Effects of Occupational Health and Safety Assessment Series (OHSAS) Standard:

A Study on Core Competencies Building and Organizational Learning

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Word count: 4530

Abstract:

Promoting the human factor of every organisation is an important component that needs to be strengthened in order to build employee competencies. Ultimately, this strengthens the competitiveness and sustainability of the operations within the organisation. The aim of this paper is to investigate the effects of occupational health and safety management system (OHSAS 18001-2007) and learning in organisations to building its core competencies. This case study was carried out by the Evolute web based research tool in four factories between May and August 2015. Results indicated that, the acquisition of OHSAS 18001:2007 standard improves employee work output as well as increases knowledge capacity. Thus an appreciable level of occupational health and safety management system, practice and environment has positive employee effect and that, organisational learning can be facilitated by top management commitment and leadership. However, the need for an increase in tacit knowledge disbursement among employees was seen to needed.

Key words: occupational health and safety, safety culture, organisational learning, Knowledge management, knowledge creation and core competences building

INTRODUCTION

Innovations in technology are rapidly changing market trends. As a result, the ability of organisations to thrive on a competitive market largely depends on how much and at what pace it learns (Morrison and Bergin-Seers 2002). This can be achieved with much emphasis on the human factor. The focus of this study is the work environment, organisational culture and knowledge creation within the heat treatment industry. Essentially, it investigates employee health and safety after the acquisition of OHSAS 18001-2007 by the case company. The case company has decades of experience in heat treatment and hot isostatic pressing (HIP). Additionally, it is accredited with the standards, OHSAS 18001-2007 *Occupational Health and Safety Assessment series,* ISO 1400:2004 *environmental standard* and *quality management standard ISO9001:* 2000.

Generally, organisations aim to satisfy customer preferences, needs and wants. To enhance this, organisations' knowledge base ought to be constantly updated. The consequence of dynamic method of learning in all organisations is to meet customer satisfaction and desire, which promotes sustainability (Yu, et al. 2013). Organisational leaning can be achieved through tacit knowledge disbursement, learning and training. During the study, interviews were conducted using the serpentine questionnaire. Questions were based on perception of workers to indicators of organisational learning and safety ontology to determine the level of interaction that promotes tacit and explicit knowledge sharing. The human potential enhancement in an

organisation is an important factor to its progress (Becker and Gerhart 1996). To this end, they suggest that safety culture should be part of the entire organisational culture.

The conceptual framework of this paper is based on theories that promote occupational health and organisational learning. Consideration was given for the enforcement of OH&S, safety culture, safety climate, knowledge creation, knowledge management and organisational learning. In addition, the concept of safety standards was used; which are mandatory in the OHSAS 18001-2007 document. Besides, the four processes of knowledge conversion being; *Socialisation, Externalisation, Combination* and *Internalisation (SECI)* (Nonaka and Noboru 2000) were used. These are embedded in the questionnaire as part of the survey. Although the nature and procedure of heat treatment is such that employees are inevitably exposed to health hazards, however workers can be protected by the installation of active and robust safety control mechanisms.

LITERATURE REVIEW
The OHSAS 18001: 2007 standard
Occupational health and safety management system (OHSAS)18001-2007 is an occupational health and safety standard. It is designed such that it can be integrated with Environmental Management Systems (EMS) present in the International Organisation for Standardisation (ISO14001). Additionally, OHSAS can be embedded with quality management standard (ISO 9001) to expedite the facilitation of a comprehensive management system (Fernández-Muñiz, Montes-Peón and Vázquez-Ordás 2016). The OHSAS document seeks for continuous improvement of both the management and conditions of health and safety within the workplace. Furthermore, under the OHSAS agreement, the control of safety and health environment (SHE) is fully placed under the supervision of top management (OHSAS 18001 Project Group 2007).

The purpose of OHSAS 18001-2007 is to minimise risk and to also possibly eliminate fatalities at the work places. Through its implementation, OHSAS creates employees' awareness of potential harmful situations and conditions in the workplace. Consequently, absenteeism at work due to sick leave and related health and injuries is reduced. It also reduces organisational cost because legal fines and insurance premiums are eliminated (Nonaka and Krogh, 2009).

