Diagnosis Integrated Management System (IMS) and ways to improve the refinery in Abadan using TOPSIS

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Abstract

Implementation and establishment of integrated management system got attention in order to create and promote quality, safety, professional health and environment protection in a lot of organizations. But appropriate performance of this system to how it meets expectations is very important. This study identifies events and integrated management system challenges in Abadan oil refining company and presents suitable solutions for their promotion. It did interviews with company experts to prepare a questionnaire. In order to identify events, questionnaire included 25 stable and justifiable questions used and distributed among 196 statistical samples and data were collected and analyzed. Events priority was done in two steps. Primary priority was done by Friedman hypothesis that this was done based on comments from statistical samples. It used TOPSIS technique and 10 pivot indexes in order to produce final and more accurate events. The study presented solutions and improvement projects in format of problem-solving group and group decision-making techniques. Some solutions were presented. According to common roots issues, four basic strategies were defined and suggested for better performance.

Keywords: The Integrated Management System (IMS), event-priority, TOPSIS Technique, Hypothesis Test, solution.
1. Introduction

An integrated management system (IMS), plays an important role in the efficient functioning of economic enterprises and allows executives to select better operational decisions and strategic choices. Accompaniment with these systems can also create a recognized international standard (common language), resulting into optimal utilization of human, financial resources, proper communication between customers, employees and managers. It can establish appropriate commercial competition between organizations, produce superior quality and reduce costs with continuous improvement in all components of the organization.

Abadan oil refining company, in order to promote safety and health professional staff and protect environment and achieve the proper quality standards, put implementation of management systems including ISO9001, OHSAS 18001, ISO14001 ISO 1 TS 9001, HSE 2 IMS from years ago (2001) on the agenda.

Generally, in addition to the usual undertaken activities such as preparation of the workbook, containing processes definition (66ID process), it includes input and output setting, diagram work and measured indexes (to control various processes from different control points. Those points include the process quality, cost, time, environmental impacts and occupational health and safety, etc.) that fit every definition and process in a period proportional to the measured index and each with optimal defined limit (according to the nature of each indicator that can be ascending or descending, and due to the associated idea contained in the same company, organization or according to existing standards). By comparison, analysis and traces appropriate charts in the form of integrated management dashboard software, items are defined outside of these limits. Corrective actions are defined and implemented.

Since the implementation of these systems, the organization has tried (in addition to doing usual activities in integrated management system by using reputable and experienced consultants) to inject new thoughts into the organization to improve the system. But with all those conditions and in spite of all aforementioned activities, it seems that it has not used all its functionality after a few years of implementation and improvement of the system. This issue considers symptoms, such as non-compliance, non-duplication, and non-view of continuous improvement in the various fields (process, indicators, safety status, health, etc.). Managers and staff’s complaints, in status of the system for paperwork are considered. The staff’s confusion in connection with responsibilities and their tasks for IMS and weakness documentation are evident. The existence of these issues indicates that the system is in a closed cycle and has dynamics of expansion, development, and recovery. While the continuous improvement is

1) ISO: International Standard Organization
2 ) HSE: Health Safety Environment
inherent component in integrated management system, the lack of observed recovery in these systems represents its patience.

Therefore, we decided to take a look at the state of the system and its various aspects from closer perspective, and identify all of the potentials to improve its status by scientific and precise diagnosis. We wanted to take step in the optimization of costs and current activities with defining improving programs and compliance. This study is done in order to treat the issue and since there hasn’t been any study that checks an integrated management system in Abadan oil refinery, the present study is an effective step to prevent the deviation of these systems from its original path.

The aim of this research is to identify all of the symptoms found in this approach and integrates management system in the Abadan oil refinery and prioritizes them in terms of importance. On this basis, all the possible ways will be defined for this research to improve the current situation in terms of approach system and prioritize solutions and offer a reward. In this study, TOPSIS few criteria techniques are used to identify collected symptoms from the participants’ questions, prioritize and analyze them. Thus transparent variables resulted from the implementation of the IMS benefits (financial – safety, etc.). Training audits quality, the collaboration of other departments and measuring indicators-attention to preventive measures can be considered as the basis of the analysis with the use of this technique. The data in this study has been collected in the first quarter of 2015 from statistical research community. All administrators, experts and staff are from Abadan oil refining company.

