

Original Research Article

Investigating Environmental Management and Quality Management Issues in the Libyan Food Industry

ABSTRACT

Aims: investigates environmental and quality management issues in the Libyan food industry (LFI). in order to achieve a better level of environmental and quality management to develop modern managerial techniques. In particular, this investigation will help LFI to increase the success of environmental protection (i.e., the reduction in waste, pollution prevention, and the recycling of materials).

Study design: The questionnaire was conducted with 62 managers at three levels (top, middle, and low) and 518 employees from three companies in LFI.

Place and Duration of Study: The study was carried out in Libya, the fieldwork was conducted in 2013.

Methodology: Adopting existing measures in environmental management systems and total quality management systems revealed in the literature and developing new ones specifically for this research. Also, a set of items was produced to explore issues relating to the cost of quality process, statistical process control, quality technique and information system. In order to satisfy the requirements of the statistical test, all questions were based on Likert 5-point scale (5 is the best, while 1 is the lowest).

Results: The results revealed that the LFI do not make sufficient efforts to improve their environmental performance and quality. Further, it is found that LFI is still in a quite low level of achievement for EM. Low compliance with environmental and quality standards was also demonstrated. It is concluded that such results can be ascribed to that the majority of managers in the LFI have a remarkable lack of motivations to environmental and quality management approach.

Conclusion: This study contributes to identifying the key issues of environmental and quality management implementation in the LFI. This paper serves as a point of departure for future research to establish a framework model for total quality environmental management (TQEM) implementation in the Libyan context.

Keywords: Food Industry, Environmental Management, Quality Management, Libya

1. INTRODUCTION

Organisations are facing challenges in seeking competitive advantages to survive in a rapidly changing worldwide business environment [1, 2]. They seek to achieve this by optimising their performance and their ability to deliver high-quality products on time, to reduce waste, to enhance the recycling of materials, and to minimise operating costs, protecting the environment, conserving resources, and promoting economic feasibility. These tasks can be achieved by adopting the new working philosophy of quality management and environmental management [1, 3]. This philosophy offers an organisation many benefits, such as changing environments that threaten food security and economic growth, increased efficiency and productivity, helping companies to develop new ways of working with customers and suppliers, and improving employees' confidence, skills, and performance. Moreover, it contributes to increasing their competitiveness, offering better methods with which to improve the quality of the goods and services they provide. Furthermore, any industrial company or governmental or

service organisation can create a new culture in regard to quality and the environment [4–7]. In the body of the literature on environmental and quality management, much focus and investigation has been directed towards the implementation of this philosophy in developed countries [8, 9].

In contrast, there are few studies on their advancement in developing countries [10]. However, these countries have suffered from lack of environmental governmental control, cost management, storage risks, low productivity, and less developed technologies; this consequently results in a negative environmental effect [11, 12, 13]. This demonstrates the need to consider environmental protection and an improvement to their products and services [14]. This would result in increased revenue generation, enabling them to obtain control and to be more accountable for the future impact of their production [15].

In this context, some studies on developing countries have been conducted in the Arab world [12, 16–18]. However, these have mainly been country specific, with small-scale research. These countries have largely neglected to study environmental and quality management issues in their companies.

In this paper, we investigate environmental and quality management issues in the LFI. This investigation might speed up the success of environmental management protection, such as the reduction in waste, pollution prevention, and the recycling of materials. The development of quality management, which will also increase efficiency and productivity, forms new ways of working with both customers and suppliers and improves the quality of the goods and services provided.

Applying Environmental Management System (EMS) and TQM in the food industry sector, clearly, has an effect on the improvement, support, and enhancement of the competitive position of companies [8, 19]. Accordingly, this research was conducted in a strategic productive sector (food industry sector) of Libya. Furthermore, Libya moves from a traditional and closed economy to modern collaborative methods. It will be a good opportunity to begin shifting the management methods of the key industrial sectors into more modern managerial thinking, based on the participation of all the organisation's units. This is to create a better level of quality and environmental management and to develop modern managerial techniques that can improve the quality of production and protection of the environment. The level of such implementation in Libya has suffered from a decline in production efficiency and, also, inefficient management. This study contributes to identify the key issues of quality and environmental utilisation in the LFI. This study appears to be the first one which investigates the implementation of TQEM in the Arab world in general and Libya in particular, with the originality of being the first conducted in this sector.

This research seeks to answer the following questions:

- What are the environmental management issues in the LFI?
- What are the quality management issues in the LFI?
- What are the recommendations to support integrating EMS and TQM in the LFI?