In spite of the benefits, OHSAS 18001 is limited in addressing issues such as employees' conditions of service, safety of products and prevention of product damage and security. However, OHSAS offers flexibility to incorporate organisation's management system to ensure compliance to the requirements of OHSAS 18001 standards. These limitations coupled with other organisational demands including supply chain network has led to calls for a more

comprehensive standard by the International Labour Organisation (ILO) and other international standards. As a result, a more comprehensive occupational health and safety standard known as the British Standard Institution (BSI) ISO45001 is due to be launched hopefully early 2017. The blueprint for the BSI ISO45001 is the OHSAS18001 which automatically incorporates quality and environmental management systems to the module. The new BSI standard emphasis on risk management, continuous improvement and performance indications (ISO45001 2015). In Finland, the Finnish Accreditation Service (FINAS) in collaboration with Bureau Veritas Certification Finland are in charge of supervision and regulation of the OHSAS standard. Some of the special features of the OHSAS regulation are:

a. Critical evaluation of work and safety measures.
b. Regulated procedure during maintenance and services.
c. Instructions for work in confined space, procedure and monitoring.
d. Periodic safety inspection in relation to 5S.
(OHSAS 18001: 2007).

Knowledge creation process
The 3 elements embodied in the knowledge creation processes are; (a) Tacit and explicit awareness conversion to create the SECI knowledge spiral. (b) The place of knowledge creation known in Japanese as 'Ba'. (c) Knowledge assets, being the inputs, outputs and mediators of the knowledge creation process (Nonaka and Noboru 2000).These 3 elements are built into the SECI model in figure 1 below.
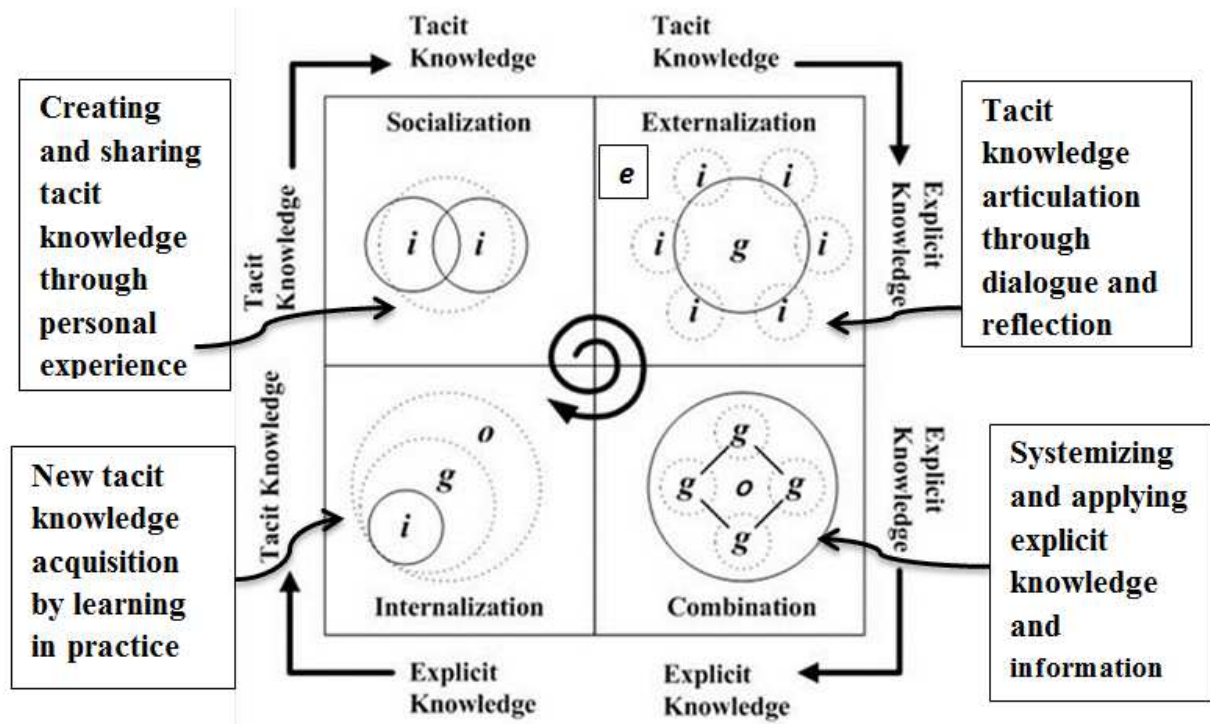
Figure 1. SECI Knowledge Creation Spiral (Nonaka & Takeuchi, 1995)

Knowledge conversion is the interaction of explicit knowledge and tacit knowledge from which organisations create knowledge. Figure 1 displays an increase in both tacit and explicit knowledge through the transformation process (Nonaka and Krogh 2009). Further clarification of the spiral can be obtained by the definitions of SECI processes as:

Socialisation: The process of converting individual's (*i*) tacit (inarticulate) knowledge to others primarily by interaction.

