measurements, it became a group value to perform against these measurements. The section head provided technical guidance, but the energy to perform and improve was generated from inside the group.

4. Clarification of key measuring points (strategy deployment behaviour).

The construction of KPI trees was again the initial phase of analyses. It provided a perspective for the performance indicators and created understanding for the real drivers of performance. Once a common focus regarding the critical drivers is established in a section, far less energy is spent on non-value-adding tasks.

5. Visual measurement (strategy deployment behaviour).

The impact of visual performance in the section under discussion evolved over time. Critical measurements, in this case availability of equipment, were visually displayed in tea and caucus rooms. At the start of the process, the measurements focused on too many parameters, but eventually only the critical ones were left and used. Success regarding the performance of the trucks stimulated interest; as people became more interested, they demanded information to measure themselves more accurately. An important lesson is that as people mature, more complex measuring indicators can be used.

6. Support and resources must be provided (consistency in CI).

The group felt empowered to create their own success. They were supported, and provided with necessary resources through a CI facilitator and engineering support.

7. Recognition is vital (CI leadership).

The performance improvement of this section resulted in the section as a whole being asked to present their success story to the management team as well as their own colleagues. According to the foremen and artisans in this section, the public recognition meant a lot for the individuals as well as for the team. For the first time they were really proud of their accomplishments. Their work made sense to them and they felt good about it.

Thabazimbi Iron Ore mine

Thabazimbi, one of the Kumba iron ore mines, went through two TOP-type processes in order to reach acceptable productivity levels. This mine was also used as the pilot site to implement the new maturity model. The mine was turned around by focusing on the same basic elements that were experienced at Glen Douglas.

In similar fashion to the cases described above the success factors at this mine were identified and linked to the CI behavioural elements.

1. A clear vision for the mine was developed and communicated to everyone (understanding CI and strategy deployment).

The mine is the oldest in Kumba (in fact, the first modern iron ore mine in South Africa) and had only a few years left for economically viable operation. Through focusing on one major project involving new technology, a new and promising vision was developed. Although the application of this technology is not 100% finalized, the vision served to energize employees and gave them a reason to improve. The vision also served as the basis for developing goals and cascading targets.

2. The vision was visually communicated through a 'storyboard' (strategy deployment and cross-functional CI).

Colourful visual storyboard was developed for the mine to put all actions and interventions into perspective. This immediately created a consolidated picture in people's minds about seemingly

independent events driven by different parties. In turn people could relate other departments' contributions to the overall vision, and silos within which departments operated started to disappear. Being visual, the message could be communicated to everyone, regardless of literacy level.

3. As part of the creation of an environment conducive to CI, management started to celebrate small wins (CI leadership).

Once focus about the goals of Thabazimbi mine was established, an effort was made towards every small success that contributed towards achieving these goals. Ownership improved as people started to feel they could really make a difference.

4. The specific approach of 'Theory of Constraints' was used by the mine to create a shared focus (cross-functional CI).

Regular combined troubleshooting by all parties involved in producing the final product enabled the elimination of cross-boundary blaming. Currently a 'production team' tackles issues as a unit. Departments are not measured against isolated targets, but in terms of how they contribute to the mine's goals.

The sequence of events contributed to the success. Strategy deployment was the first action; it created focus and laid the foundation for the CI actions that followed.

Kumba's Learning about the Establishment of CI Capability

A number of key points have emerged in these cases, which provide valuable focus for future development work. It was found that the initial sequence of some of these actions is important, but subsequent actions may be implemented according to the availability of resources/enablers or the maturity of the workforce. The most important action to start with is the creation of a common goal to ensure focus. The alignment and buy-in of the management team with these goals and the subsequent behaviour of these managers form the initial driving force to change the employee's perceptions and create the urgency and the energy for change.

In order to lay the foundation for sustainable improvement behaviour, the deployment of the goals throughout the organization is crucial. This success of this goal deployment will be determined to a large extent by the visibility for all employees (strategy deployment). The following elements were identified as success factors for the establishment of behavioural change:

- Strong case for change can create momentum for an improvement drive by providing a common focus.
- Leadership and management's verbal and non-verbal commitment to improvement is vital.

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- A simple and structured approach prevents loss of focus during implementation, e.g. Glen Douglas actions, namely: 5S clean up, idea system and visual performance.
 - Proper analysis of the process and its key value drivers fosters understanding of individual and team contribution to the bottom-line.
 - It is important that everyone understands what needs to be improved and how this should be done.
 - Visual performance measurements are critical to maintain focus and create urgency.
 - Ownership of improvement determines sustainability, and it is therefore more important to allow ample time for buy-in than to have an exclusive top-down approach (may vary between situations).
 - For sustainable success, engagement in any improvement process should aim to empower employees and not threaten them.
 - A structured idea management system is a relative simple enabler to involve the majority of employees and also to enhance knowledge sharing.