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Improving the 'Safe to Work' Programme Initiative for Contracting Firms in the Energy Sector of Trinidad and Tobago

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Abstract: *In 2011, the 'Safe To Work' (STOW) certification scheme was launched to pre-qualify contractors with health, safety and environmental (HSE) requirements in the energy sector of Trinidad and Tobago (T&T). This paper investigates into the improvement of the current STOW structure incorporating concepts and theories relating to HSE, and advocates a project management approach for facilitating contracting firms with their STOW implementation in T&T. The current STOW structure was enhanced, and a proposed framework for a STOW-Safety Management System (SMS) was derived. Empirical data was acquired via survey and interviews, and statistical analysis was performed. Based on the empirical evidence, the proposed STOW-SMS framework would provide a viable template for improving the HSE functionality of contracting firms. The framework was also premised on contracting firms to better manage the tendering process in the energy sector. It is anticipated that the STOW initiative and the proposed framework could be applicable to other industries in public and private sectors in T&T, as well as a wider context of the Caribbean region.*

Keywords: *STOW, SMS, contracting firms, energy sector, Framework, Trinidad and Tobago*

1. Introduction

In Trinidad and Tobago (T&T), many gigantic energy players have stringent health, safety and environmental (HSE) policies. The Energy Chamber of Trinidad and Tobago (ECTT) saw the imperative need to standardize HSE requirements. In 2011, the 'Safe To Work' (STOW) scheme was launched in Trinidad and Tobago (T&T) under the joint effort of the ECTT, the Association of Upstream Operators of Trinidad and Tobago (AUOTT) and the Point Lisas Energy Association (PLEA) (Stowtt, 2011). This was a certification scheme to promote uniform HSE standards for contracting firms in accordance with the Occupational Safety and Health (OSH) Act of Trinidad and Tobago (2004). The standardisation of HSE requirements ensures that a contractor is equipped to combat the risks involved in the workplace. The STOW initiative was intended to pre-qualify contractors with the necessary HSE requirements for work in the energy sector of Trinidad and Tobago..

According to the ECTT, the entire process of implementation is rigid in terms of policies and legislative embodiments, together with the financial and economic considerations of implementing such safety management systems (SMS) in organisations. However, the STOW implementation process is dynamic. The present STOW-SMS does not have an overarching template for essential areas of safety management. As a consequence, many energy-sector contracting organisations (including those currently certified) failed in their STOW implementation (ECTT, 2011). Solutions to existing problems coupled with the expansion of the scope of STOW, would irrefutably bring improvements to the opportunity areas mentioned above and the overall success of the STOW project implementation.

In such context, this paper reviews the current problems inhabiting the STOW initiative, discusses the main elements of the STOW scheme, and explores the need for broadening its horizon for inclusion of extended requirements and performance indicators. The current requirements and the parameters of STOW were analysed, and areas of opportunities were identified. This paper is intended to expand the current scope and functionalities of the STOW scheme, derive a project management approach with guidance to contracting firms engaging in STOW-SMS implementation in T&T.

2. Problems Inhabiting the STOW Initiative

Since the launch of the STOW scheme in 2011, many contractors and contracting firms have been experiencing the challenges in pre-qualifying for low, medium and high risk jobs in the T&T's energy sector. According to Stowtt (2011), there are a host of eleven (11) elements identified for improving the HSE management systems associated with the STOW certification programme. These elements are listed as follows:

1. HSE Management, Leadership and Accountability
2. Legal Requirements and Document Control
3. Risk and Change Management

4. Planning, Goals and Targets
5. HSE Competency and Training
6. Security
7. Health and Hygiene
8. Environmental Management
9. Incident Reporting and Investigation
10. Crisis and Emergency Management
11. Monitoring, Audit and Review

In terms of the technical aspects, the STOW requirements (such as *Element 1*: management, leadership and accountability; *Element 3*: risk assessment and management of change; and *Element 8*: environment) seemed to be giving contractors the most problems to implement. It is not by chance that the first element of the STOW requirements focused on leadership and accountability.