Externalisation: Knowledge transformed from tacit to explicit (clearly defined concept) is termed externalisation.

Internalisation: In this process, explicit knowledge is adapted and converted into tacit knowledge.

Combination: Combination is defined as the gathering process of new (fresh) and existing explicit knowledge of individuals into a system of knowledge.

Nonaka further explains that this conversion process is not static but dynamic and evolutionary between tacit and explicit knowledge (Liu and Philips 2011).

Knowledge management:

Knowledge management (KM) has existed for decades and is currently gaining much popularity. It can be defined as the coordination process of an organisation's knowledge assets which creates value to meet its strategic requirements (Girard 2015). By this process, the right knowledge is given to the right people at the right time for the right purpose while sharing to enhance organisational performance (O'Dell and Hubert 2011). Hence, knowledge management heightens learning processes, organisational knowledge creation and sharing (Becerra-Fernandez and Sabherwal 2010). King explains that although *Knowledge Management* is human dependent, relevant modern information and communication technology methods should be used to support it (W. King 2009). Additionally, *knowledge management* needs to be used to empower an organisation by cultivating its organisational know-how with external sources to create the relevant explicit knowledge of employees (W. R. King 2008) as illustrated in figure 2.

Figure 2. Knowledge management model; Adapted from (King W., 2009, s. 28).

Knowledge empowerment

Empowering the requisite knowledge base of workers has many advantages. For example, an occupational knowledge sharing and training atmosphere disburses useful information within the organisation. Ultimately, it builds the core competencies and can raise the company's competitive advantage (Liu and Philips 2011). The company becomes more innovative through knowledge sharing culture, which promotes the organisation's prospects to desired productivity levels (Liao, Fei and Chen 2007).

Organizational Learning:

Organisational learning is the creation, transferring and the development of the knowledge base of an organisation. It concerns learning from past experiences within as well as outside the organisation to build a framework that increases its knowledge base (Örtenblad 2001). The relationship between *knowledge management* (KM) and *organisational learning* (OL) is that KM focuses on the acquisition and creation of the required knowledge while OL deals with the processes employed in achieving this goal. King explains that OL is the way and manner in which an organization can progressively utilise its acquired knowledge (W. King 2009). In view

of these, individuals in an organisation can and should be involved in the requisite knowledge acquisition, disbursement and utilisation. Senge's five disciplines of the culture of a learning organisation outlined in the *Fifth Discipline* explains that each division of the organisation contributes to the progress or otherwise of the organisation (Senge 2006). Below are listed some of the benefits of implementing Organisational Learning.

(a) An enabling environment for future leaders emerges throughout all stages of the organisation and thereby provides an automatic leadership succession plan.

(b) Workers become adaptive to changes as they become more flexible and new ideas can be welcomed easily.

(c) Satisfaction of employees raises as they become more knowledgeable in the operations, strategies and dealings of the organisation. Organisational learning, therefore, raises worker's integrity (Senge 2006).

From the aforementioned, it becomes imperative for every organisation to inculcate a culture and structure of learning with training within its workforce. As the organisation seeks to be successful in this age of fast technological innovations coupled with changing market trends, failure to learn would be catastrophic to its growth and survival. Achieving an organisational learning concept in an institution cannot be done by just the stroke of a pen. It needs to be built into the entire organisational culture with a solid safety culture.

Safety culture:

Safety culture can be defined as an atmosphere in which safety is recognised and considered top priority in an organisation. In these way attitudes and perceptions of managers and workers towards safety at the workplace becomes culturally oriented (Cooper 1998). Management leadership and commitment towards an atmosphere of safety and organisational learning are some of the issues various researchers attribute towards building an organisation's safety culture. Others are, safety-related rewards, encouraging training and inspiring communication among staff (Kantola, Vanharanta, et al. 2013). For example; by pairing up responsibilities and building mutually related programmes. This positive culture of safety automatically upholds a safety standard: - *Safety climate*

Safety climate:

Safety climate can be defined as the level of importance an organisation attributes to the awareness, implementation and management of safety-related issues. In other words, it is the attitudes and availability of protective measures and equipment available in an organisation in relation to overall safety of people, environment and facility (Olive, O'Connor and Mannan 2006).

