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Total Safety Culture – A Case Study on Its Implementation

Dr. Li Sai Kwan, Aaron Li

DBA, Macquarie University, Sydney

***Corresponding Author:** Dr. Li Sai Kwan, DBA, Macquarie University, Sydney, Hong Kong.*

ABSTRACT

Introduction: Though the effect of safety culture on performance is well studied recognized, the question of what safety assumptions and beliefs are remains largely unexplored. With the contemporary studies on Total Safety Management (TSM) and its effectiveness in improving safety performance, it is plausible that TSM principles can be taken as the contents of a viable safety culture. Method: To this end, TSM principles are matched against the Safety Culture Maturity Model and a case study is quoted to explain how TSM principles can be operationalized into solid management actions. Results: A close similarity between TSM and Cultural Maturity Model is highlighted and a list of assumptions and beliefs in TSC is recommended. Conclusion: It is concluded that TSM principles constitute the contents of a viable safety culture. Value and Practical applications: A pathway for cultivating a Total Safety Culture is exemplified.

Keywords: *Total Safety Management, Safety Culture, Case study.*

INTRODUCTION

Since the occurrence of a series of disastrous safety incidents in the 80s (e.g. Three Mile Island, 1979; Challenger explosion, 1986; Chernobyl, 1986), the importance of safety culture is receiving ever increasing attention of academics. Yet in the extant literature on safety culture, much has been told about the definition of safety culture (Kerstan et.al. 2013) and the problem of having a less than adequate safety culture (Reason 1998), not much has been told to illustrate the requisite contents of a viable safety culture. As reported by Hui et al. (2002), an organization's safety culture can contains as few as 2 and as many as 19 factors. As safety culture has to be commensurate with the prevailing working environment and the context of the company involved, it is unwise to propose a universal safety culture that suits all situations. However, it is advisable to have a set of rationally agreeable safety values and management practices that can guide companies to develop their own safety culture. With the success of the Total Quality Management, beliefs and management practices basing on Total Safety Management (TSM) might be the right ingredients for filling this vacancy. Karuppan (1996) claims that the TSM approach will excel the traditional compliance based safety management system. In this pursuit, some empirical studies have identified a relationship between TSM and safety performance (Li 2016). However, most of them do not suggest the detail contents, especially at assumption level (Nielsen 2014), of a viable safety culture nor explain how to achieve it (Kerstan et.al. 2013). To this end, a case study is included to demonstrate the actions taken for cultivating such a Total Safety Culture.

Among many different definitions of "Safety Culture", the UK nuclear safety panel has offered a commonly quoted definition."The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organisation's health and safety management" (HSC 1993, 23).

In other definitions of Safety Culture, technical practices (Pidgeon 1991), actions, policies, and Procedures (Ostrom et al. 1993), way of doing things (Kennedy and Kirwan 1998), and attention and actions (Cooper 2000) are mentioned. Yet the actual contents of these values, beliefs, competencies, and practices etc. have not been elaborated. It is thus postulated that the contents of the original TQM principles, translated into safety terms, constitute a set of beliefs and practices that embodies the notion of Total Safety Culture. To support this postulation, it is necessary to review the original meanings of TQM principles in safety terms.

As culture is elusive in nature, a more tangible

model of culture, namely the culture web (Johnson and Scholes 1999), and the principles of Total Safety Management (Li 2016) are brought together to form a new Total Safety Culture (TSC) Model. To further confirm their legitimacy, TSC contents are then matched against the elements of the Safety Culture Maturity Model (Lardner et al 2001). Finally, a case study is used to illustrate what and how actions were taken to realize this Total Safety Culture.

TOTAL SAFETY MANAGEMENT PRINCIPLES

To begin with, the relevancy of TQM principlesin safety management is validated through a point to point inquiry. TQM is widely perceived as a performance enhancing program. As reported by Reger and et al (1994), hundreds of anecdotal cases of TQM show that a properly implemented TQM program will improve organizational performance. Basing on the same rationale, a study on the effect of TSM on safety performance has shown that some TSM principles show a positive association with performance (Li 2016). As a recapitulation, Table 1 below sets out the meanings of TQM principles (Deming 1986) in safety terms (Li 2016).

Table1. *TQM principles (Deming, 1986) in safety terms*

	TQM Principle (Deming 1986)	Meaning in Safety Terms (Li 2016)
1	Create constancy of purpose toward improvement of product and service.	Recommending the top management to institute a "determined and long term" focus on safety over other short term success and a strategy of constant improvement in pace with the environment and technologies.
2	Adopt the new philosophy.	Adopting the new philosophy [of Total Safety Culture] that rejects long tolerated lapses - i.e. accidents usually occur and are accepted as usual; instead, all accident shall be regarded as preventable and safety is the essence of business success.
3	Cease dependence on mass inspection to achieve quality	Pointing out that inspection is not the right solution of safety problem; instead, an effective safety assurance programme shall be pursued; in this sense, safety inspection has a deeper purpose for driving continual improvement, not only for quick fixing occasional safety lapses.
4	End the practice of awarding business on the basis of price tag alone	Company should consider the safety capability of prospective suppliers (sub-contractors); total cost is reiterated over the initial price. Therefore, the consequential loss resulting from use of bad contractors must be estimated and included in total cost calculation.
5	Improve constantly and forever every process for planning, production, and service	The traditional "Control and Inspect out" concept is extended to the contemporary "Assurance" concept. A well-integrated management system that drive continual improvement in all functions starting from planning and design to final commissioning. `This idea is strictly in line with the urge for constancy of purpose.
6	Institute training on the job	It is a subtle irony that Deming is urging for a 'totally reconstructed' training program that begins with the management as if they was incompetent. In the example quoted by Deming (1986), a foreman is regarded as knowing nothing about the job that workers are doing. Therefore, safety training shall be instituted, i.e. mandatory from top level to front line staff.
7	Adopt and institute leadership	According to Deming (1986), leadership is not simple counting; it is instituted to replace the Western style of focus on outcome and management by numbers. To this end, a proactive safety leadership streaming down from top management to frontline staff for the realization of TSC is needed for winning over the minds and hearts of workers (Wachter and Yorio 2014).
8	Drive out fear	Deming claims that 'no one can put in his best performance unless he feels secure' (1986:59). This 'drive out fear' proposition is equally right in safety. In order to create a fearless working environment, it is necessary to win over the minds and hearts of workers through human performance-based safety management systems. (Wachter and Yorio 2014).
9	Break down barriers between staff areas	Besides the physical meaning of barriers, Deming's account on this principle points to the systemic nature of organization and urges for collaboration among different departments in problem solving (Deming,