Some hurdles were impeding the certification process (ECTT, 2011). These include:

1) Evidence of the concept that "practice is more than paperwork" – Contractors failed to provide evidence that the STOW SMS is in effect and functioning as it should be within the organisation.
2) Time to complete the certification process – The ECTT is advertent to the fact that operating companies have started imposing deadlines for STOW certification of contractors, which if not met, leaves the contractor's ability to achieve future contracts a difficult venture. This situation caused contractors to expeditiously implement paper-based HSE management systems that could not be validated as functional and effective by the Independent Assessor. The system should therefore not be tested until at least three months have elapsed for gathering evidence that the system works efficiently, before seeking certification.
3) Leadership is crucial – The leaders of the organisation set the tone for the safety culture and are held accountable for the organisation's safety performance. Senior executives, managers and supervisors are expected to be familiar with the HSE performance of their operations and able to discuss it with assessors. The company is expected to provide proof of adequate allocation of human and financial resources to implement and sustain the HSE management system. Additionally, contractors must have systems in place to evaluate their HSE performance through feedback from and discussion with clients.
4) Risk Assessments are salient - For risk assessments, contractors are expected to have a suitable and sufficient risk assessment process which starts with the identification of critical activities. The STOW Board pays particular attention to the assessor's findings when it pertains to risk assessments, especially for higher risk companies.
5) Risk assessments must be documented - Many service companies do have environmental impacts. For instance, many contractors involved in drilling operations would place little or no emphasis on the environmental requirements because they are of the opinion that this area is not applicable to them. However, the STOW Board expects contractors to evaluate the possible risks that their operations pose to the environment. If there are significant risks, the STOW Board would expect a separate environmental management plan that addresses the risks. Even if, the risks are minimal, measures must still be put in place to reduce the risk.
6) Contractor HSE system – Many contractors rely significantly on the HSE management systems of the client (when on the client's site). The STOW Board remains adamant that contractors must have their own HSE management systems and not rely solely on their client.

3. Literature Review

3.1 Safety Capital and Knowledge Management of OSH

Occupational Safety and Health (OSH) activities are seldom considered as the sources of the intellectual capital of the firm. However, it is widely recognised that safer and healthier workplaces, along with competitive advantage, are one of the firm's major objectives, as they can improve productivity, boost employees' morale and reduce costs (Thompson, 1997). Hale and Hovden (1998) proposed to address the safety system and culture (intangible assets) to current safety theory and practice.

Nonaka (1994) proposed a dynamic approach to explain the process for the creation of Safety Capital. Nahapiet and Ghoshal (1998) advocated a process of creation of Safety Capital using the general theoretical framework of organisational knowledge that is adapted to the specific nature of the occupational safety. Besides, Spender (2008) argued that Safety Capital would not only be processed by the organisation, but also created, distributed and managed as a distinct asset. Figure 1 shows the dynamic process of Safety Capital creation.

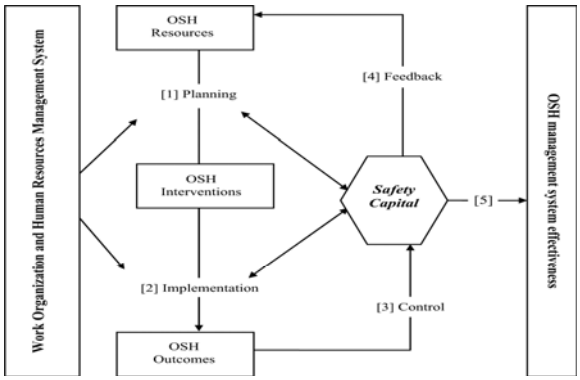

Figure 1: The Dynamic process of creation of Safety Capital
Source: Abstracted from Nonaka (1994)

3.2 Development of a TQM-based SMS

The concepts and techniques associated with total quality management (TQM) have gained worldwide acceptance in manufacturing and service industries (Yu, 2004; Hunt, 2004). Manzella (1997) argued that the process used in controlling the risk of a hazardous event and controlling the quality of a product has much in common. This opens an insight into the integration of the essential ingredients of TQM into a safety management system.

The starting point is to derive some core safety management briefs from the TQM philosophy. Feigenbaum (1983) referred "total" as an organisation-wide systems approach to producing quality products and services, and defined "total quality control" as an effective system for integrating quality improvement efforts of various groups in an organisation, so as to enable the products and services to meet full customer satisfaction. Deming (1982, 1986) suggested instituting quality into the products at the beginning of the manufacturing process and emphasised improving quality constantly and involving everyone in the company in the quality transformation process. Crosby (1984) introduced the four absolutes of his total quality philosophy, i.e. the definition of quality is conformance to requirements; the system of quality is prevention of problems; the performance standard of quality is zero defects; and the measurement of quality is the price of non-conformance or the cost of quality.