Serpentine research tool

Serpentine 2.0 of the Evolute research tool is an Internet-based questionnaire was used to collect the research data and for analysis. Serpentine is designed to reveal the safety culture, safety climate and the management of safety in an organisation. It also reveals the level of knowledge

management and organisation learning within a company. Serpentine consists of 17 features embedded in the 51-item questionnaire. The serpentine module of figure 3 is based on 3 models widely used in safety culture, organisational culture and organisational knowledge creation research. These models are (a) Schein's internal psychological factor distinguishing model of organisational culture, (b) Cooper's safety culture model consisting of internal individual psychological factors and external observable factors, and (c) Nonaka's and Takeuchi's previously discussed SECI model of an organisational knowledge creation process. The latter provides a continuous process for externalisation of knowledge creation by tacit knowledge. This consists mainly of tacit and explicit knowledge creation through the SECI spiral. An outstanding feature of Evolute is that it is embedded with an integrated statistical analytical software. Thus, statistical requirements like the minimum standard deviation (MSD), variance and other values are obtainable simultaneously (Kantola, Vanharanta, et al. 2013, Porkka, Mäkinen and Vanharanta 2013)
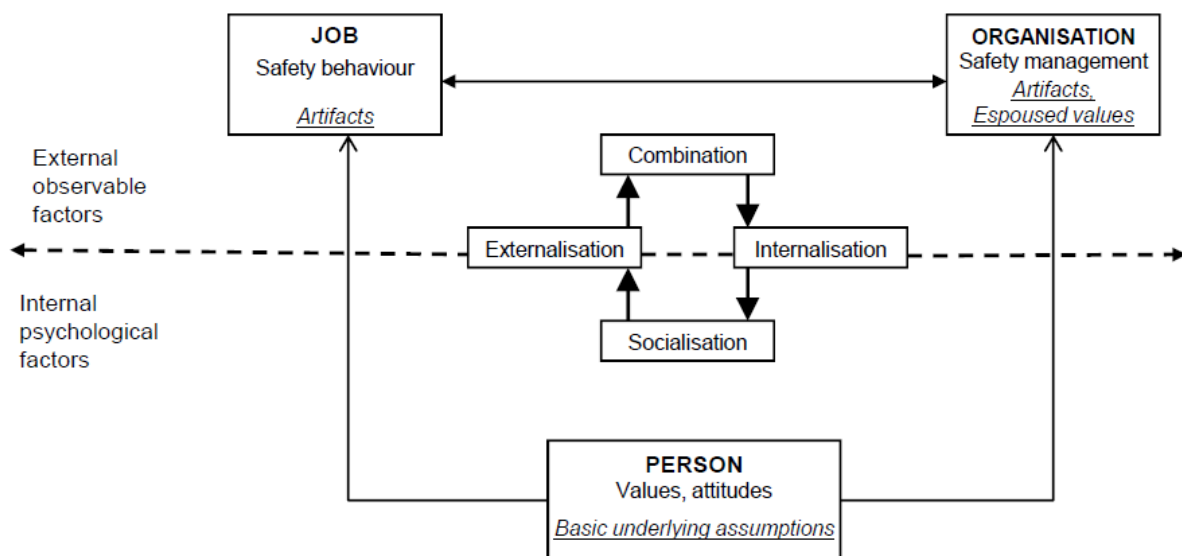

Figure 3. Serpentine safety model. Adapted from (Porkka, Mäkinen och Vanharanta 2013)

METHODOLOGY

Data collection tool:

The Evolute research tool evolved from Peter Senge's principles of creative tension (2006) which has been developed further on the principles of holistic concept of man, circles of mind metaphor and positive metaphors (Markopoulos, et al. 2010). Based on this principle, Evolute can analyse current reality to a perceived future goal of issues under scrutiny. Serpentine, therefore, captures and reveals present and perceived desired future levels of safety, environmental and availability of personal protective equipment (PPE) with organisational knowledge creation and collaboration (Porkka, Mäkinen and Vanharanta 2013). Fuzzy logic is

used to obtain perceived organisational levels of safety and learning in the questionnaire. Through this process of fuzzy logic questions, respondents were able to relate the illusory and vague nature of their perception without numerical conversion scales. (Kantola 2015).