2. Review of literature

2-1. Integration of management systems

The main factor of the emergence of the thought of triple integrated management systems is joint funds between job safety and health standards (OHSAS18001), quality management system (ISO 9001 and ISO\TS 29001), Environmental management system (ISO 14001) and coordination of existing systems and the lack of overlap between them. The similarity of this management system and the advantages of the concurrent offered implementation of integrated management systems which is new solution to coordinate between the various parts involved and prevent disconnection activities.

1 ) Occupational Health and Safety Assessment Series
2-2. Similarities and subscription systems

The main factor that consolidates the formation of above integration management systems trilogy was the similarities and the common points existing between these systems. We state these items briefly:

- All three systems on general viewpoint and approach system classification are put in a chain with management systems. This is seen also from these systems name.
- The structure and Deming cycle: Deming cycle (P-D-C-A) expanded to application in the various systems, such as the quality systems by Deming.

-Planning: Determining the objectives and necessary processes to achieve results in accordance with the policy.

-Implementation: the implementing processes.

-Review: monitoring and measurement of processes associated with the policy, macro and micro objectives, legal requirements and other requirements and reporting.

-Action: corrective measures were required for continuous improvement in performance of the integrated management system.

1) Plan-Do-Check-Act
Figure 1. P-D-C-A

When comparing this cycle with the trilogy structure, we see that the ISO 14001 and OHSAS 18001 standards completely match with this structure. This structural similarity in ISO 9001 is also visible.

Application Scope: The first part in all three above standards is called application scope. This section expresses implementation range and runs for each of the three systems. In other words, all three standards were considered and designed in order to run in any organization regardless of type, size, and nature of the organization’s activities. Thus the application scope of these standards correlates to factors such as the organization policy and the nature and status in which they are activated.
Audit, Record and Download Certification: all of these standards are international. They are recorded and auditable by foreign organizations (server certificate). Almost all of certificate organizations are above system audit. In the previous parts, there are comments about the number of the issued certificates for professional health and safety management system. There is no doubt that the benefits of such system are higher than those that could be pointed to all of them. But a small part is sufficient to encourage managers and the owners of industries in the establishment of integration management system.

In brief, some benefits of this integrated management systems include:
- The definition of the aim clearly in regard to the organization policy;
- Prevent wrong movements to the extracted routes in taking aim;
- Eliminate the interference, imbalance and different works within the system;
- Decrease of rework cost;
- Creation and expansion of information systems in dynamic workflow;
- Providing revision possibility in system and fix defects and weaknesses;
- Establishing the possibility of getting feedback from the activity details;
- Providing background for various forecasting process;
- Reducing documentation volume and records system.

3. The implementation method of the research

It has used interview tool for understanding individuals’ opinions regarding to the system (including employees, managers and Organization directors) and the factors affecting the quality of the integrated management system in order to identify and define variables (indicators) that are effective in diagnosing the system. Questionnaire technique has been used in order to recognize the individuals’ opinions associated with the system (the results of the staff, managers and directors in integrated management system) regarding the above defined variables.

In this research, TOPSIS is used as a decision technique for final prioritization of recognized integrated management system. It used the method of collective wisdom (brainstorming) to know the expert opinions associated with the system (including integrated management system custodian, quality and efficiency unit head and staff, management systems Chairman, HSE unit head and staff, and also internal audit and relevant consultant and elected staff and directors). The statistical community that includes employees, managers and directors of the Abadan oil refinery in integrated management system incumbent, has been defined. It is necessary to explain that some departments such as finance, security and integrated management systems have not been defined, and therefore it is not possible to poll from them. 196 employees, directors and managers of the Abadan oil refinery randomly for sampling were chosen in accordance with the Cochrane formula.
A questionnaire was designed to diagnose management integrated system and to identify indicators. After reviewing the questionnaire’s validity and reliability, relevant analysis was carried out. Therefore, variables identification and factors affecting how the implementation of the integrated management system, with 17 people from managers and departments directors and some integrated management system custodian (HSE Office, quality and efficiency staff) as well as some other integrated management system representatives were identified in conducted interviews.