With reference to the Total Quality philosophy proposed by these gurus, seven (7) safety management briefs were derived. These include:

(1) Safety is built at the beginning.
(2) Safety is conformance to safety requirements.
(3) All accidents are preventable.
(4) Goal is zero accidents.
(5) All employees are involved in accident prevention.
(6) Customer satisfaction in safety is the focus, and
(7) Continuous safety improvement is the objective.

Moreover, Yu (2004) and Hunt (2004) advocated a systematic process of developing a TQM-based SMS. Figure 2 shows the framework that incorporates the core safety management briefs and essential elements of TQM paradigm.

Figure 2. A conceptual framework of SMS
Sources: Abstracted from Yu (2004) and Hunt (2004)

3.3 The Legislative Framework for HSE

Health and safety legislation appears as a complex raft of specific, independent regulations dealing with complex topics in an isolated manner. Health and safety legislation forms an integrated framework and it is essential to grasp the holistic nature of this framework in order to fully understand the specific requirements contained within it. According to the British Standards Insititution, several key elements constitute a legislative framework (BSI 2012) . These elements are:

1) Standards
2) The Policy Process
3) Impact assessment
4) Enforcement

3.4 HSE Management in a Contract Environment

Management of HSE in a business environment requires co-operation among companies and a clear definition of the tasks and responsibilities of each of the parties. According to SHAPCC (1999), there are several phases comprising this process, with each phase respectively possessing the tasks and responsibilities required between the company and contractor(s). The basic flow of phases is as follows:

1. The Planning Phase
2. The Prequalification Phase
3. The Selection Phase
4. The Mobilisation Phase
5. The Execution Phase
6. The De-mobilisation Phase
7. The Final evaluation and close-out Phase

The concept of contract management is salient, and an intrinsic relationship exists between the STOW Board and the contractor. In order to manage such a contractual arrangement, a vehement contracting process is required.

3.5 The Project Management Framework

Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. Meeting or exceeding stakeholder needs and expectations invariably involves balancing competing demands among:

1) Scope, time, cost, and quality.
2) Stakeholders with differing needs and expectations and
3) Identified requirements (needs) and unidentified requirements (expectations).

The term project management is sometimes used to describe an organisational approach to the management of ongoing operations. This approach, more properly called management by projects, treats many aspects of ongoing operations as projects in order to apply project management to them (PMI, 1996).

The Project Execution Plan (PEP) is the core document for the management of a project. It is a

statement of policies and procedures defined by the project director, although usually developed by the project manager for the project sponsor/project director's approval. It sets out in a structured format the project scope, objectives and relative priorities (OGC, 2009). The PEP includes plans, procedures and control processes for project implementation and for monitoring and reporting progress. It defines the roles and responsibilities of all project participants, and is a means of ensuring that everyone understands, accepts and carries out their responsibilities. Besides, the plan sets out the mechanisms for audit, review and feedback, by defining the reporting and meeting requirements and, where appropriate, the criteria for independent external review.

Implementing STOW is a meticulous process. The proposed elements are not only technically oriented but also includes behavioural aspects. As such, there needs to be a rigid project management structure during the implementation process. Together with the theories of contracting and procurement, there must also exist, a sound PEP for the efficient implementation of the STOW SMS. By having this PEP within the STOW framework, the implementation process can be economical both for the contractor and the ECTT.

4. Conduct of an Empirical Study

4.1 Set up of the Study

As the STOW initiative progresses due to adoption within contracting firms in T&T, areas of improvement become ever more necessary. At this juncture, focus would be placed on an empirical study which was undertaken. Two main forms of collecting primary/empirical data were utilised, these were self-completion questionnaires and semi-structured interviews. Four (4) main target groups were identified including, STOW Board members, STOW Independent Assessors, the Safety Committee members at Harsco and members from the Atlantic Safety Department. Self-completion questionnaires were administered physically for two of the sample groups (i.e., Harsco and Atlantic), and also via electronic emails to the STOW Board members and STOW Independent Assessors in T&T. Harsco was the second Contractor, (first Scaffolding Contractor), to earn the STOW Certification, therefore, this company was considered a suitable candidate for the purpose of this study. Additionally, Atlantic was the first Energy Company that obtained the STOW certification. In so doing, Atlantic showed character as a leader for promoting the STOW concept and was therefore considered a suitable candidate, for the purpose of this study.

Four (4) sets of questionnaires were designed for acquiring views from four (4) groups of targeted interviews. For the group of STOW Board members, a sample size of ten questionnaire responses was expected. The same sample size was set for the STOW Independent Assessors. From Harsco, nine (9) questionnaire responses were expected from all team members of the company's Safety Committee. From Atlantic, a target of ten (10) questionnaire responses were expected, and these responses were dispersed to random personnel within the company's HSE department. Members of the Atlantic HSE team were chosen by the method of simple random sampling of the personnel who were knowledgeable of the current STOW scheme. In total, thirty-nine (39) questionnaires were dispersed to the four (4) sampling groups.