Project Company:

The case company is experienced in improving properties of metal and alloys by heat treatment and hot isostatic pressing (HIP). The company's clients include automobile, aerospace, defence, power generation, construction and medical industries. Currently, it has factories in 24 countries with 190 operational plants. In Finland, it has been in operations since the early 70s and currently operates in 4 locations. This research was concentrated in all the 4 Finnish plants. The company has wide international recognition in these expert areas, and all its Finnish plants are accredited with ISO 9001:2000, ISO 14001:2004 and OHSAS 18001:2007 certifications.

RESULTS

Results of the analyses are presented as total employee combined current (c) and target (t) levels of the eight categorised states in figures 4 and 5. Figures 6 and 7, likewise, display the overall combined current (c) and combined target (t) levels of the 17 features under investigation. Table 1 gives the detailed statistical values of figures 4 to 7. The columns "Median_c" and "Median_t" represents the combined **current** median and **targeted** median values respectively. Analysing the combined results under the listed categories yields the SECI knowledge creation patterns in figures 4 to 7. Typically, figure 4 is the categorized *current* state while figure 5 is the categorized *targeted* state.

- o *Individual awareness and development.*
- o *Opportunity for learning.*
- o *Externalisation.*
- o *Learning and toleration of errors.*
- o *Development of safety culture.*
- o *Internalisation.*
- o *Combination.*
- o *Socialisation.*

Starting from *safety training* through all the concepts under investigation to *controlling of risks* of table 1, respective values of 0.5 to 0.451 were obtained. Therefore, numeric values of the concepts; *flow of information*, *working environment*, *safety attitudes* and *safety climate* levels are equally visible. Other occupational employee concepts like Individual awareness and responsibility, cooperation among staff (seen in *socialisation/internalisation*) with *learning and tolerance of errors* are likewise statistically and pictorially presented. The low values of

standard deviation obtained for both the **current** states, and the **targeted** states represented an appreciable correlation in individual perceptions. This implies the existence of a significant level of reliability, which can be said to be a true representation of the prevailing situation. *Safety awareness* and *responsibility* in the **current** state (c) have the highest value as indicated in both table 1 and figure 6. It means that employees possess a good level of awareness of safety-related issues and also take responsibility of safe working environments. Low values of variance retrieved imply closeness of the data sets to the mean values. In as much as safety awareness and responsibility have the highest ranking, there is still the need to be encouraged as room for improvement abounds considering the difference between the current and targeted values (Kwegyir-Afful 2015).

Table 1. Statistical results (Generated by the Evolute Research Tool).

Class name	Median _c Current	Median _t Target	Average _c Current	Average _t Target	Standard Deviation _C Current	Standard Deviation _t Target	Variance _c Current	Variance _t Target
Safety training	0.5	0.5	0.86	0.929	0.25	0.133	0.062	0.018
Safety directions/regulations	0.391	0.5	0.772	0.891	0.244	0.173	0.059	0.03
Learning by doing	0.393	0.5	0.7	0.871	0.282	0.145	0.08	0.021
Co-operation	0.366	0.486	0.669	0.827	0.242	0.197	0.059	0.039
Working environment	0.366	0.475	0.644	0.858	0.259	0.179	0.067	0.032
Management	0.413	0.5	0.755	0.92	0.313	0.172	0.098	0.03
Support & encouragement	0.336	0.376	0.588	0.767	0.257	0.2	0.066	0.04
Safety policy	0.441	0.481	0.809	0.891	0.244	0.154	0.059	0.024
Openness to new ideas	0.38	0.5	0.739	0.875	0.286	0.226	0.082	0.051
Atmosphere	0.348	0.463	0.616	0.838	0.273	0.17	0.074	0.029
Efficiency of safety actions	0.366	0.5	0.759	0.927	0.244	0.113	0.059	0.013
Resourcing for safety	0.382	0.479	0.655	0.805	0.314	0.234	0.099	0.055
Safety aware. /responsibility	0.5	0.5	0.883	0.943	0.21	0.139	0.044	0.019
Safety attitudes	0.41	0.5	0.838	0.906	0.143	0.18	0.021	0.033
Creating new knowledge	0.366	0.366	0.631	0.749	0.244	0.222	0.06	0.049
Flow of information	0.377	0.5	0.748	0.844	0.295	0.255	0.087	0.065
Controlling of risks	0.451	0.5	0.794	0.907	0.246	0.198	0.061	0.039