Because of prioritizing Integrated Management System based on Respondents’ reactions to the questionnaire, it is necessary that wishes and ultimate goals of implementing an integrated Management system in this study that are called "core indicators", are defined.

In this respect, 15 pivot indexes were extracted by studying texts and IMS standards resources and obtaining experts’ comments. 10 thrust indicators cases have been selected by experts. Pivot indicators feature -that are requirements or standard tabs basis- have been based on concepts. Pivotal indicators titles were stated like the following: (items 1 to 3 relating to the quality management system, items 4 to 6 related to environmental management system and items 7, 9 related to safety, health system and 10 shared between all three systems).

1- Customer (customer satisfaction)
2. Product quality
3- Sustainable production
4. Polluting the environment
5. Natural resources waste
6. Society attitude towards the organization (in terms of environmental conditions)
7- Number of events
8- Events intensity
9- Number of occupational diseases
10- Continuous improvement

These indicators are as TOPSIS inputs. In the below-stated table, the first row represents the central indicators in integrated management system. The numbers in table represent the experts’ opinions regarding the extent of the effect each has on pivot indices IMS that covers range from 1 to 9. And also the first column includes 20 from 25 complication items that are priority based on integrated management system variables by "Friedman" ranking.

The real purpose is the final complication priority according to the actual demands of the integrated management system (Central index) and priority of improvement programs using TOPSIS methods.
Table 1. Primary TOPSIS Data

<table>
<thead>
<tr>
<th>IMS core indicators</th>
<th>Customer orientation</th>
<th>Product quality</th>
<th>Sustainable production</th>
<th>Polluting the environment</th>
<th>Waste of natural resources</th>
<th>Attitudes toward the organization</th>
<th>Number of event accidents</th>
<th>Improvement severe</th>
<th>Continuous improvement</th>
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<tr>
<td>IMS conditions</td>
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<td>No-Transparency of</td>
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<td>amending Instead of</td>
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<td>corrective action</td>
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<td>Not paying attention to all articles</td>
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<td>Poor quality education</td>
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<td>Lack of management support to resolve conflict</td>
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<td>Lack of education for all</td>
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<td>Employee with Low motivation</td>
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<td>Lack of cooperation from other agencies</td>
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<td>Extended license but not improve</td>
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<td>weak Software</td>
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<td>Inadequate audit program</td>
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<td>Low quantity of education</td>
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<td>Weak consultants</td>
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<td>No-process Look</td>
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<td>Inadequate internal audit program</td>
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</table>
4. Processing and analysis Data

In this study, after designing the questionnaire, collection and analysis of data produced important results. They are stated the following:

1. The average score given to the Abadan oil refinery management system by employees, managers and directors, consultant and system custodian is 60% in a total.

2. Variables or integrated management system diagnosis are prioritized by using the average score for each question (variable).

3. Comparison of data collected in the form of tables and graphs represent different opinions of employees, managers and directors, custodian (anchors) system and consultant towards each other regarding the research variables.

4. There is a relationship between some of the different research variables. For example, by increasing the number of comments on the lack of clarity benefits from implementation of the integrated management system, opinions based on the need to integrated management system also increases and vice versa.

5. So, the lack of normal data that was done with the Kelmogorov - Smirnoff test with Friedman hypothesis being different of different people comments regarding the variables was accepted that is based on the first priority (the most important complication) lack of clear benefits in implementation of the integrated management system for the employees. The last priority is “not useful management integrated system in terms of staff”.