Semi-structured interviews were conducted via teleconferences and face-to-face means. The standardised *t*-statistic (*t*-distribution) was used since the samples taken from the population were small (i.e., <30). A one-sample *t*-test was conducted. This involved finding the standard error, degrees of freedom, test statistic, and the *p*-value associated with the test statistic for each of the set of responses, (per question), within the questionnaire.

The standard error (SE) of the sampling distribution was computed by:

$$SE = s * \text{sqrt}\{ (1/n) * (1 - n/N) * [N / (N - 1)] \} \quad \text{Eq.1}$$

Where's' is the standard deviation of the sample, 'N' is the population size, and 'n' is the sample size. When the population size is much larger (at least 10 times larger) than the sample size, the standard error can be approximated by:

$$SE = s/\text{sqrt}(n) \quad \text{Eq.2}$$

The degrees of freedom (DF) are equal to the sample size (n) minus one. Thus, DF = n - 1.The test statistic is a t-score (t) defined by:

$$t = (x - \mu)/SE \quad \text{Eq.3}$$

Where x is the sample mean, μ is the hypothesised populations mean in the null hypothesis, and SE is the standard error.

The *p*-value is the probability of observing a sample statistic as extreme as the test statistic. Since the test statistic is a *t*-score, the *t* Distribution, assesses the probability associated with the t-score, given the degrees of freedom computed.

Hypothesis tests were undertaken on the responses of each question, which constituted the respective criterion for each sample group. Once the sample means were validated (or accepted) when compared to the approximated population means, the value of that mean would determine whether that criteria is relevant for inclusion in the proposed STOW-SMS framework. The responses from the four (4) sampling units were then juxtaposed to analyse how the respondents from the different samples view the criteria as valid for improving STOW.

4.2 Testing of Study Hypotheses

The study was divided into three (3) variables, namely 1) the dependent variable, or the variable to be explained, 2) the independent variable, or the variable that is supposed to be influencing the dependent variable, and 3) the control variable which is another variable that might be influencing the relationship and needs to be held constant.

This study set forth six (6) hypotheses with respect to the dependent variables. These are:

Hypothesis 1: STOW covers the spectrum of risk management in contracting firms as it pertains to natural disasters in T&T.

Hypothesis 2: STOW requires a demarcated legislative framework which guides the actions performed by the Board, the Independent Assessors and the contracting firms.

Hypothesis 3: STOW incorporates the contracting and procurement process into the working capacities of contractors.

Hypothesis 4: STOW incorporates quality control concepts into safe practices in the workplace of contracting firms.

Hypothesis 5: STOW incorporates a Project Management approach for SMS implementation within the working capacities of contracting firms.

Hypothesis 6: STOW regards Safety Capital as a central issue in terms of safety culture and knowledge management of best practices.

All hypotheses were tested to validate the importance of the dependent variables that would constitute the core components of the proposed STOW-SMS framework. The scale advocated by Likert (1932) was used to define the levels of importance, with, one (1) being the least important and five (5) being the most important. High values (i.e., ≥ 4) were used to signify the importance of each criterion (i.e., the variables) to the STOW SMS.

5. Findings and Analysis

5.1 Response Rate of the Study

Table 1 depicts the response rates for each of the aforementioned sampling units and the overall survey response rate. It shows that 40% of the sample size responded from the STOW Board members, 70% from the STOW Independent Assessors and 100% from both Harsco and Atlantic. The overall response rate was found to be 77%. The low response rate from the STOW Board Members was expected due to the fact that these members held senior management positions across the various companies in the energy sector. Feedback from the STOW Board members was crucial (i.e., 40% response rate).

While looking into the overall response rate acquired from respective sampling units, the STOW Board members contributed to 13% of the responses. The Independent Assessors contributed 23%, while the Harsco Safety committee contributed 30%. Staff members of the Safety Department at Atlantic contributed to the remaining 34% of the response rates (see Figure 3).