Results also proved that accurate and active documentation methods instituted in an organisation would eventually empower health and safety management mechanisms. Furthermore, such reports and records enable executive management to analyse incidences and near misses that has the potential to cause serious injuries or even fatalities (Kwegyir-Afful 2015). Even though total correlated results show positive values above average, due to the company's zero percent tolerance for injuries and fatalities these positive values have to be stressed to improve continuously as the OHSAS standard demands.
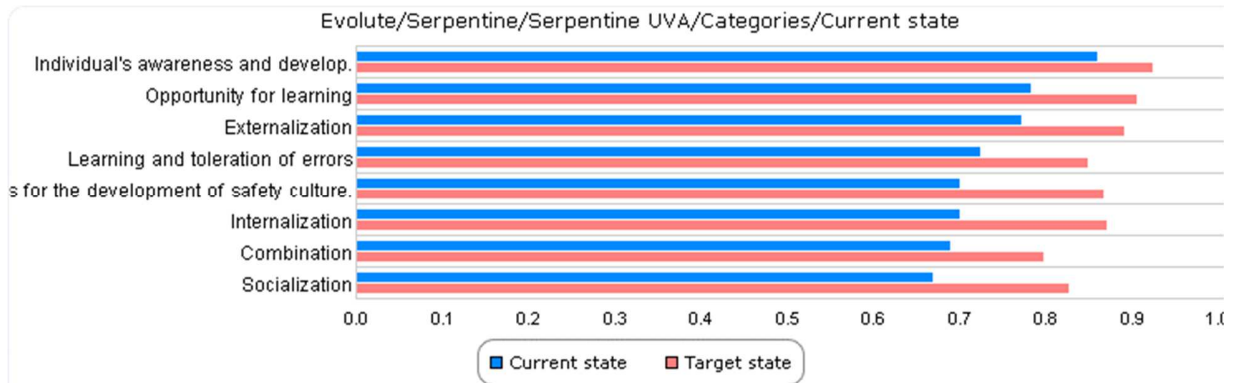
Figure 4. Categorised *current* state (Evolute generated)

In both figures, **blue** bars represent current individual categories while **red** bars represent targeted desire of the same categories of respondents' combined conception. Likewise, the differences reveal the *creative tension* allowance that exists for improvement.
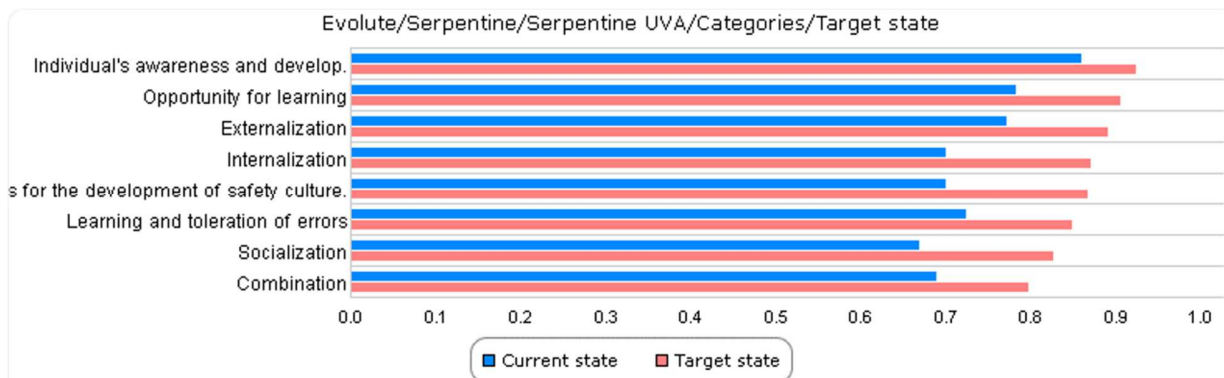

Figure 5. Categorised *targeted* state (Evolute generated)