		1986: 63). In safety, the breaking down of [communication] barriers is much needed under the "Reporting Culture" that is needed for collection of incident and near miss data (O'Leary and Chappell 1997).
10	Eliminate slogans, exhortations, and targets for the work force	TQM is about a culture and leadership style of management by facts and high sincerity, not by empty exhortation and fear. To this end, achievable goals and positive symbols and signals are recommended to boost safety morale.
11	Eliminate numerical quotas for the work force and goals for management	Deming regards quota as a fortress against improvement of quality and productivity in the sense that no quota is appropriate with never-ending improvement (Deming 1986:71). In safety, except the zero accident target, no target is appropriate. Therefore, other type of targets, such as safety training, time to abate hazards found, and time to report incidents shall also be used on top of the usual accident rate.
12	Remove barriers that rob people of pride of workmanship	Deming has stressed repeatedly that performance does not depend solely on individual capability, but on system constraints. Conversely, positive reinforcement, as articulated in the Behavior Based Safety Guide (Health and Safety Authority, Dublin 2013), will bring about employees taking personal account for safety. The need of protecting 'pride' is thus highlighted. To achieve this, positive reinforcing safety motivation rather than negative penalizing safety control is recommended.
13	Institute a vigorous program of education and self-improvement for everyone	Deming claims that there is no shortage of good people, but a shortage of high-level knowledge. (1986: 86). And much in the same vein, organizations learn only through individuals who learn (Senge, 1990:139). It is clear that Deming is projecting a learning culture in which every body strives for self-improvement and that leads to collective success of the company. In safety, this idea can be realized with a training programme on both job related safety and safety management theories.
14	Take action to accomplish the transformation	From the foregoing thirteen points, Deming's focus on leadership, training, and continual improvement can be construed as a change in the value system of organizational players –constancy in purpose among seniors and training and personal development for general staff. In most cases, safety is taken at a lower priority and frequently played down by production ends. If safety is to be assured, then Deming's urge for 'transformation' is even more critical in safety because good safety performance is less visible. In this sense, a double loop learning on "why" safety is needed becomes the only mean to accomplish this transformation.

As elaborated in Table 1 above, the TSM re-interpretation has surfaced the safety assumptions and beliefs and practical management practices under the original TQM principles. Just to highlight a few, point number 2 "accident is preventable" and "safety is the essence of business success" are beliefs that cannot be proved numerically. Yet these beliefs guide staff members to take positive actions, such as training and continual process improvement, for preventing accident. Conversely, if accident is unpreventable, then nothing can and needs to be done. This change in belief is already overdue in eastern countries (like China) for replacing their traditional belief in fate and karma – if you are destined to died, nothing can be done to prevent it from happening. In this sense, the primary objective of this study is to offer an example of a more positive safety culture as a replacement to the traditional pessimistic belief.

Table2. *Similarity between Leadership traits and TSM principles*

	Leadership Trait (Geller 2000)	TSM principles
1	Focus on process - safety leaders hold people accountable for accomplishing proactive process activities that can prevent injuries.	Improve constantly and forever every process for planning, production, and service; safety is an inseparable part of these operations (Li and Jones 2010).
2	Training - concern that employees must know exactly what actions to perform to complete a particular task effectively and	Institute training on the job, a training programme on both job related safety and safety management theories.

	safely.	
3	Use conditional statement to promote resourcefulness and thinking and thus ownership.	Drive out fear and remove barriers that rob people of pride of workmanship.
4	Listen first before offering direction, advice, or support.	Drive out fear - Deming claims that 'no one can put in his best performance unless he feels secure', therefore, allow subordinates to tell their story first (1986:59).
5	Promote ownership [for self-motivated compliance]	Institute a vigorous program of education and self-improvement for everyone.
6	Encourage choice [set target, allowing choice of actions to promote ownership]	Remove barriers that rob people of pride of workmanship and eliminate numerical quotas for the work force and goals for management; one will perform better when he is free to choice and is not bounded by hard targets.
7	Set expectations - facilitates a shift from "other directed" to "self-directed" by initiating a process or action plan with expectations rather than mandates.	Adopt the new philosophy, a double loop learning process in safety through leadership at all levels to change the basic assumption of general staff members and become self-directed.
8	Confident but uncertain - show confidence without being sure of the best way to achieve it. This fosters innovation and self-motivation	Remove barriers that rob people of pride of workmanship and eliminate numerical quotas for the work force and goals for management; one will perform better when he is free to choice and is not bounded by hard targets.
9	Look beyond the numbers – understand that not everything can be measured.	Eliminate numerical quotas for the work force and goals for management.
10	Make more distinctions between people – to avoid stereotypes and enable objective linkage between people's talents and job descriptions.	7 deadly diseases - Annual rating of performance "it is purely a lottery"; rating is subjective and will mis-label employees and turn them cynical.

