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Advantages of integrated management system in educational centers

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Abstract

Implementation of integrated management system in universities and higher education campuses provides an active, safe and healthy environment toward sustainable development and it also causes increase in their quality levels. Implementation of IMS not only causes continual improvement, but it also familiarizes the public with new management systems, which would be a good pattern for using efficient management and policies. Thus, this study was performed to investigate and plan integrated management system and control and reduce health and safety hazards and environmental impacts and to increase quality level according to ISO 14000, ISO 9000 standards and occupational health and safety assessment series in the Science and Research Campus of Islamic Azad University, as the largest university site in the Middle East. In this case, the campus processes were identified and environmental aspects and health and safety hazards were assessed by FMEA method. As a result, 3 process groups including management, main and support in 2 levels (zero and one) have been identified and also earthquake, flood, lack of sewage treatment system and unsuitable sewage disposal, explosion of boilers during installation, road accidents in bad climate and some construction activities have been identified as unacceptable risks. With regard to the previous studies, the objectives, targets, programs, indices, procedures and work instruction of integrated management systems were documented. Obviously, the main result of research will be reduction of health and safety hazards, environmental impacts and increased protection of properties, increase quality level and finally implementation of integrated management system in the campus of the Islamic Azad University.

Key words: ISO 9000, ISO 14000, OHSAS 18000, universities and higher education campus, failure mode and effect analysis, risk priority number, health and safety hazards, occupational health and safety, environmental impacts, Iran.

Introduction

Given the ever increasing industrial growth, the importance of sustainable development of the inherent human tendency for a healthy and safety environment, higher customer demands and the execution of new management systems, many organizations have realized the role of a system in leading and harmonizing their activities toward the objectives of the organization various management systems, which address the services and product of an organization from their particular viewpoints, can be applied in an organization. Three credible management systems currently being used in many organizations include quality, environmental and occupational health and safety management systems. However, considering the specific requirements of such systems, the implementation of each system individually will not only cause confusion and complexities in the organization, but will also result in loss of resources, huge amounts of documents, redundancies, decreases in efficiency, and conflicts between the policies and objectives of the organization. Therefore, to prevent such complexities, management systems have been combined into a single system entitled integrated management system (IMS) [1]. The common requirement of the three systems has been identified and combined in IMS while ensuring that the individual needs of each system will not be in conflict with those of the others. Application of IMS will allow appropriate and logical allocation of resources, provide a better image of the organization, improve the performance and customer satisfaction, and decrease confusion and complexities. International standards developed by the international organization for standardization (ISO) express the requirements of integrated management systems (quality, environmental and occupational health and safety) and include ISO 9000, ISO 14000 and occupational health and safety assessment series (OHSAS 18000).

Realizing the importance of implementing IMS and considering the necessity of applying efficient and strategic management to raise the quality level of the university, the Science and Research Campus of Islamic Azad University (SRC of IAU) was the pioneering university in the country to do so in order to prevent, control and reduce undesirable environmental impacts as well as occupational health and safety hazards for the staff, students and all interested parties. Science and Research Campus of the IAU is currently one of the most important scientific centers aiming at training expert human resources and faculty members. The center was established in 1985 in Tehran and admitted 250 students in various fields of humanity, sciences, engineering and agriculture in northwest Tehran.

This research has been carried out in accordance with the quality, environmental and occupational health and safety management system and the corresponding requirements. Given the geographical and climatic specifications of the location, namely, the altitude of 1800 m above sea level and steep slopes, much rainfall, the earthquake fault passing underneath and construction activities in progress to extend the campus site and build roads, as well as lack of access to drinking water and healthy

sewerage (Introductory Bulletin of SRC, 2000), there exist environmental aspects and impacts and health and safety hazards on the campus. Therefore, the major objectives of this work included identification of the processes in SRC as well as identification and assessment of environmental aspects and health and safety hazards using failure mode and effect analysis (FMEA) method and implementation of IMS to improve the existing conditions. In other words, this project dealt with ways to improve the quality, environmental and occupational health and safety status in the center toward continual improvement.

Materials and Methods

This work was based on data collection and information in the literature and through investigation and analysis of data to provide management strategy, to improve the existing quality, environmental and occupational health and safety status. The following steps were taken in order to achieve scientific and practical objectives.

a. Revision and understanding of the existing status of SRC from the quality, environmental and occupational health and safety points of view as well as job description.
b. Identification and assessment of environmental aspect and occupational health and safety hazards using FMEA method and identification of the process in SRC and the interaction between them.
c. Problem detection, planning and documentation of IMS.
d. Providing strategy to improve the existing situation.