2. ENVIRONMENTAL MANAGEMENT

EMS is effectively a voluntary, self-regulatory structure, in contrast to external requirements imposed on firms by government and other regulatory bodies. EMS is a framework through which an organisation protects, enhances, or reduces the impact of its activities on the environment by providing a system that first can set objectives, measure targets, develop programs and activities, audit, and evaluate its operation [4]. ISO 14001 has been adopted as one of the most widely used voluntary environmental initiatives. It was devised to be an international environmental management standard

that would provide firms with a systematic framework of both compliance and continual improvement in production. It is appropriate for a range of operations, including manufacturing and service provision, and can also be used by government agencies [20].

In the last few years, the importance of an Environmental Management System (EMS) has been recognised as essential for organisations in all sectors of industry. EMS has brought great benefits to organisations, but it has also presented many challenges[10]. Most companies would accept that the environment is of concern to them. Indeed, most organisations seek to demonstrate their good environmental practice and, to this end, engage in such activities as environmental reporting, providing end users information relating to environmentally sound practices with their products, using certification such as ISO 14001 or EMS to demonstrate their environmental management system standards, and making available environmental policies [2]. Due to a general worldwide awareness of such global environmental problems as global warming and ozone depletion, management and control strategies have become the norm for companies as they aim to show that they are addressing the environmental issue so that they are well positioned to hold on to their global customers and also succeed in the more competitive and critical global economy [21]. The purpose of EMS is to work towards minimising adverse environmental effects throughout a company's operations. To enable companies to achieve this, EMS provides an organised approach for managing environmental issues. The main benefits of ISO 14001 lie in the economic gain for companies ranging from the cost savings of such elements as energy consumption, raw material input, management of waste, the reversal of environmental impacts, and improved public image. EMS works to help organisations improve their economic and environmental performance [22].

ISO 14001:2004 defines *EMS* as 'a framework that allows an organisation to consistently control its significant impacts on the environment, reduce the risk of pollution incidents, ensure compliance with relevant environmental legislation and continually improve its processes and operations' [23].

Maier and Vanstone (2005) put forward the idea that an organisation actually benefits from having an EMS in place in several ways:

- It promotes a better understanding and awareness of the various legislative requirements, which in turn leads to the development of compliance plans.
- It leads to the identification of potential ways to save costs through efficiency improvements.
- It provides a better understanding of production processes so that greater control can be exerted, which in turn can lead to a reduction in emissions and a lowering of the risk of pollution incidents.
- It enhances the public image of a company by enabling more detailed reporting and transparency, which is important as part of the public image of the company as other stakeholders, such as customers, insurers, and local residents, feel they have access to the way the company operates and its practices [24].

An EMS therefore formally lays out an organisation's commitment to environmental management and includes such goals as waste reduction, pollution control, and energy and resource use. In setting objectives and targets which require a system of reviews of the company's environmental performance, along with clear policies, the EMS leads to companies being able to publish an environmental report. This then allows the documentation and comparison of the company's progress against both its policies and against the performance objectives and targets as laid out in the EMS.

3. QUALITY MANAGEMENT

During recent decades, quality has become of key importance to organisations, and this has driven many companies to engage at a high level with quality issues and to develop

a new management philosophy and practice of Total Quality Management (TQM). This has been used to underpin the organisation's quality strategies. This philosophy, based on TQM, has generated significant interest in several economies across the world. Rather than being a cost to any organisation, good production and high quality have come to provide a competitive advantage for firms. There is a general consensus that TQM is a way of managing an organisation to improve its overall effectiveness in competing globally [4]. The benefits are found in having fewer defects, enhanced leadership skills, reduced costs, enhanced business competitiveness, and a resultant increase in both market share and profit. There is also an associated effect in improved skills amongst employees and the achievement of greater customer satisfaction [25].

Most definitions accept the notion that it is the customers who define quality and that the term TQM is therefore a body of practice defined by both quality theorists and practitioners to produce a quality product. TQM is, therefore, also a philosophy that would enable an organisation to consistently meet the needs of its customer, and this is accepted worldwide by manufacturing executives as a strategic concept for organisation survival. However, many authors continue to produce their own definitions of the term. *TQM* therefore has many definitions of which one of the most widely used is that presented by Oakland (2003): 'A comprehensive approach for improving competitiveness and flexibility through planning, organising and understanding each activity, and involving everyone at each level. TQM ensures that the management adopt a strategic overview of quality and focus on prevention rather than inspection' [26]. It can be noted here that TQM is an approach that aims for continuous improvement to increase the competitive advantage, efficiency, and flexibility of the organisation as a whole (not as parts). TQM is an approach that adopts the philosophy of mistake prevention rather than mere mistake detection. TQM can be defined in relation to the production as a company culture characterised by reach customer satisfaction through continuous improvements.