As for leadership, the entire TSM programme is driven through leadership. Essentially, it is the top management to take the lead to "institute" leadership at lower levels. So it is expected that the right type of leadership, both transactional and transformative, cascades down from the top and is adopted at all levels. Literally, managers and supervisors at all levels are expected to set themselves examples of good safety culture and to transform their subordinates in the way wanted by the company. To this end, Geller (2000) has suggested ten leadership qualities for instilling total safety culture. Table 2 below is a comparison between the ten safety leadership traits and TSM principles; a close similarity is obvious between the two.

From Table 2 above, if leadership is pivotal to organizational performance, the similarity between leadership traits (Geller 2000) and TSM principles legitimizes the latter essences of performance. In this sense, TSM principles are postulated as the contents of a viable safety culture and this rationale gives rise to the main theme of this paper.

Corporate Culture, Safety Culture, and Total Safety Culture

One of the key problems to be overcome in realizing a culture change program is the illusive and intangible nature of culture. Referring to a commonly quoted definition by Schein (1985), culture is defined as:

"A pattern of shared basic assumptions that a group learns as it solves its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems."

Amount the numerous definitions of safety culture in the literature, Uttal (1983) defined it as ``shared values and beliefs that interact with an organization's structures and control systems to produce behavioral norms". Turner et al. (1989), defined it as, ``the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious".

In these definitions, both culture and safety culture are defined as assumptions, beliefs, value system, roles, and technical [management] practices. Assumptions and beliefs are abstract ideas that are difficult to visualize and measure. To overcome this problem, theorists have

proposed different cultural models; among them, the culture web (Johnson and Scholes 1999) represents a more solid and tangible view on culture.

Figure1. *Cultural Web*

Similarly, Schein (1990) suggests diagnosing culture from three different levels namely Artifacts, Espoused Values, and Assumptions. Yet the contents of assumptions and beliefs remain ambiguous; an explanation on what assumptions and beliefs are and the way to bringing about a change in culture is long overdue.

TOTAL SAFETY CULTURE (TSC)

By bringing together the cultural web, three levels of culture, and the re-interpreted TSM principles, a new TSC configuration model, as depicted in Figure 2 below, is formed.

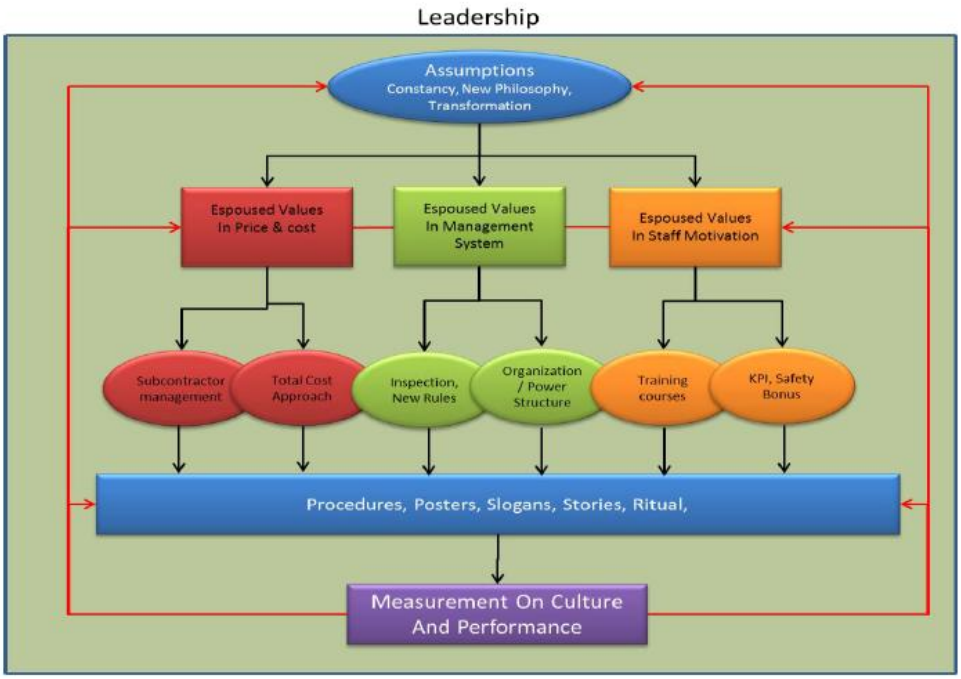

Figure2. *The schematic representation of TSC Model.*

From Figure 2, the three levels configuration (Schein 1990) of culture is maintained. At Assumption level, TSC assumes a need for constancy of business purpose in safety; a set of beliefs that make sense of safety as follows:

- Safety is not a contingency to serious incidents,
- Safety is indispensable part of business,
- Accidents are preventable
- Safety is always a good business to do,
- Safety is something we must do
- Safety is professional – Reliable, effective, efficient
- Safety is my duty
- All functions have a part to do
- Safety actions cannot wait

To this end, company needs a transformation from the existing philosophy that regards safety as dispensable, extra time and cost or deeds of God to a new philosophy of taking safety as investment and essence of business – i.e. constancy in safety purpose. Operations are thus reviewed continually to drive continual safety improvement, progress and cost are no longer a priority over safety and workers are encouraged fearlessly to report accidents and near misses for improvement. Yet the question on how to change the mindset of general staff members, i.e. achieving genuine cultural transformation, becomes a real challenge to the top management. In those Eastern countries tinted with the traditional Chinese culture, people possess an untold belief in fate and destiny. It is

frequently heard on construction sites that "if you are destined to die, there is no way to escape". This subtle belief implies that nothing could be and should be done for preventing accident. That is why Easterners tend to take personal risk in performing their works. A genuine transformation is long overdue.

In order to change the mindset of workers, an enhanced value for safety is used as leverage for bringing about this change. It means that the top management needs to create a value for safety that is at least comparable to the achievement in progress and meeting cost targets. Therefore, safety performance should be included as a key performance index and is measured constantly. To this end, the structure of the organization needs to be adjusted and a new power is created to manage, measure, and regulate TSC actions for cultivating this much wanted new philosophy. Under the tenet of TSC, safety performance is juxtaposed next to progress and cost and this belief is a radical change in the mindset of staff members including the top guys themselves. It is reiterated that the first change to be brought about this change is the belief and value system of the top management, without this change, no other changes will happen. This approach matches perfectly with Deming's idea of holding the Top Management responsible for quality problems (Deming 1986).