6. Test-prioritization performed by Friedman, prioritized the average score for each variable are largely similar.

7. 20 from 25 defined indicators/variables were selected for final prioritization according to score and base on experts’ opinion as the incoming TOPSIS.

8. Integrated management system pivotal indicators that are requests and implementation objectives of this system are defined and weighted using TOPSIS technique.

9. Final prioritization of integrated management system diagnosis is done by using TOPSIS techniques and entering the opinions of experts. Based on first and foremost side effect,
there is no definition of appropriate indicators and enough in order to measure and monitor processes.

10. Roots and the known side effects of collective wisdom techniques are used to identify problems; these roots help to identify solutions and improvement projects shared between different complications.

11. Suggested ways to improve the integrated management system are defined using collective wisdom. Prioritizing solutions can be tailored to the priority problems.

**Table 2. Final ranking event using TOPSIS**

<table>
<thead>
<tr>
<th>Weights calculation</th>
<th>effect No.</th>
<th>priority</th>
<th>Title</th>
<th>eight</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>0</td>
<td></td>
<td>Inadequate Indicators</td>
<td>.615</td>
</tr>
<tr>
<td>L2</td>
<td>0</td>
<td></td>
<td>weak Software</td>
<td>.606</td>
</tr>
<tr>
<td>L3</td>
<td>0</td>
<td></td>
<td>The number of poor audit</td>
<td>.596</td>
</tr>
<tr>
<td>L4</td>
<td>0</td>
<td></td>
<td>Low quality audit</td>
<td>.575</td>
</tr>
<tr>
<td>L5</td>
<td>0</td>
<td></td>
<td>Extended license but not improve</td>
<td>.567</td>
</tr>
<tr>
<td>L6</td>
<td>0</td>
<td></td>
<td>Inadequate internal audit program</td>
<td>.558</td>
</tr>
<tr>
<td>L7</td>
<td>0</td>
<td></td>
<td>Lack of cooperation from other agencies</td>
<td>.540</td>
</tr>
<tr>
<td>L8</td>
<td>0</td>
<td></td>
<td>Weak consultants</td>
<td>.532</td>
</tr>
<tr>
<td>L9</td>
<td>0</td>
<td></td>
<td>Low quantity of education</td>
<td>.514</td>
</tr>
<tr>
<td>L10</td>
<td>0</td>
<td></td>
<td>No-process Look</td>
<td>.513</td>
</tr>
<tr>
<td>L11</td>
<td>0</td>
<td>1</td>
<td>Inadequate audit program</td>
<td>.496</td>
</tr>
<tr>
<td>L12</td>
<td>0</td>
<td>2</td>
<td>Lack of management support to resolve conflict</td>
<td>.482</td>
</tr>
<tr>
<td>L13</td>
<td>0</td>
<td>3</td>
<td>amending Instead of corrective action</td>
<td>.474</td>
</tr>
<tr>
<td>L14</td>
<td>0</td>
<td>4</td>
<td>Insufficient duration of Audit</td>
<td>.458</td>
</tr>
</tbody>
</table>
### Conclusion

Based on results in table 2, we review the proposed solutions and the provision of priority effect.

First priority: inappropriate and inadequate indicators

**Stemming:** it is essentially difficult to define appropriate indicators in the different working professions. In the Abadan oil refinery, implementation of the integrated management system by the employees of each unit are defined mostly in the first period as the traditional and few items have been edited and improved in these years. Indicators should have the following properties:

- It controls and measures various aspects including process quality, product quality, cost, time, safety, health and environmental aspects.
- Acceptable limits or suitable targets are defined for them so that acceptable tolerances are scientifically defined to control process and prevent creating additional costs.
- Ability to calculate them is provided; it means actual data in index input must be ready.

The proposed solution: implementing process management system includes an accurate identification of activities, processes and their documentation, scientific and precise performance indicators, the effectiveness, efficiency, features overview, measuring indicators and the mechanization. Defined indicators in the field of time, cost, quality, safety and health and environment were defined in the form of process management, performance indicators, and effectiveness, efficiency the and overview about acceptable indicators, suitable purpose and science for indexes, the preparation process for the indicators.