Hellsten and Kldfsjo (2000) define *TQM* as 'a continuously evolving management system consisting of values methodologies and tools, the aim of which is to increase external and internal customer satisfaction with a reduced amount of resources' [27]. It can be seen that this definition presents TQM as a management approach aimed at creating an organisational culture, which depends on both internal and external customer needs. It also aims to develop employees and help them to be creative and innovative through creating a culture between management and the workforce of working together, which helps respond to the needs of customers' (internal and external) requirements and expectations.

4. LINKING ENVIRONMENTAL MANAGEMENT WITH QUALITY MANAGEMENT

The literature identifies both the similarities and differences in the evolution of environmental management and quality. Environmental management has been driven by a combination of alterations in the law and changes in general attitudes to a preventative and proactive approach. Quality management has developed a sophisticated set of tools for utilisation in both driving improvement and preventing defective production. Quality management was initially developed to meet customers' requirements and arose from a realisation that quality improvement could reduce costs. Similarities between quality management and environmental management practices with regard to the managerial tools and underlying philosophies have been noted [1,4]. Quality management programs and practices have consumed operation management research [5]. The critical linkages between environmental management and quality management have been identified and connected, as environmental management requires active management and should be integrated into all aspects of the manufacturing process, from design to production, delivery, usage, customer service, and, ultimately, post-use disposal [25].

221 A company instigating an environmental management protocol will have undergone a
222 philosophical, as well as a practical, shift in thinking and operation, thus considering its
223 organisation both in parts and in whole. This has striking parallels with quality
224 management that results in environmental and quality management complementing each
225 other. These are introduced together with increasing frequency [1]. Links were identified
226 between currently accepted 'best practice' and improved environmental performance by
227 companies, with the environmental management of operations acquiring a number of
228 natural parallels with quality management. The quality management philosophy of the
229 prevention of 'right first time' has also changed, with the proactive belief that 'prevention
230 is cheaper than cure' becoming the norm. This also applies to environmental
231 management. So quality management is seen as a way to enhance the environmental
232 performance of companies, and it is a step towards environmental excellence [2].
233

234 The implementation and integration of environmental management and quality
235 management have been analysed in previous studies. The implementation of the two
236 management systems can be carried out in three ways in terms of the order of
237 operations [28]: establishing the quality management system first, then the
238 environmental management; establishing the environmental management first, then the
239 quality management system; or establishing the environmental management and quality
240 management simultaneously. Whatever the choice, the firm must seek the level of
241 integration they desire between the management systems. This can be represented as a
242 continuum that ranges from low integration, with two independent systems at one end, to
243 full integration. This implies the existence of a single system at the other. Firms are
244 situated somewhere between these two extremes, with varying degrees of integration
245 [29]. They are always striving to come closer to a concept of an integrated total quality
246 and environmental management (TQEM) system and, in so doing, to go beyond what
247 are merely integrated systems for quality and environmental standards.
248

249 The concept of TQEM was suggested by the Global Environmental Management
250 Initiatives [30] and the Council of Great Lake Industries [31]. TQEM consists of four
251 paradigms: '(a) Total: which involves the entire organization, supply chain, and/or
252 product life cycle, (b) Quality: designed to drive up quality through 'zero defect'
253 definitions, (c) Environmental: strategic environmental management approach (d)
254 Management: The system of managing through steps such as Plan, Organize, Control,
255 Lead, Staff, provision and organize'. As defined by the International Organization for
256 Standardization, TQEM is a total applied system approach and an integral part of high-
257 level strategy.
258

259 Having TQEM will mean that the firm will be better equipped to develop a philosophy of
260 continuous improvement, as opposed to other less ambitious strategies that are based
261 on simply meeting certain requirements [1].
262

263 TQEM combines the two management concepts of TQM and EMS. It brings their two
264 management approaches together to support a company's business. In so doing, it aims
265 to solve the conflict between the independent operation of EMS and TQM that can lead
266 to competitive decisions within organisations as they seek to achieve quality and cost
267 efficiencies while minimising their environmental impact. TQEM provides a mechanism
268 for more effective interaction between TQM and EMS. The integration of environmental
269 management and quality management has therefore become a popular topic for
270 research and practice [4].
271

272 Notably, a greater understanding of environmental management and quality
273 management will not only provide greater productivity or profitability in itself but will also
274 embed the culture within the operating philosophies of firms. This will involve changes in
275 understanding and practice at all levels of the organisation and requires the training of
276 the workforce, recognition by senior management that the workforce can contribute and

are essential to gaining quality enhancement, and recognition that customers are important stakeholders who must be satisfied with all aspects of the operation. To date, notable, but also limited, advances in implementing TQEM have been seen in Libya. The small changes are nonetheless significant, and it is expected that this will spread through the Arab world. The goal remains to find ways to implement TQEM that will be acceptable and therefore successful in Arab operational culture.