In order to operationalize these changes, visible TSC actions shall be formulated and implemented. Starting from the organization structure, the formation of a safety department and/ or appointment of a safety manager give a strong signal to general staff that the company is committed to safety and is willing to spend money on it. And commensurate with this appointment, adequate power is delegated to the safety manager for performing his duties. Following this is the development of a new safety management system or refinement to the existing one. Inevitably, safety training is organized for staff members and new safety posters and signs are displayed to promote the change. New safety management procedures and house rules are then developed and implemented and form a new basis for performance measurement. The whole cultural process is then embraced with promotional aids such as posters, banners, videos, and other artifacts. The effectiveness of the change is then measured and reviewed in senior meetings for formulating new actions to drive further improvements.

A Case Study on Total Safety Culture Implementation

Perhaps the most important action to be taken is the top management's genuine commitment to safety. In reality, this commitment is usually the contingent action for mitigating the adverse effect of major safety problems. In the studied case, the company has contracted multiple fatal accidents in a short period of time. Sanctions from various sectors and the company owner rushed in forcing the top management to take drastic actions are implemented urgently, both as a gesture of improvement and as a cure to the existing safety management problem. The CEO was very convinced of the importance of safety and he regarded safety as "a good business to do"; he said that if you spend less on safety, you will end up in spending more as compensation and extra cost. Again, this assumption is in perfect harmony with Deming's idea on the overall cost instead of the price tag (Deming 1986). The next question is how to bring about a similar change in this basic assumption in the mindset of all staff? A formal inauguration to the programme is a good start.

To begin with and starting from the Assumptions and Beliefs level, a "Zero Tolerance" policy and a statement that reads "All Accidents Are Preventable" were promulgated. A formal inauguration was then planned. About six months prior to the inauguration, a safety department was added to the company structure and a safety professional was appointed Safety Manager. The formal inauguration to the new safety management programme is a full day retreat hosted by the CEO, all senior staff members were required to attend. In the retreat, a tailor made safety promotional video was shown and a safety management specialist was invited to explain the normative safety culture contents and the new safety policy of the company to the audience. New safety posters and banners were also displayed in the venue as manifestation of the determination for a change. The same training course was then delivered to all staff members in the entire Greater China region. This campaign formed a convincing signal to all on the commitment of the company in improving its safety management. And with this genuine commitment, the normative safety culture of the company took shape; the ethos "All accidents are preventable" and "Safety is Good Business" became the common assumptions of staff members and were

expected to comply with the "Zero Tolerance" ethos. So the indigenous Chinese culture of "fate and destiny" was shaken in its root. The company even made it clear to managers that they were paid for setting themselves good examples and bringing about this change. Figure 3 below is a schematic representation of the actions taken to bring about the change.

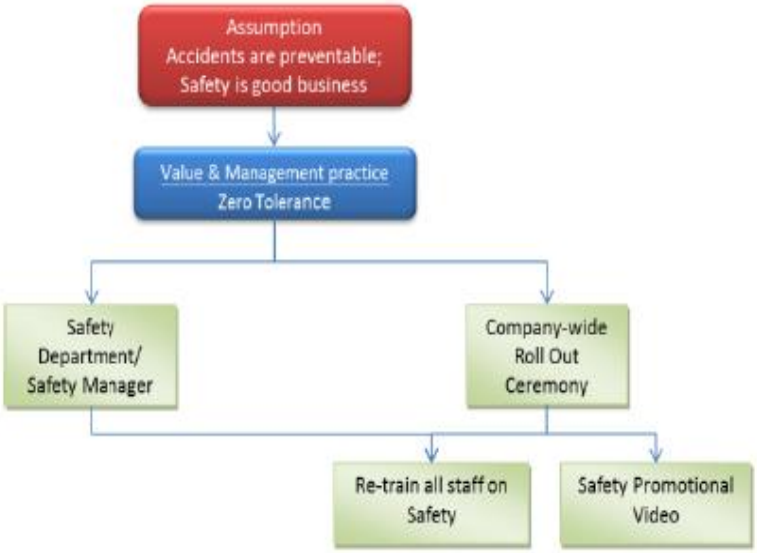

Figure3. *Setting the Normative Safety Culture*

It is discernible that the company has initiated a double-loop learning (Argyris 1991) on why safety is critical to their business success and how to achieve a radical improvement through the leadership of the top management that cascaded down to all levels for changing their basic assumptions. With these normative assumptions and beliefs clearly disseminated, the company moved onto the next stage and now the safety manger took the center stage – a series of new procedures and rules were developed and implemented for realizing the new safety policy. It took a year for the safety manager to complete the initial roll out and safety training to all projects in the region. A series of new safety management procedures and routines were then implemented to embrace these new espoused safety values. Set out in Table 3 below summarizes the actions taken for adding value to safety and driving a change in their normative safety culture.

Table3. *Actions taken for adding a value to safety*

At Belief and Assumption Level	
TSC Principle	TSC Actions
Adopt the new philosophy. [a refined Safety Culture]	- Zero Tolerance Policy, - All accidents are preventable, and - Regarding safety as a good business as collective beliefs.
Create constancy of purpose [commitment of the Top Management]	- Top Management Commitment with a written safety policy statement, - Top management takes the lead to inspect sites - Safety is the first issue to be discussed in operation meeting; - Project Directors are held answerable to queries on safety from the Safety Department Manager.
At Espoused Value and Management practice Level	
TSC Principle	TSC Actions
Create a value for safety	- Quarterly KPI and Safety Bonus - Annual Safety Award - Monthly safety model workers election
Adopt and institute leadership	- Requiring site staff to perform safety duties - Requiring senior staff to set themselves as good examples and join the routine site safety walk.
Remove barriers that rob people of pride	- A new safety KPI system developed and implement; it takes into account both proactive safety assurance measures (such as safety planning and training) and reactive records (accident rate), a quarterly safety bonus will be issued to those scoring high.