Second priority: poor software

**Stemming:** the software contained in the Abadan oil refinery from and integrated management system the dashboard is named. It is designed and produced by information technology unit and has much space to perfect software in the field.
The proposed solution: study, identification and modeled from available software in this field, or the purchase and deployment of integrated system management software with all required abilities.

Third priority: the inappropriate audit visit

The root issue: There are three types of audit in the Abadan oil refinery. Internal audit done by a team of trained staff under the title of the internal management system auditor can be done once a year. External audit by auditor outside of company and is affiliated to the standardization International Organization to certify and confirm certification can be done once a year And care audit by the staff in quality, efficiency HSE units the company is actually integrated management system custodian which was done in different units can be performed twice a year. Numbers of different audits not only take a lot of the time from employees and managers, but also diminish the importance of audit.

The proposed solution: the integrated management system should be designed in such a way that its requirements implementation quality is not dependent on the number and quality of audits but met systematic auditing requirements. The number of care audit should be decreased because it isn’t a requirement of integrated management system. In this regard, plan audit part is explained further. (The eleventh priority)

The fourth priority: low quality internal audit

Stemming: -doing internal audit continuously by recurring teachers,
-the lack of serious internal auditors presence in the relevant training courses,
-the lack of sufficient auditors motivation to learn,
-being limited to the experience and practical knowledge auditors to the Abadan oil refining company,
-failure to change the composition of the internal audit team and inability of adding new teams.

The proposed solution: -assessing the different opinions of audit team members and review audit team,
-identifying and adding capable staff and interested in the team,
-increasing the number of auditors in a way that fatigue does not reduce audit quality and be able to have enough,
- applying incentive tools and motivational and training auditors,
- updating information and reinforcing new techniques for auditors

The fifth priority: the certification renewal not improving

The root issue: senior executives of the organization are in pursuit of more extended certification but not improving the attitude of managers and studying their past experiences. Abadan oil refining company’ experience shows that the importance of the Organization's senior
management with changing management system and including integrated management system changes adversely.

The proposed solution: - integrated management system training has to be conducted by experienced teachers to senior executives while recognizing system benefits and motivational aspects.

- motivate managers to provide clear reports regarding the integrated management system, which includes financial benefits, reduce costs, reduce accidents and occupational diseases, and protect the environment.

The sixth priority: improper internal audit program

Stemming: internal audit program includes audit about processes. Audit teams include 5 persons, head auditors and auditors, and date and time of the audit. The above program has been prepared since the implementation of ISO9001 in the company for many years. And despite being integrated management systems, it has not created a significant change and improvement.

The proposed solution: internal audit program overview,
- overview in the allocation,
- paying attention to work units in relation to the matter,
- the planning of an audit process which is units or activities they have,
- audit are linked together by a team audit.

The seventh priority: the lack of other agencies cooperation

Stemming: not cooperating other agencies,

- relieving observed conventions are mainly caused by the weakness of being processed in the organization and not having necessary facilities to resolve contradictory and especially financial resources.

One of the input management review meetings must be a contradictory view of integrated management system that will not be observed in an organization.

The proposed solution: education and culture, and create a processing look in the organization;

- using the tools that are required responsibility,
- changing their look from part/zone to process budget breakdown of development organization and its current budget, in a way that the necessary budget for the organization's development programs, are anticipated including the elimination of the conventions that require high investment or cost;

- completion of the integrated management system software while possibility of tracking of corrective measures was created and custodians can take corrective actions in the right time to follow up and solve related conventions that cause their elimination them;
- import conventions and appropriate management in review meetings and avoid conflicts in the management overview meetings

The eighth priority: poor advisors
Stemming: in the implementation of the first integrated management system standard (2002) (despite using annual consulting service) only 4 consultants were used.