Table 1. Sampling Units Response Rate

Sampling Unit	Sample Size	Response	Response Rate
STOW Board Members	10	4	40%
STOW Independent Assessors	10	7	70%
Harsco	9	9	100%
Atlantic	10	10	100%
Overall Response Rate	39	30	77%

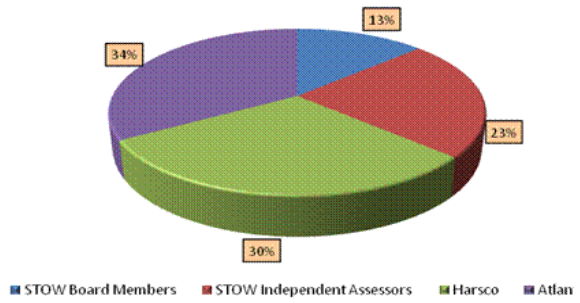

Figure 3. Response Rate of Sampling Units

5.2 Determination of the STOW-SMS Criteria

Feedback pertinent to the current STOW elements was retrieved via questionnaires. These responses gave rise to statistical measures, primarily the arithmetic means and standard deviations. The *t*-statistic for each result was determined. Figure 4 shows the means for each sampling unit as they relate to the existing STOW elements criteria. The STOW Board members recorded the highest mean value of 4.63, while Harsco scored the second highest with a mean of 4.33 followed by Atlantic with a mean value of 4.28. The STOW Independent Assessors scored the lowest with a mean value of 4.11 and also scored the highest standard deviation of 1.18, which implies that there was a significant degree of variance and deviations from this mean value calculated.

Figure 4: Mean Values of Existing STOW Criteria

There were varying mean levels corresponding to the different perceptions that each sampling unit experienced regarding specific STOW criteria. This is beneficial, since the results identify the need for proper communication channels and management amongst the parties involved in the process. The STOW Board, STOW Independent Assessors, the Energy Companies and the Contractors should be on the same page as it relates to the definition of the current STOW criteria. Table 2 shows a summary of the acceptance for existing STOW criteria.

Table 2. Acceptance of Existing STOW Criteria

Sampling Unit	Mean	Standard Deviation	Hypothesis Tests
STOW Board	4.63	0.44	Accepted
STOW Independent Assessors	4.11	1.18	Accepted
Harsco	4.33	0.75	Accepted
Atlantic	4.28	0.70	Accepted
Overall Results	4.23	0.75	Accepted

Even though there were varying levels of means experienced by each sample, all respondents scored greater than 4.00. This implied that these current STOW elements would be retained within the proposed STOW SMS framework. The overall mean value for STOW criteria was computed to be 4.23 with a standard deviation of 0.75.

5.3 Validation of Study Hypotheses

Six study hypotheses were validated via the statistical analysis of the STOW criteria. A review of the statistical analysis performed on each question within the designed questionnaires was described. Once these issues demonstrated the acceptance of the criteria, the means were reviewed per sampling unit. The overall mean values per criteria were also calculated, which is the primary method for testing the six (6) hypotheses of this study.

The aim was to validate the compliance of each of these criteria for provisional inclusion into the proposed STOW-SMS framework. Figure 5 shows the overall results from the study, whereas Table 3 summarises the acceptance for the study Hypothesis. Once the sample mean was found to be ≥ 4.00, the criteria would be included in the framework. This also implies that the respective study hypothesis would have been validated.

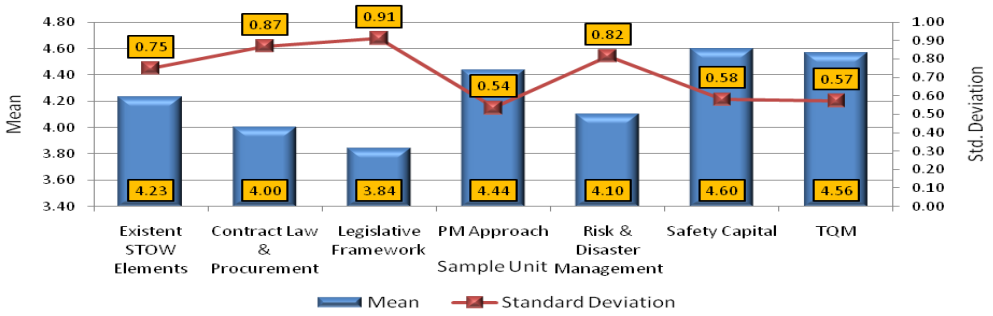

Figure 5. A Summary of Overall Results of STOW Criteria

Table 3: Validation of Study Hypotheses

Study Hypothesis	Sample Means	Sample Standard Deviations	Validation	To be included
1. STOW covers the spectrum of risk management in contracting firms as it pertains to natural disasters in T&T.	4.10	0.82	Accepted	Yes
2. STOW requires a demarcated legislative framework which guides the actions performed by the Board, the Independent Assessors and the contracting firms.	3.84	0.91	Rejected	Yes*
3. STOW incorporates the contracting and procurement process into the working capacities of contractors.	4.00	0.87	Accepted	Yes
4. STOW incorporates quality control concepts into safe practices in the workplace of contracting firms.	4.56	0.57	Accepted	Yes
5. STOW incorporates a Project Management approach for SMS implementation within the working capacities of contracting firms.	4.44	0.54	Accepted	Yes
6. STOW regards Safety Capital as a central issue in terms of safety culture and knowledge management of best practices.	4.60	0.58	Accepted	Yes