Institute training on the job, Institute a vigorous program of education	- Re-train all staff and workers on safety rules and actions specific to the company and the industry; a safety video was produced for this purpose. - Require all site supervisors to attend a recognized safety course. - Require all project managers to attend a safety management course. - In-house safety training course on Safety Culture and Total Safety Management

From Table 3, the company has done a lot on safety training. First of all, all staff members were required to attend three-hour in-house safety training on the company safety culture and policy, management procedures and specific rules. A similar course more focused on safety rules and site practices was also provided to all workers. This company wide training program not only has enhanced the knowledge of staff members, but also highlighted the commitment of the top management in improving their safety management and thus contributed to reshape their safety culture. The company also has sponsored staff members to attend public safety training courses ranging from technical competence to management subjects. And commensurate with this new safety training programme, an annual safety award and a quarterly safety bonus programme have also been launched. The importance of safety was further highlighted with a series of project management and safety control practices as depicted in Figure 4 and tabulated in Table 4 below.

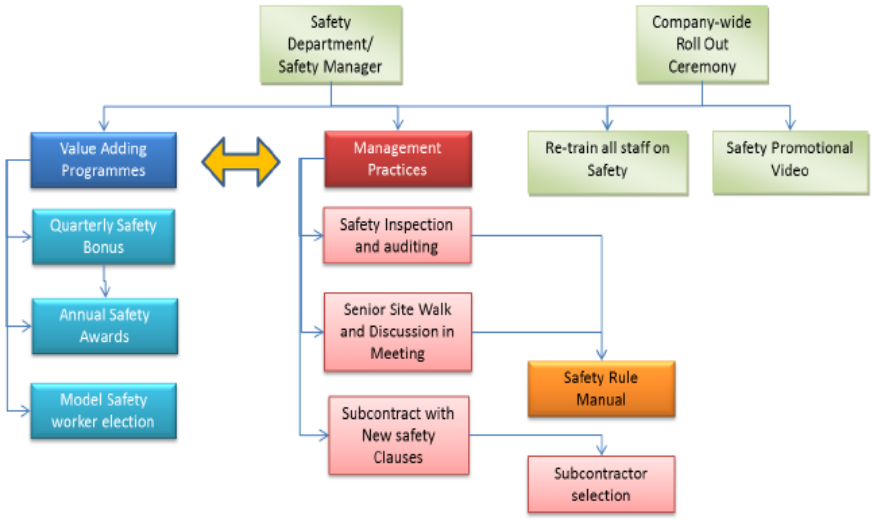

Figure4. *TSC Actions*

Table4. *New safety management practices*

At Project Management and Control Level	
TSC Principle	TSC Actions
End the practice of awarding business on the basis of price tag alone - Considering the safety capability of prospective suppliers (sub-contractors) - Using suppliers / sub-contractors with good safety capability.	- Subcontractor safety performance measurement once in six months; results circulated to the top and senior management for sub-letting - New set of subcontract safety clauses; violation to safety rules will be penalized - Invite subcontractors to attend safety management committee meeting
Improve constantly and forever every process - Cease dependence on mass inspection to achieve Safety - effective safety control and continual improvement program - Improve constantly and forever every process for planning, production, and service	- Senior manager site inspection - Inspection finding analysis to identify root causes - Report key findings in the monthly safety report, circulate to all staff - Safety Alert circulated to all staff - In-house safety rule manual; preventive measures and new safe practices are appended once agreed in safety management meeting - Independent safety audit - Safety staff empowered to stop unsafe works

Break down barriers for improving communication	- Safety is the first issue to be discussed in the weekly - Discussion in safety management meeting, safety is a management concern in decision making (e.g. subcontracting) - Encourage reporting any accident or incident for cause analysis. - Safety suggestion box /email.

In the safety policy statement, it is stated that "our success depends on the participation and support of employees and workers". This statement makes perfect sense. As the company does not maintain any direct labour, the actual works are always done by subcontractors. In this sense, the safety competence of subcontractor plays a crucial part in the company's safety performance. To this end, a new subcontractor selection and management program was introduced – new safety requirements were included in the contract and penalty clauses were included to deter violation to safety rules. And once in every six months, a companywide Subcontractor safety performance survey was conducted and the findings were discussed in meetings. Bad performers were formally warned and required to improve if they wanted to continue to work with the Company.

In the technical and practical scenario, continual improvement to construction method was ensured through the compilation of a method statement for each hazardous operation and continual updating of a Safety Rule Manual. Safety inspection was conducted to assure both immediate hazard abatement of hazards and continual improvement through statistical analysis of findings. Figure 5 below depicts the actions to be taken for driving continual Improvement.

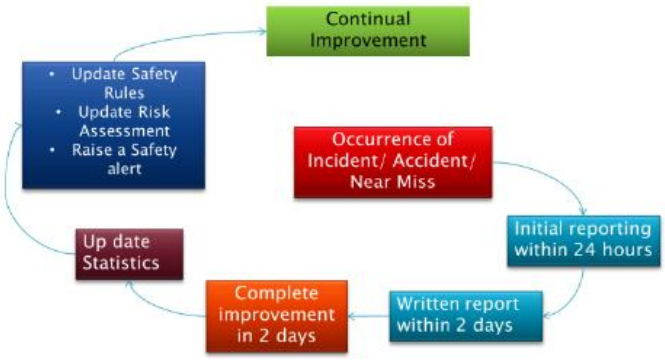

Figure5. *Continual Improvement Flow Chart.*

As resulting from safety inspections, accidents, incidents, and regular safety audits, new ideas and designs were formally included in the Safety Rule Manual and promulgated company-wide. In addition to this, whenever there was an accident, a Safety Alert with practical improvement actions would be issued and raised to the attention of all staff and discussed in the operation meeting. So far, the Company has introduced about 10 new safety mandates and rules to its daily operations. This continual improvement mechanism is in line with Deming's idea on "Improve constantly and forever every process". With these changes in place, staff members were deeply convinced that safety was highly valued in the company and start to talk about and take actions on safety.