The proposed solution: the use of scientific methods in order to select a consultant to employ various and enable consultants’ services for injecting various experiences and knowledge and information in the field of integrated system management to the organization.

The ninth priority: low quantity of education
The root issue: the lack of proper planning to cover all employees involved in the field of training and retraining courses on IMS.

The proposed solution: careful planning to set up training courses and retraining integrated system management;
- staff prioritization commensurate their work effects with IMS requirements demands in educational program and devoted appropriate time period to their training;
- using not-traditional educational methods (training classes), such as distance learning, weblog and so on.

The tenth priority: the lack of processing look
Stemming: “throw ball land in another administration land” is a term that can be heard in some corporative offices and caused from traditional and department look to the issues which exists in organization.

The proposed solution: education and culture, and creating process look in the organization;
- using the tools that required responsibility to change their department to process look, for example, paying attention to definition of processes owners and meeting their ultimate responsibility procedures to them.

The eleventh priority: inappropriate audit program:
Ensuring processes with integrated management system standards can be done twice-yearly by audits in Abadan oil refinery. It is done based on special checks list. And a score is given to processes commensurate with the rate of compliance with the standard tabs. Auditors unlike the internal audit have been chosen from the level of the entire organization. Custodian integrated management system are namely quality and efficiency experts and unit HSE.

Stemming: lack of change and improvement in the audit program over time.

The proposed solution: the audit planning overview so as to include modifying the scope of audit planning, audit frequency, process proper categories to audit and how follow discrepancies.
The twelfth priority: not supporting director from fixing indication
"Referred to the fifth priority»

The thirteenth priority: reform instead of corrective action
Stemming: seriousness and respect to the roots of conflict and doing corrective action is not taken.

The proposed solution: the pursuit of contradictory views and taking corrective actions by Custodian in integrated system (quality and productivity – HSE) at the scheduled time period.

The priority of the XIV: insufficient duration of the audit
See the internal planning audit (priority 6)

The fifteenth priority: not putting importance to all tabs
Stemming: there has not been enough attention to tabs due to the complex nature of some standard clauses and insufficient training of auditors.

The proposed solution: provide specialized necessary training to custodian regard to the anchors and employing motivational incentive tools, definition and implementation procedures in order to strengthen preventive activities in organization by reporting events

The priority of the XVI: the lack of understanding and employees belief
Stemming: lack of adequate training and lack of culture, lack of understanding benefits of the implementation of IMS by staff

The proposed solution: culture and education: training plan for all the personnel and managers,
- Overview in reward system to custodian and managers after the IMS certification extension,
- Completion of IMS software to prepare various reports based on the charts and tables,
- Transparent reports on direction tangible benefits of IMS

The priority of the XVII: lack of clear benefits
Stemming: lack of offering necessary feedbacks from IMS benefits in the form of various comparative and analysis reports

The proposed solution: definition and overview indicators of integrated management system effectiveness and measuring them provide outstanding comparative reports based on facts and figures regarding to benefits resulted from the implementation of the system.

The priority of the XVIII: bad quality education
Stemming: The use of less experienced and repeated teachers, lack of serious training, insufficient time courses.

The proposed solution: the use of outstanding teachers with practical experience; paying more time (due to being integrated system) at least 5 days;
- The definition of the exact heading along with the application contents confirmed with custodian system,

The priority of the XIX: the lack of training for all
Stemming: necessary and sufficient attention to not-contractual staff training.
The proposed solution: required integrated management system should be done.

The priority of the XX: low employee motivation
See Priority (XVI)
The proposed solution: do training according to what was said in before tabs;
-reload and implement bonus procedures and fits bonus with employees ' activities in connection with integrated system management;
-acculturate; connect IMS activities with incoming staff

Research suggestions

1) Prioritize solutions using various indicators, such as time, cost and the extent of integrated management impact on system, using multiple decision techniques such as TOPSIS
2) Implementation of this project in the other organization and preferably another oil refining company and compare the results.
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