From both figure 4 and figure 5, ***Individual awareness and development*** obtained the highest point. Least in ranking is ***Socialisation*** under the ***current*** state. This comparative lack of socialisation as examined under the theories of ***knowledge creation*** needs to be rectified. *Socialisation* is necessary to promote organisational tacit knowledge disbursement (Nonaka and Krogh 2009). Generally, results of the ***categories*** from the total of the 8 concepts of figures 4 and 5 look promising. Howbeit, because both *socialisation* and *combination* lies at the bottom of the ***categorised current*** and ***targeted states*** respectively, strategic management decisions and programmes would be needed to correct the individualistic attitudes that prevail in the company. This is really important to ensure the company's sustenance of its competitive advantage. In principle, the growing lack of ***socialisation and combination*** amongst employees could consequently results in the decrease of employee competence (Nonaka and Takeuchi 1995).
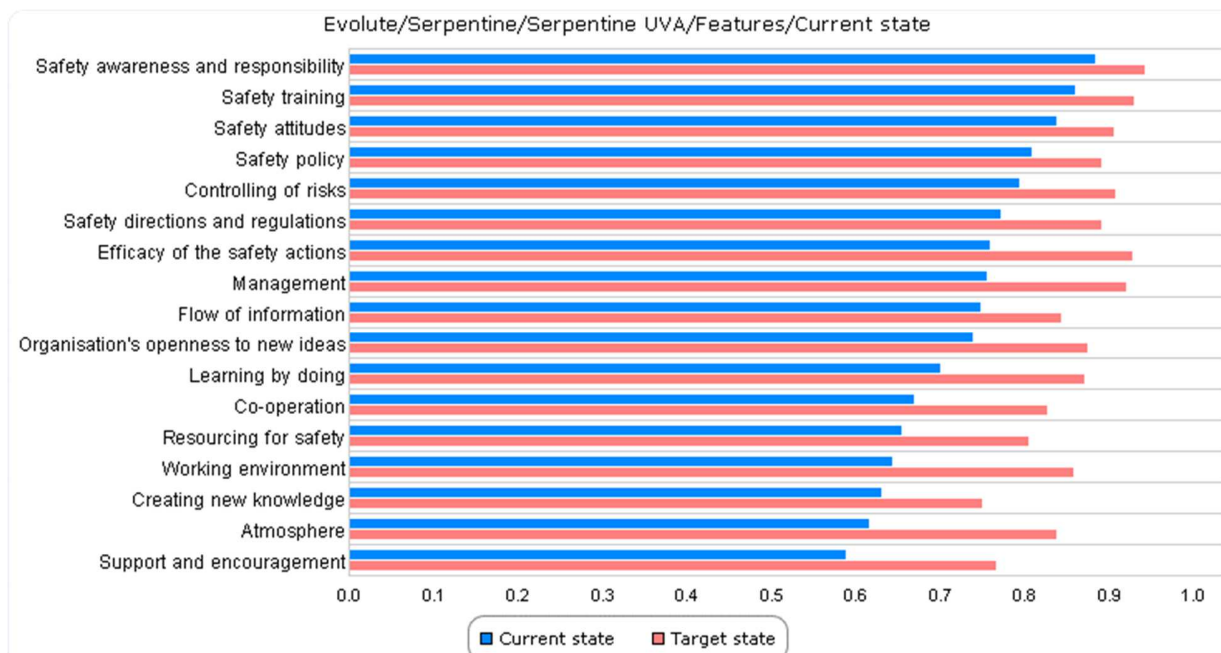
Figure 6. Current state of features sorted in descending order (Evolute Generated).