At the artifacts and promotional level, the company has done a lot on increasing the visibility of safety. These included a safety promotional video, a series of new safety posters and banners, safety stickers and signs, and the most important of all, a safety mascot. Figure 6 and Table 5 below indicate the actions taken for promoting safety.

At the artifacts level, enhancing visibility of the safety management in place is always the first thing to do. With the help of a professional video producer, a safety promotional video was shot on the Company's active sites and all actors were familiar figures of the working team. Started with a statement of commitment given by a senior staff, the video was featured with demonstrations on the specific safety requirements of the Company. In addition to this, a new safety slogan on banner and a series of new safety posters were printed and displayed on all sites. With these, the visibility and thus

the commitment of the top management to safety were effectively projected to the entire population of the Company.

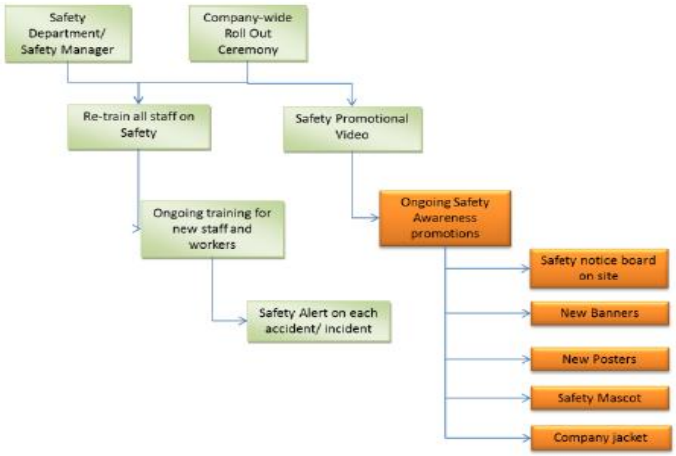

Figure6. *TSC Actions for Safety Promotion*

Table5. *Actions taken for promoting safety*

At Project Management and Control Level	
TSC Principle	TSC Actions
Drive out fear - Safety as value (Petersen, 1994; Geller, 1994, 2001) –one that is to be protected among other situational priorities; - A reporting culture and a just culture that encourage employees to report near misses and incidents, - A personnel policy that encourage peoples at all levels to participate in protecting and advancing safety; and - A positive leadership style that founds on coaching and help (Geller, 1994, 2001) but not on fear.	- Staff is encouraged and required to report any safety incident; score will be deducted from the quarterly safety bonus assessment if any accident or incident has not been reported within 24 hours. - Stated in the corporate safety policy that anything done for preventing accident will not be disgraced for failing other goals - Frontline participation is assessed in the quarterly safety bonus assessment - Senior managers regular site visit
Break down barriers between staff areas - An effective safety coordination and communication process through which safety ideas and instructions are freely and effectively communicated, - Safety needs are adequately considered in decision making processes, and - Management decisions are suitably balanced with adequate concerns on safety.	- Safety is the first issue to be discussed in the weekly operation meeting - Safety is always taken at priority over other concerns - Staffs from all functions and worker representatives are invited to attend the Quarterly Safety Management Committee Meeting. - At project level, a monthly Site Safety Committee meeting is held. - Suggestion box maintained on each site. - Workers are encouraged to voice out their safety concerns and report incidents.
Eliminate slogans, exhortations, and targets for the work force - A culture and leadership style of management by facts and high sincerity, not by empty exhortation and fear; and - An operational practice of using positive symbols and signals to boost safety morale.	- A series of new safety posters and banners are printed and displayed on every site; their contents always focus on the right safety practices instead of empty exhortation for “Safety First”
Eliminate numerical quotas for the work force and goals for management - Be free of unrealistic numerical targets, - Be managed by facts and effective leadership (principle 7 above), and - Be driven by positive and constructive signals (principle 10 above).	- A target accident rate is maintained as a direction only - Actual safety performance assessment counts on proactive parameters such as safety training provided and time to rectify unsafe findings - Manage by facts – unsafe findings are categorized and analyzed down to the root causes such that

	effective actions can be taken

Parallel to promotional video was a companywide safety training course delivered to all staff members and workers. The course focused on the meaning of safety culture, the problem of having a less than adequate safety culture (Reason 1998), and the problem with the traditional culture of "destiny". The ideas of regarding accidents as "preventable", safety as "good business" and "essence of business" were then fully elaborated. All of these ideas and assumptions, as reiterated in the training, formed the foundation of the new directive of "Zero Tolerance". And later in the year, the Company had even created a safety mascot which was printed on all safety related documents.

Literally, any promotional activity will become empty exhortation or lip service if it is not supported with genuine improvement actions. To this end, the CEO required staff members at all to set themselves good example in safety. Nobody should go to site without fully equipped with full safety gears namely safety shoes, safety helmet, and company reflective vest. Safety staff was delegated with the power of stopping any unsafe acts on site and instruct for immediate improvement. These requirements did have brought about changes, though reactively and not without dispute from project staff. Safety staff did have stopped works in multiple occasions and the project team did have improved as required. The Top Management also had created a safety story which safety staff could quote in safety training – a senior staff was caught leaning over a falling edge without protection; he was penalized with a bonus deduction and a warning letter. Gradually, project staff started to consider safety needs in their planning and control activities. Method statements were circulated to safety staff for comment and information and safety staff was invited to meetings and to deliver training to workers at work commencement. So safety had gained a place in project routines. And up to this point, it is quite obvious that the safety culture of the Company has been refined from the initial level 2 – Managing to level 4 – Cooperating (Fleming 2001). To sum up all actions taken, Figure 7 below forms the road map of TSC implementation.