METHODOLOGY

5.1 Research Context in this Study

The researcher conducted an empirical study on one of the important sectors in Libyan industry—the Libyan food industry—which consists of 15 companies. The reasons behind the choice of this sector for this study are that (1) the food industry in Libya represents about 25% of the total of Libyan industry; (2) the researcher has a good connection with people who work in these companies; and (3) given that this is the first research study of the food industry in Libya, it is expected that its results will contribute to the development of both Libyan managers and organisations.

It was also taken into account that the companies in the food industry are situated across the four Libyan geographic regions (northern, eastern, western, and southern). Also, this current research has limitations relating to time schedule and the cost of fieldwork. Therefore, the researcher, unable to cover the whole of the Libyan food industry, selected food companies that are in the eastern region of Libya. Further, as this research focuses on environment and quality management, only the large companies in this region are studied. This is because environment and quality management in big companies, as a process and as departments, appear to be more established than that in small companies (32). Table 1 shows the characteristics of the three selected companies in the LFI in eastern Libya. It covers six main features: company name, ownership, type, standardisations, managers number, and employee numbers.

Table 1. The characteristics of the LFI

Companies	Ownership	Type	Standardisations	Top	Mid	Low	Employees	Total
Al Rehan	Private company	National	ISO 9001 & Libyan quality award (LQA)	3	4	10	300	187
Bou Attane	Public company	National	ISO 9001 & LQA	4	6	10	650	260
National Mills	Public company	National	LQA	5	5	15	150	133
Total	One private & two public	Three national companies	Two companies have ISO 9001 & LQA. One company LQA	12	15	35	1100	1162

5.2 Research Measurement

The adopted measures in this research are, mainly, existing measures. Similarly, their items and scales were developed through selecting and adopting the ones that have been used in the literature [33]. To explain more fully, the measures fall into three types in terms of level of development: (1) existing measures, which are items and scales that have been developed by previous studies; (2) composed measures, which are existing in the literature, but the items and scales of which have been adopted according to the

current research; and (3) new measures, which are items and scales that have been developed ad hoc for this research's purposes.

Accordingly, the adopted measurements in the questionnaire are reviewed. In part one of the questionnaire, the researcher investigated EMS issues in the LFI, which consist of nine questions concerning pollution, emissions, raw materials, environmental performance, environmental aspects, and relationship with stakeholders. Part two was an investigation of TQM issues in the LFI, which consists of eight questions concerning cost of quality process, statistical process control, quality technique, reward for employees, information system, and framework needed.

5.3 Research Sample

The sample of this research was conducted within 62 manager levels (top, middle, and low) and the sample of the employees (518) from the three companies in the LFI. As the number of the managers of the three levels is small (12, 15, and 35), the researcher delivered the questionnaire to all of them. The purposive sampling was used with the employees. The table of Kregcie and Morgan (1970) was used to draw a sample from them [34]. The selection of the questionnaire was necessary for collecting information from a large number of employees, which reflect their responses and reaction towards TQEM implementation. Table 2 shows the sample of the three selected companies in the Libyan food industry.

Table 2. The sample of management staff and employees in the LFI

Management Level Companies	Top Management (staff number)	Middle Management (staff number)	Low Management (staff number)	Employees
1. Al Rehan	3	4	10	170
2. Bou Attane	4	6	10	240
3. National Mills and Fodders	5	5	15	108
Total	12	15	35	518

5.4 Questionnaire

In this paper, a quantitative method (a questionnaire) was used to collect data, to investigate environmental and quality management issues in the LFI. It has been approved as an effective method by many researchers in the fields of environmental and quality management. Existing measures in EMS and TQM literature have been adopted and new ones have been developed specifically for this research [1, 7, 12]. A battery of items were derived to investigate pollution, emissions, raw materials, environmental performance, environmental aspects, and relationship with stakeholders. Also, a set of items was produced to explore issues relating to the cost of quality process, statistical process control, quality technique, and information system. To satisfy the requirements of the statistical test, all questions were based on Likert five-point scale.