Since the materialization of the above objectives is possible only through implementation of IMS, the ISO 9001:2000, ISO 14001 and OHSAS 18001 series were used as research pattern for the quality, environmental and occupational health and safety management systems, respectively FMEA method.

FMEA method was used in this research to identify the existing hazards. The method is basically a qualitative analysis method, which examines systems or subsystems to identify possible deficiencies of their component and attempts to analyze the effects of such deficiencies on other parts of the system [6]. Although FMEA ought to be carried out early in the life of the product specially in the planning phase and based on precise data, the system analyst can use this tool to identify and evaluate the deficiencies of the components throughout the life of the product or system [7, 8].

In order to determine the risk priority number (RPN) three components equation was used:

$$RPN = \text{Probability of detection} \times \text{probability of occurrence} \times \text{severity} \quad (1)$$

where severity is a measure of extent of losses and damages sustained if hazards or environmental impact take place.

Probability of occurrence of a hazard or environmental impact shows the probability of such event within a given period of time [9]. Probability of detection is the probability of detecting health and safety hazards or environmental impacts. Risk is the likelihood of a hazard causing damage or loss [5].

Determination of the probability of occurrence, severity and probability of detection is illustrated in Tables 1-3 and definitions of risk levels for health and safety hazards and environmental impacts are given in Tables 4 and 5, respectively [10, 11].

Table 1. Probability of occurrence of hazards/environmental impacts in SRC [5, 8].

Type	Scale	Description
Very likely	4	Occurs frequently during the university or persons life
Likely	3	Occurs occasionally during the university or persons life
Unlikely	2	Occurs some times during the university or persons life
Very unlikely	1	Occurs rarely during the university or persons life

Table 2. Severity of hazard/ environmental impact in SRC [6].

Type	Scale	Description
Disastrous	4	Hazard results in death permanent damage or disability and cost the organization a great deal/ Impact includes in compensable damage to resources and lack of effective action to reduce and control the impact leads to widespread pollution inside and outside the center and repeated complaints by interested parties.
Critical	3	Critical effect which causes customer dissatisfaction, stops activities increases expenses and endangers customer's safety/ Damages resources compensable if accompanied by control measures release pollutants to the environment, use natural resources.
Moderate	2	Little impact which causes customer's discomfort and annoyance and customers attempt to stop it. Impact also results in consumption of natural resources and releases pollutant in to parts of the campus
Low	1	Negligible impact, inconsiderable consumption of natural resources and release of pollutants within the campus premises.

Table 3. Probability of detection of environmental impact/ hazard in SRC [12].

Type	Scale	Description
Undetectable	3	No system has been implemented. There exists no awareness of health and safety/ environment and there are contradictions in safety, health/ environmental parameters and the parameters are totally objective
Semi-detectable	2	Environmental impacts and health and safety risk's have been identified and assessed but not quite implemented, there are no revision. There exists some control measurers in health and safety and environmental issues
Detectable	1	Revision system in health and safety risk and environmental impact assessment functions very efficiently. The control mechanism in health and safety and environment functions well and is quite capable of identification of hazards and environmental impacts.

Table 4. Determination of risk rating and level.

Level	Low	Average	Severe	Critical
Rating	0-6	7-12	13-24	25-48

Table 5. Determination of rating and level of environmental impacts.

Level	Significant	Insignificant
Rating	0-24	25-48

Hazards rate 36 and above, environmental aspect and impacts rate 32 and above and hazards and environmental impacts having a severity of 4 are considered intolerable. Furthermore, aspects covered by legal requirements are considered intolerable regardless of the RPN.

Method justification: There are obviously various methods for identification and assessment of hazards and environmental impacts, each having their advantage and drawbacks. Given the time and financial constraints and the need to achieve qualitative results, FMEA method was chosen as the identification and assessment method in this research. Probabilities of occurrence, severities, and probabilities of detection of environmental impacts and hazards were designed based on the existing status of SRC of IAU.

To compare levels of environmental impacts and occupational health and safety hazards, three parameters, namely, severity, probability of occurrence and probability of detection were applied to obtain a quantitative RPN, which was used to priorities management plans and controls and implement corrective and control measures. However, since the three parameters are not completely predictable, one has to incline the results to qualitative ones. Thus, the predictable level has to be categorized, the number of categories varying in different organizations depending upon the particular condition. Obviously, the more the number of categories, the more the results tend to be quantitative and precise. Therefore, considering the environmental, health and safety condition of SRC, severity and the probability of occurrence were divided into 4 levels and the probability of detection into 3 levels so that acceptable results can be achieved despite time and financial constraints.