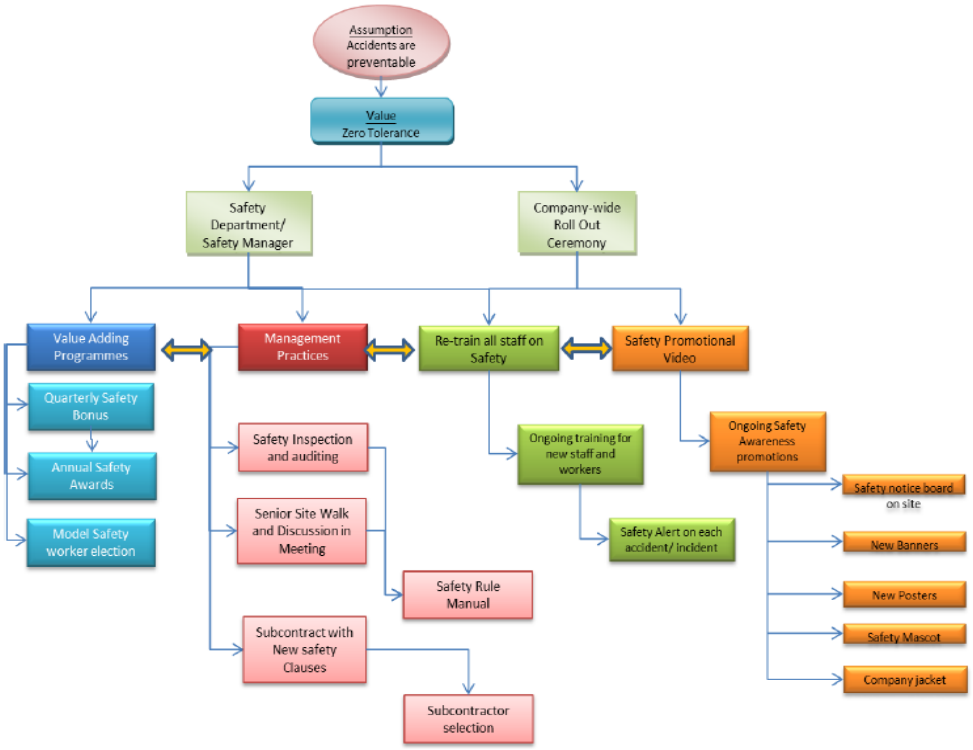

Figure7. *A road map for TSC*

DISCUSSION

TSM versus the Safety Culture Maturity Model (SCMM)

Fleming (2001) have proposed a Safety Culture Maturity Model (SCMM). The model contains 10 elements and is amenable to 5 different levels of cultural maturity starting from Emerging to Continual Improvement. The model is then tested and validated in a case study by Lardner

and Fleming (2001). A comparison between these 10 elements and the TSM principles (Li 2016) reveals a close alignment in their approach toward safety culture. Table 6 below is the comparison between the 10 maturity elements and TSM principles.

Table6. *Comparison between the SCMM elements and TSM principles.*

	SCMM Elements (Fleming 2001)	TSM Principles (Li 2016)
1	Visible management commitment	Create constancy of purpose - top management to institute a "determined" preference on safety over commercial goals
2	Safety communication	Drive out fear - a fearless working environment, it is necessary to win over the minds and hearts of workers; Break down barriers - breaking down of [communication] barriers is much needed under the "Reporting Culture" that is needed for collection of incident and near miss data (O'Leary and Chappell 1997).
3	Productivity versus safety	Adopt the new philosophy – accidents are preventable and safety is the essence of business success.
4	Learning organisation	Education and self- improvement for everyone - a learning culture in which every body strives for self-improvement and that leads to collective success of the company.
5	Health and safety resources	Take action to accomplish the transformation – Provision of necessary resources is implied.
6	Participation in safety	Drive out fear - a fearless working environment to win over the minds and hearts of workers.
7	Shared perceptions about safety	Adopting the new philosophy - a double loop learning process in safety through leadership at all levels to change the basic assumption of general staff members
8	Trust between management and front- line staff	Drive out fear - a fearless working environment, it is necessary to win over the minds and hearts of workers through human performance-based safety management systems.
9	Industrial relations and job	Not mentioned in TSM
10	Safety training	Institute training on the job - safety training shall be instituted, i.e. mandatory, from the top level to front line staff.

It is readily discernible that, except point number 9, the SCMM and the TSM principles are closely aligned. Nevertheless, the TSM study contains more elaborated cultural meanings in terms of beliefs, such as "accidents are preventable" and assumptions, such as "safety is the essence of business success" and practices, such as "a fearless working environment" and training. If the SCMM elements are the contents of a viable safety culture, then the TSM principles are equally but more elaborated set of safety cultural references.

Cultural Maturity versus Quick Fix Solution

First of all, it should be noted that the improvement programme of the company is idiosyncratic; it only represents what have been done by that company and therefore should not be regard as a standard model or the best practice. Actually, the actions taken by the company are rather common in Hong Kong and there are always rooms for continual improvement.

Changing the culture of a company is never an easy task. It takes three years for the studied Company to refine its safety culture slightly and achieve an observable improvement to its safety performance. There is a substantial drop in its accident rate and the number of serious accidents. As a considerable sum of money has been spent, it is beyond rational comprehension and solid prove that the spending pays off. Therefore, the whole improvement programme founds on a belief or assumption in safety – safety is good business. Just as the CEO said, "you spent 1 dollar on safety, 10 dollars could be saved". Of course, there is no prove on this statement, it is purely a belief. On the other hand, as supported by the lowered accident rate, the assumption on "accidents are preventable" appears to be very right. This assumption is also supported through post-accident review through which the missing preventive measures could always be found in hind sight. Therefore, the traditional Chinese "destiny" assumption is rebutted; safety can be assured through adequate planning and precautionary measures.