Remarks: * - There were varying responses (with a standard deviation of 0.91). The representatives from contracting firms and operating companies requested this criterion be included within the STOW-SMS framework

The *t*-statistic value was calculated within the acceptable range. The Safety Capital criteria scored the highest mean value (i.e. 4.60), followed by the need for a TQM approach in managing safety at contracting firms (i.e., mean = 4.56).. A project management approach for implementing STOW was rated the third (i.e., mean = 4.44), followed by the need for a risk and disaster management plan (i.e., mean = 4.30). Having a contracting process in place was rated as the fifth criteria (i.e., mean = 4.00), whereas the idea of introducing a legislative framework for STOW scored the least (i.e., mean = 3.84). Despite that the legislative framework criterion was statistically rejected, with the highest standard deviation (i.e. 0.91), representatives from contracting firms and operating companies requested this criterion be included within the STOW-SMS framework.

6. A Proposed STOW SMS Framework

6.1 Components and Criteria of the Framework

Figure 6 shows the structure, the core criteria and the components of the proposed framework. Based on the validation of study hypotheses, the existing elements of the STOW scheme would be evolved. The existing eleven (11) elements remain substantiated. Additionally, six new criteria and/or components would be incorporated into the proposed STOW-SMS framework. The rationale of incorporating these new criteria is elaborated below:

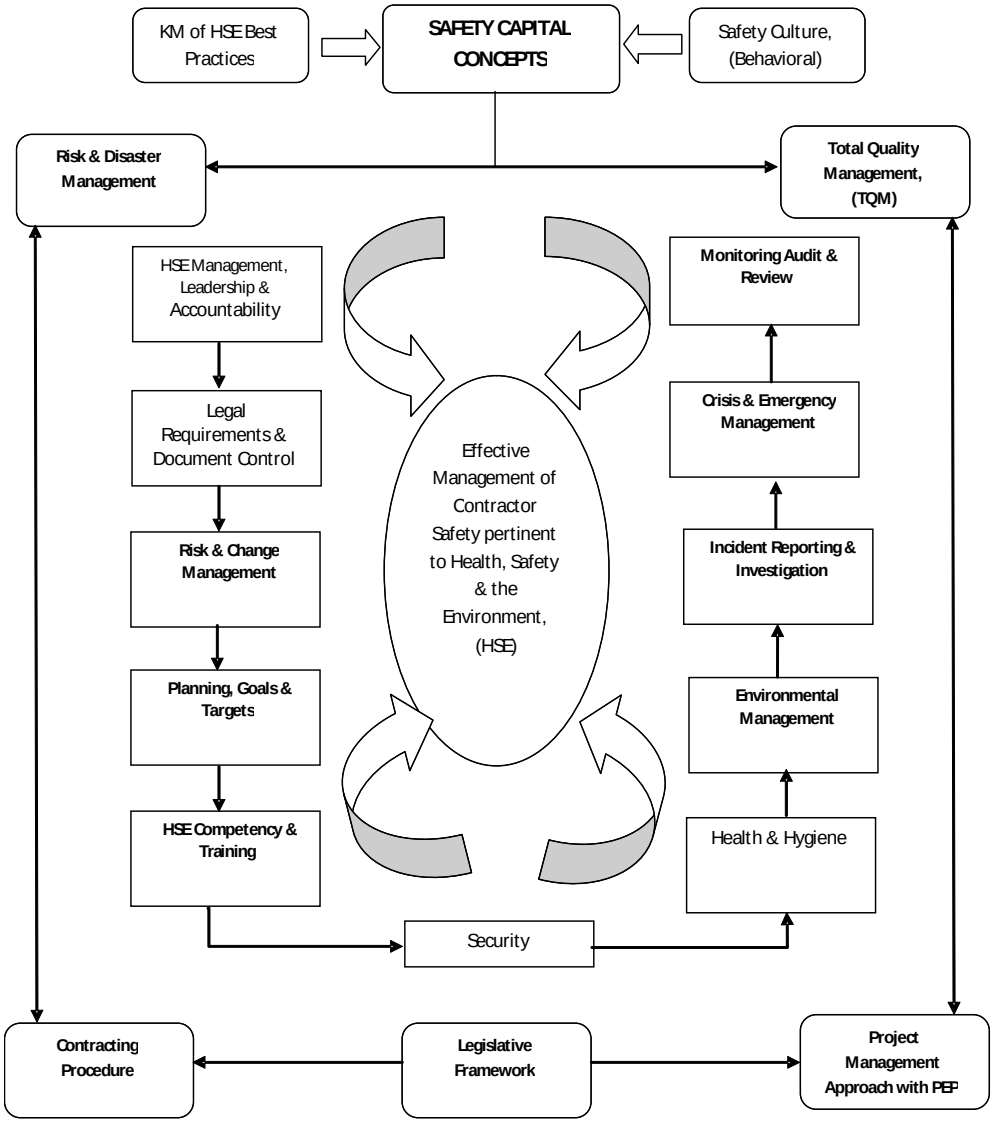

Figure 6: The construct of the Proposed STOW-SMS Framework

1) Safety Capital Principles - Based on the principles of Safety Capital, it is important to establish and promote an HSE culture and to build the knowledge sharing capacities in matters pertinent to HSE throughout the organisation. A safety culture needs to be recognised as one of the forefront capitals for an organisation (similar to human capital and financial capital).

2) Risk and Disaster Management - The present STOW scheme targets man-made hazards only. As such, it is incumbent on any SMS to reserve elements that can prepare organisations to cope with the effects of any natural and other disasters. The principles of risks and disaster management would thus be adopted to develop plans in alignment with the emergency response procedures affiliated with these types of risks.

3) Total Quality Management - Currently, there does not exist any theories or elements pertinent to TQM within the STOW SMS. The process used in controlling the risk of a hazardous event and controlling the quality of a product has much in common (Manzella, 1997). This opens an insight into the integration of the essential ingredients of TQM into an SMS. Quality and HSE are closely related. The principles of TQM would be an integral aspect of the proposed framework.

4) Contracting Procedure - The STOW scheme is currently ambiguous as to the procurement type that should be used during the STOW implementation process within contracting firms. There should exist, a clear-cut procurement type that is standardised for all contracting firms and mandatory for use when seeking STOW certification. Emphases would thus be put on incorporating contracting and procurement principles, as well as the processes involved in practicing contract law.

5) An HSE Legislative Framework - It is important to foster the need for incorporating a legislative framework into the STOW-SMS. At present, there is no related legislation endorsed by the STOW Board that requests the adoption of the STOW scheme among contracting firms in the energy sector. There should be some legislative framework existent to incorporate STOW SMS as part of The Occupational Safety and Health (OSH) Act of Trinidad and Tobago (2004), or possibly to supersede this current legislation and replace it as the reformed local legislation for managing HSE in T&T.

6) Project Management Approach - There is the need to clearly define an unambiguous project definition report, which includes a STOW specific project execution plan for implementation of the STOW SMS. The principles of good project management would facilitate the STOW SMS implementation, and the use of a PEP would improve the process by providing information of project cost, time and scope.

These criteria would enhance and revolutionise the current STOW systems approach to managing safety and also the implementation of the said system among the contracting firms in T&T.

6.2 The STOW SMS Performance Metrics

The survey findings from the four (4) sampling units showed that perceived STOW SMS performance was generally accepted from all sampling units defined. Figure 7 shows the relationship of the mean values computed for the STOW-SMS performance metrics criteria, with respect to the sampling units.

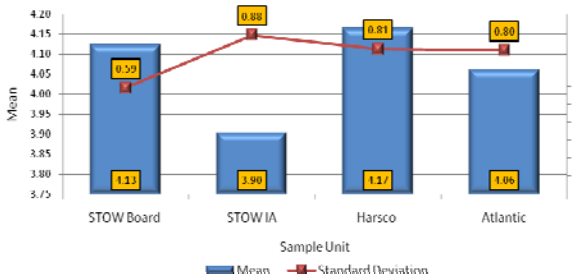

Figure 7: Means values of Performance Criteria Metrics

Harsco scored the highest with a mean value of 4.17 followed by the STOW Board members who scored a mean value of 4.13. Atlantic scored a mean value of 4.06 followed by the STOW Independent Assessors who scored a mean value of 3.90. The standard deviation for the STOW Independent Assessors was also the highest, which implied that there were noticeable deviations from the mean value calculated.