Results and Discussion

For an organization to function effectively, it has to identify and manage numerous linked activities. Activity using resources, and managing in order to enable the transformation of inputs into outputs, can be considered as a process.

The application of a system of process within an organization, together with the identification and interactions of these processes, and their management, can be referred to as the process approach. An advantage of the process approach is the ongoing control that is provided over the linkage between the individual processes within the system of processes, as well as over their combination and interaction [2]. SRC processes were identified; the indices of process and interaction of process were established and documented. Also identity certificate of process were documented based on suppliers, input, output, activities and customer of process. The processes identified at 2 levels of zero and one are presented in Table 6.

The most significant health and safety hazards and environmental impacts [14], which were identified as intolerable are shown in Tables 7 and 8, respectively. Risk levels for health and safety hazards have been divided into four categories, namely critical, serious, average and low. Having the highest RPN (36) in both systems, earthquake was rated intolerable, their risk was of critical type and their environmental impacts were significant in health and safety and environmental system, respectively. Given the fact that various faults pass beneath Tehran making it prone to earthquake and that the Northern Tehran fault is located directly bellows SRC. There is a great likelihood of an earthquake occurring there. Other serious hazards include accidents in campus roads and landslides during excavations. Further investigation indicate that the comprehensive development plan in SRC has increased health and safety hazards as well as environmental impacts arising from construction activities on the campus. Thus, preventive measures are required to lower the health and safety hazards and environmental impacts. As it can be observed in Table 7, the only hazard with a low risk level is that from fires caused by explosion in boilers, which has been classified as intolerable due to its maximum severity. Considering the ecological conditions of the region, the occurrence of floods and inappropriate system of wastewater disposal are other aspects leading to significant environmental impacts. Risk level and ratings can considerably help prioritize plans and control measures to lower risk.

Considering the important objective of SRC, namely training efficient and expert human resources and given the fact that centers of higher education like this can function as role models for present and future generation as far as environmental protection and increased awareness of occupational health and safety as well as quality management are concerned, implementation of IMS based on the requirements of ISO 14000, ISO 9000 standards and Occupational Health and Safety Assessment Series (OHSAS 18000) can provide the necessary cultural background and lead to continual improvement in these areas. Therefore, to achieve these goals, planning and documentation of an IMS system in form of a documentation pyramid consisting of policy, quality manual objects, targets, plans, procedures [15], work instruction and job descriptions and other documents were carried [3] out and developed to reduce and minimize environmental aspects and impacts [16] and occupational health and safety hazards and increase quality management in accordance with the conditions, procedures, environmental impacts and hazards in university. Management objectives considering identified impacts, hazards and procedures are shown in Table 9.

It is suggested that IMS be implemented in other higher education centers as well considering their great mission to raise future generation and educate them to set an example in promotion of health, safety and quality levels in order to improve the current status and fulfill the objectives and plans of IMS. Implementation of environmental (ISO 14000), quality (ISO 9000) system and occupational health and safety assessment series (OHSAS 18000) can help universities and other higher education centers achieve the above goals [17].

Implementation of IMS in universities has other advantages in addition to continual improvement, for example IMS can play an important role in management of expense and risk [18]. Issue related

Table 6. Identified processes at SRC of IAU [13].

No.	Process group	Zero process	Level one process	Indices
1	Management	Management and improvement	Management system	Delay in achieving qualitative objectives Document control Management review
			Monitoring and measurement	Quality of internal audit Quality of process monitoring Percent of the customers interviewed
			Improvement	Effectiveness of corrective action and preventive action Ratio of preventative action to corrective action Analysis of data Number of non-conformities
2	Main	Service provision	Training	Monitoring and measurement of customer satisfaction Training per capital Effectiveness
			Research	Monitoring and measurement of customer satisfaction Number of seminars presented Number of non- conformity
3	Support	Resource management and support	Human resource management	Number of complaints by faculty and staff Number of non-conformities due to human error Number of job losses
			procurement	Number of day services were delayed Number of non-conformity
			Financial resource and property management	Number of dissatisfaction due to inappropriate work conditions Number of accidental repairs
			Culture development	Monitoring and measurement of customer satisfaction Number of Cultural activities performed

Table 7. Intolerable environmental impacts in SRC.