From a different perspective, the studied Company has initiated the safety improvement programme only after it had encountered difficulties from poor safety performance. Once the improvement became visible, safety started to fall prey to economic and process ends

because there is no easy way to prove the validity of these safety assumptions but there are visible and measurable saving from doing less on safety. Therefore, safety performance started to decline again. Literally, a cyclic patternof mutual cause between good and bad performance is predictable and is depicted in Figure 8 below.

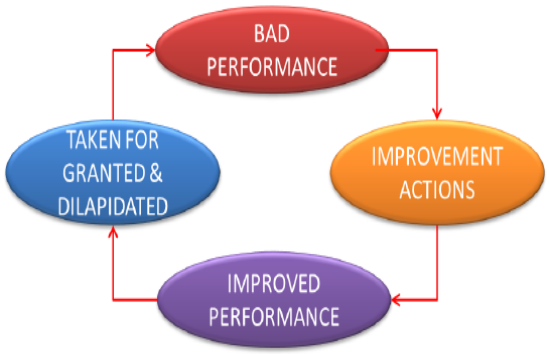

Figure 8: *Cyclic Causality*

From Figure 8, a company is performing well because it was performing badly in the past and has taken contingent actions as quick fix to imminent management problems. Therefore, the improvement might not be a genuine improvement to its safe culture; instead, it is just a temporary and short lived tightening in management controls. It is highly possible that its inadequate safety culture has not been changed at all but is only being temporarily suppressed by tightened controls. So once improvement is visible and the controlling actions are relieved, the effect of the unaltered safety culture takes effect again leading to a gradual decline in performance. This phenomenon matches perfectly with the principle of constancy of purpose – any quick fix improvement will be short lived. In order to have a lasting improvement, the safety culture of the company must be genuinely matured and instilled to each employee at all level.

The safety culture maturity model is first postulated by Fleming (2001) and five different levels of cultural maturity are described. Figure 9 below shows the progressive levels of cultural maturity. Thereafter, other theorists (Foster and Hoult 2013, Hudson 2007, DuPont's Bradley Curve) offer similar models also with 5 maturity levels. It is noted that all of these theorists postulate a close bonding between safety culture and safety management system. It is argued that safety culture could only be refined or advanced to a higher level in pace with the advancement of the safety management system. Under the same rationale, the degradation of safety culture shall follow the same pattern – safety management practices are dilapidated together with the gradual deterioration in management concerns and this pattern conforms perfectly with the idea highlighted in Figure 8 above and Figure 10 below.

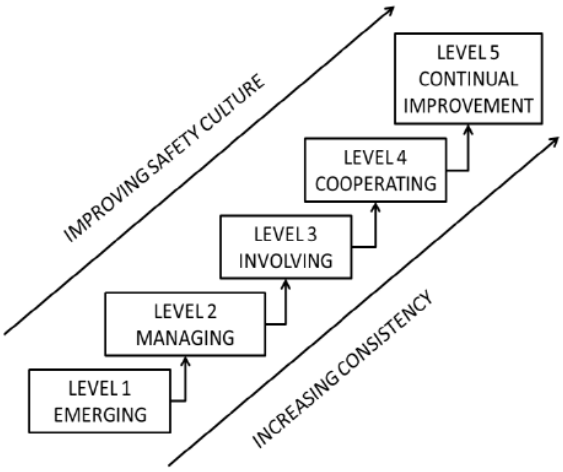

Figure9. *Safety Culture Maturity Levels (Fleming 2001)*

Figure10. *A Vitreous Cycle of Continual Improvement to Safety Culture*

From Figure 10, initial improvement actions are driven by pro-active leadership of the senior management and institutionalized into management routine and procedures. With this improved system in place, short term and local improvements are gradually spread companywide and bring about ongoing and systemic improvement to safety

routines and practices. The improved safety management standard in turn brings the measurable safe performance to a higher level. This visible positive sign then reinforces the strength of the beliefs in safety and thus further perfecting the safety culture of the company. Conversely, the same cycle can be reversed and the safety culture can be reverted gradually and

back to its original form.

CONCLUSION

According to Beer and Nohria (2000), about 70 percent of change initiatives fail. As culture has an elusive nature and is highly diversified into subcultures in organizational context (Li and Jones 2010, Li 2016); any attempt to change it will thus be subject to the different interpretations of different subcultural groups resulting in different value perspectives and thus responding actions (Alvesson and Stefan 2007). Therefore, change might not be happening in the way as expected and planned. Actions taken are usually for complying with the instructions of seniors and are thus superficial and temporary. Under such circumstances, there is no genuine cultural improvement but a quick fix episode instead.

Another major cause leading to high failure rate is the unstable management team. Whenever there is a change in the CEO or a key safety staff, there might be some changes in the management system due to personal management style and preference. Moreover, it is difficult if not impossible to have the original value and belief system passed down to the successor without distortion. In this sense, changing a company's safety culture is very difficult while preserving it is equally hard to achieve.

And as explained above, if safety is only a contingent need, when the imminent problem is resolved, the attention will be shifted away from it leading to an unconscious dilapidation and thus safety performance starts to decline until something bad happens again and the whole cycle restarts. So there is no genuine improvement to safety culture.

In conclusion, as our world is becoming more civilized and most clients are now counting on safety performance of contractors, the pursuit of good safety performance becomes both and management reality and a fad. Under this swim or sink condition, contractors must do something to refine their safety cultures. To this end, the Total Safety Culture programme is recommended as a practical approach to pursue the change. And for future studies, a cause and effect survey on Total Safety Culture and performance is suggested.

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