While there were rejected hypotheses coming from the STOW Independent Assessors sampling unit, the other sampling units justified the anticipated benefits in performance, if the proposed STOW criteria were to be included within the STOW SMS framework design. The overall mean among four sampling units was calculated as 4.06 with a standard deviation value of 0.77. Table 4 shows a summary of findings and the hypothesis testing results on the proposed performance criteria.

Table 4: Acceptance of Proposed STOW-SMS Performance Criteria

Sampling Unit	Mean	Standard Deviation	Hypothesis Tests
STOW Board	4.13	0.59	Accepted
STOW Independent Assessors	3.90	0.88	Partially Accepted
Harsco	4.17	0.81	Accepted
Atlantic	4.06	0.80	Accepted
Overall Results	4.06	0.77	Accepted

6.3 Anticipated Benefits of the STOW-SMS Implementation

The contractors and/or contracting firms could measure their project performance with respect to the HSE requirements and a host of key performance indicators

(KPIs) of the STOW SMS. The development of these KPIs is to 1) measure HSE solution for assuring proper STOW-SMS implementation, and 2) monitor the HSE management and performance in line with the corporate goals of respective contractors and firms.

There are three stages of the KPI development process. These are:

1. The development of strategic measures that focuses on the six (6) proposed STOW criteria across different functions of the organisation.
2. The development of KPIs and incorporating them into the HSE processes and solutions, by eradicating existing or potential bottlenecks in operations.
3. The determination of viable KPI after implementation of proposed STOW SMS criteria.

Moreover, based on the feedback and experience shared from the four (4) target groups of this study, several benefits are anticipated from the adoption and implementation of the evolved STOW-SMS Framework, inclusive of:

1. Project targets and deadlines would be met at a faster rate.
2. Various departments within local contracting firms are willing to form partnership arrangements and to work in coordination.
3. Introducing the proposed criteria within STOW that meet the needs of respective contracting firms.
4. Anticipated wider impacts involving matters relating to HSE would be achieved.
5. There would be a continuing need for STOW SMS improvement activities (continuous improvement strategies).

7. Conclusions

In T&T, there is a need for contracting firms to better manage HSE requirements in their workplace. Recent and technologically improved systems (e.g., using advanced computer software and programmes) could facilitate the proper storage, compilation and generation of HSE materials in contracting firms. The STOW initiative was intended to pre-qualify contractors with their attainment in the HSE requirements for work in the energy sectors. Despite that the initiative has taken an important step in promoting uniform HSE standards, many contracting firms failed in their STOW implementation.

There has been a marked difference in the implementation of STOW, when it is left up to the HSE manager and other employees in comparison to the effort is driven by the top executives of the company. When the top executives take charge, implementation is smoother and takes place at a faster rate. Moreover, the emphasis on the human resource element would ensure that employees are made aware of HSE and are equipped with mentoring and training sessions within the organizations. This would increase employee capability and competence level when performing their tasks, both internal and external to the workplace, thereby inculcating methods of best practices for HSE.

This paper discussed the problems inhibiting the existing STOW initiative. Based on the analysis of empirical evidence and testing of six (6) study hypotheses, an enhancement of the current STOW structure was proposed and a STOW-SMS framework was derived, with six new criteria and/or components and KPIs. The proposed framework would be able to effectively manage challenges, by invoking its Safety Capital functions. The adoption of the proposed framework would provide a viable template for assisting contracting firms to improve their HSE functionality, and allow them to better manage the tendering process in the energy sector. Once the STOW initiative progresses as an industry-wide practice for managing HSE, then actions could be taken to enact STOW as the legislative strong hold representing HSE in T&T.

In order to foster the adoption of the proposed framework, a further review would be performed by targeting a larger sample size from the stipulated four (4) sampling units, so as to attain more feedback from the main stakeholders and/or the inclusion of other stakeholders. Further improvements in STOW can ensure that the initiative become an overarching template for HSE within contracting firms in T&T.

In conclusion, it is anticipated that this framework would allow for the dynamic management and monitoring of HSE and the performance of HSE best practices among contracting firms in T&T. The STOW initiative and the proposed framework could be extended to other operating companies in the energy sector, governmental and state owned companies and ministries, manufacturing companies and other private-sector companies in T&T. In the longer term, efforts could also be made to transcend the boundaries of T&T and transfer the STOW-SMS framework to other regional countries, thereby promoting STOW as a benchmark for the industry-wide management of HSE in the Caribbean.

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