No	Activity/services/Natural phenomena	Environmental aspect	Environmental impact	National law	Occurrence	Severity	Detection	RPN	Rating
1	Water consumption for sanitary purposes	Production and disposal of waste water	Pollution of under ground water	-	4	3	3	36	Significant
2	Construction activities	Production construction waste	Solid waste	✓	4	3	3	36	Significant
		Production of pollution	Pollution	-	4	3	3	36	Significant
		Destruction of nature resources	Reduction in nature resources	✓	3	4	3	36	Significant
3	Earthquakes	Ruins	Solid waste	✓	3	4	3	36	Significant
4	Floods	Water pollution	Pollution of surface water	-	4	3	3	36	Significant

Table 8. Intolerable health and safety hazards in SRC.

No	Activity/services/Natural phenomena	Hazard	Cause	Risk level	Occurrence	Severity	Detection	RPN
1	Natural events	Earthquakes	Movement of earth layers	Critical	3	4	3	36
2	Central heating processes	Fires	Explosion in boilers	Low	1	4	1	4
3	Driving on campus	Accident	Poor weather condition	Serious	3	4	2	24
4	Construction activities	Collapse of heavy machines on workers	Installing machines on loose scaffolds	Average	1	4	2	8
		Collapse of workers	Openings in various parts in the heights	Average	1	4	3	12
		Landslides	Excavation	Serious	2	4	3	24
		Collapse of workers	Cut or worn out cables or ropes in scaffolds	Average	1	4	3	12
			No safe guards in hanging scaffolds	Average	1	4	2	8
			Inappropriate installation of scaffolds	Average	1	4	2	8
		Collapse of workers in to wells	No ropes or worn out ropes	Average	1	4	2	8
		Collapse of workers in to wells at the end of working day	Not covering well opening	Average	1	4	3	12
			No warning signs	Average	1	4	3	12

Table 9. IMS objectives in SRC.

Management system	Objectives
Environment	Implementation of an environmental management system, building a wastewater disposal system and extension of green field in university campus
	Control and reduction of noise pollution
	Control and reduction of emissions
	Control and reduction of soil contamination and erosion
	Solid waste management
	Control and reduction of energy consumption
	Public awareness of environmental protection
Occupational Health and safety	Strengthening buildings to reduce destructive effects of earthquakes (Building work shop preventive instruction, 2005)
	Taking necessary measures to prevent floods
	Taking necessary measures to prevent and reduce rates of accident
	Taking necessary measures to prevent and reduce human damages due to laboratory work
	Taking necessary measures to prevent ergonomic hazards
	Increasing public awareness of health and safety
	Implementation of HSE management
	Extension of Medical centers on campus
	Improving the quality of drinking water
	Taking necessary measures to reduce damage cause by construction activities
	Collection and healthy disposal of sewerage
Quality	Doubling the number of students during a five year period
	Facilitating the comprehensive development plan of SRC
	Development of graduate programs
	Establish research centers in various areas
	Promotion of customers satisfaction
	Promotion of staff satisfaction

to risk management, expenses and benefits for the university, its customers and other interested parties are of great significance[19]. Such issues facilitate efficient and optimal use of resourses, reduction of expenses, time saving and alignment of processes to achieve desirable results by customer loyalty, operational results and flexible and fast reactions to opportunities. Competitive benefits affect general performance of the university by improved organizational capabilities, understanding and motivation of staff toward achieving the university objectives, their contribution to continual improvement and assuring the interested parties of the effectiveness and efficiency of the university reflected by its financial and social benefits as well as the product life cycle and the university's reputation [20]. Needless to say, the implementation of an environmental management system reduces the environmental aspects and impacts in any organization [21] assures environmental protection in local, national, regional and global levels [22], reduces energy, consumption, lowers wastes and encourages recycling methods, improves quantity of natural and human environment and achieving sustainable development, increases observation of rules and regulation, prepares for emergency situation [23], prevents unexpected events, reduces rate of complaints, fines and punishment, eliminates redundancies, improves performance because of optimal use of human, natural and economic resources and services and facilitates international business in such a way as to remove obstacles and attract customers in world markets. Furthermore, implementation of environmental management system leads to agreement among nations, causes creditability and reputability[24], improves environmental performance throughout the world and affects production, services, development and pollution prevention and environmental protection [25]. An occupational health and safety management system reduces occupational health and safety hazards [26] at educational centers, increase protection of properties, reduces expenses, saves time [27], improve public awareness of health and safety, increase efficiency, reputation and credit of the organizations, leads to satisfaction among staff, students and visitors, proves the commitment to personnel, students assets and equipment, legalized activities, provides a stable and precise strategy for the organization, encourages more effective domestic and international relations, increases periodical control and continual improvement in the occupational health and safety system and finally applies for a certificate for IMS from a certification body [28].

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