Current state of features

Results of the **feature** represent all the 17 concepts as shown in figure 6 and figure 7. Obtained results of the current levels (blue bars) of knowledge creation and safety culture are arranged in descending order in figure7 below. Highest feature *is Safety awareness and responsibility* with an average value of 88.3% and the lowest current state being *support and encouragement* also at an average of 58.8%. It is imperative that these features with the least values of human competencies and work environment be addressed by management accordingly as suggested for the **categorised** states of figures 4 and 5. Values in figure 6 are compared to the desired **target** of each feature in figure 7 (Kwegyir-Afful 2015).
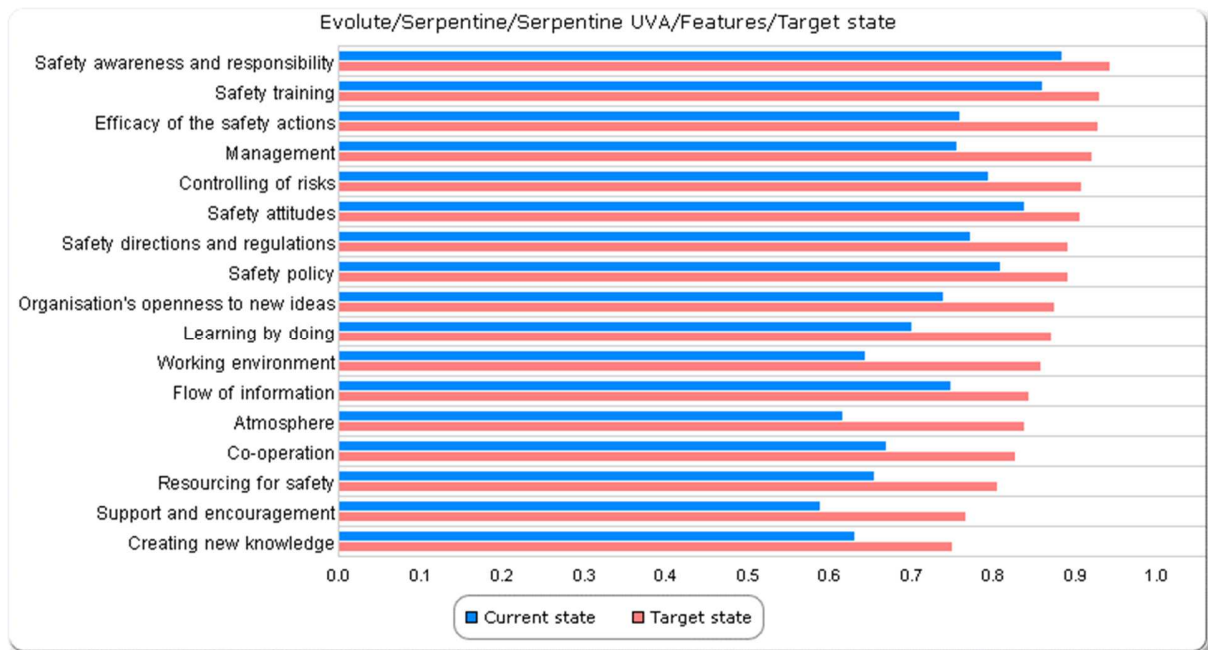
Targeted ambition of *feature*.

Figure 7. Desired targeted state of the 17 concepts (Evolute generated)

The desired objectives of each feature in the target state figure 7 are also arranged in descending order in red. The highest value here are safety awareness and responsibility. However, values with the lowest desire for improvement are seen to be Creating new knowledge followed by support for encouragement. Implications are that respondents do not see much need for knowledge creation improvement as compared to the high-ranking concepts. This could be particularly troubling since the fortunes of any organisation rest on supporting and encouraging new ideas (Littlejohn, Milligan and Margaryan 2012). Likewise, the combined values of figure 6 and figure 7 explain the proactive vision of SECI *knowledge creation* concept and *organisational learning* under OH&S analysis. This is necessary since success lies on ability to establish a proactive plan rather than a reactive correction as the saying goes; - *prevention is better than cure.*

Limitations:

The scope of this research was confined to only the heat treatment industry and therefore, findings are equally within the discipline. However, some suggestions are applicable to most high-risk organisations where organisational learning and safety issues remain paramount (Kwegyir-Afful 2015).

CONCLUSION

The importance a rigorous occupational health and safety standard along with the requisite know-how of employees in the prospects of the heat treatment industry has been investigated, analysed and discussed in this research. Substantially, it has been discovered at lease in the case company that since the introduction of the OHSAS standard, high degree of safety and progress of work schedules has been achieved. This is evident in the reduction of the rate of absenteeism due to injuries and occupational related illnesses. The company's image has as well been upheld in high esteem. Employee job satisfaction has equally been raised. Evaluating findings by the knowledge creation spiral, it has been realised that under such circumstances, companies' progress and chances of survival during operational turbulence increases. However, the knowledge creation spiral, embedded in the questionnaire identified a lack of *socialisation* and *collaboration* among employee. Additionally, it was discovered that creating new knowledge ranked least in all the explored organisational concepts. In as much as *support and encouragement* is targeted the lowest, it is particularly worrying as it limits the organisation's future potentials. In that, organisational culture in relation to disbursement of tacit knowledge through interaction is equally lacking. Most essentially, management of the case company has received these findings, and it is believed to be putting measures in place to rectify the above shortcomings and anomalies. Therefore, this research concludes with findings based on the research questions and collated results. Furthermore, it emphasises on specific areas that require management commitment to promote the desired and targeted OH&S conditions and knowledge building towards productivity outcome. (Kwegyir-Afful 2015).

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