The questionnaire was designed to make it easy for the Libyan respondents to answer. A five-point rating scale was considered to be the most suitable to provide the information needed. This approach was suitable both for dealing with critical factors for environmental management [35] and for investigating the production challenges that are faced by the Libyan industry [15]. The respondents were asked to score each of the items using a five-point rating scale (1 = never, 2 = rarely, 3 = I don't know, 4 = sometimes, 5 = always), which was intended to show the extent of quality and

environmental management in their respective organisations. The average of the rating scale is 3, derived from the following calculation: $(1+2+3+4+5)/5=3$. A mean above 3 shows a positive feedback with the statements, while a mean below 3 shows an overall negative feedback [36]. The questionnaire was tested through a review carried out by academics and research staff, and 12 managers and 60 employees in the LFI were considered. This testing was carried out before the questionnaires were sent out, so as to ensure that it could be assessed properly.

To process the data collected from the questionnaire, the questionnaires were coded and entered into a pre-set Statistical Package for the Social Sciences (SPSS) software. Descriptive analysis was used (i.e., the observation of frequencies, percentages, means, and standard deviations) as a method for data examination. As mentioned previously, the research data were collected from managers and employees in the LFI. The data collected were measured by questions built on five points of the rating scale. The participants were asked to answer by marking the scale for the given statements.

6. DATA ANALYSIS

6.1 Environmental Management Issues in the LFI

Table 3 presents the results that are related to environmental management and the responses from each company. This was measured by nine questions on a five-point rating scale.

Table 3. The results of data analysis for environmental management issues in the LFI

Questions	Companies	Never	Rarely	I Don't Know	Sometimes	Always	Mean	Std. Deviation
Your company supports prevention of pollution and emissions?	Al-Rayhan	38	45	34	38	23	2.79	1.343
	Abu-Ante	46	65	77	28	28	2.70	1.229
	National Mills	40	50	10	18	10	2.28	1.261
	Total	124	160	121	84	61	2.59	1.277
Are hazardous materials disposed of in an environmentally suitable manner?	Al-Rayhan	37	29	47	38	27	2.94	1.349
	Abu-Ante	66	43	87	8	40	2.64	1.352
	National Mills	69	37	14	6	2	1.71	.949
	Total	172	109	148	52	69	2.45	1.216
Do you have the desire to work towards reducing pollution emitted by the company?	Al-Rayhan	36	76	40	20	6	2.35	1.032
	Abu-Ante	20	104	62	33	25	2.75	1.114
	National Mills	38	54	15	17	4	2.18	1.097
	Total	94	234	117	70	35	2.42	1.081
Do you think focusing on the environmental aspects would reduce the pollution emitted by the company?	Al-Rayhan	24	45	45	56	8	2.88	1.131
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	17	29	16	4	2.09	1.223
	Total	198	138	120	80	14	2.26	1.087
Do you attend courses that would be	Al-Rayhan	53	60	17	20	28	2.49	1.423
	Abu-Ante	81	32	75	44	12	2.48	1.255
	National Mills	65	49	1	5	8	1.77	1.090

beneficial to addressing the problem of dust and pollution?	Total	199	141	93	69	48	2.24	1.256
Do managers in your company know pollution could badly affect the environment?	Al-Rayhan	16	13	41	54	54	3.66	1.235
	Abu-Ante	44	37	52	66	45	3.13	1.368
	National Mills	15	9	21	48	35	3.62	1.281
	Total	75	59	114	168	134	3.47	1.294
The company has procedures to check and revise the environmental performance?	Al-Rayhan	18	40	69	44	7	2.90	1.015
	Abu-Ante	87	74	73	8	2	2.03	.929
	National Mills	41	21	50	11	5	2.36	1.135
	Total	146	135	192	63	14	2.43	1.026
The company has a relationship of cooperation with stakeholders (government, clients, suppliers, etc.) for environmental protection?	Al-Rayhan	61	40	39	33	5	2.33	1.206
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	17	29	16	4	2.09	1.223
	Total	235	133	114	57	11	2.08	1.112
Environmental audit is primarily a means of identifying opportunities for improving environmental performance?	Al-Rayhan	1	20	48	82	27	3.64	.892
	Abu-Ante	31	39	60	60	54	3.27	1.316
	National Mills	22	16	25	42	23	3.22	1.351
	Total	54	75	133	184	104	3.37	1.186

391

392 Table 3 shows the results gained from measuring environmental management, which
 393 can be summarised as: all the respondents were asked about support to prevent
 394 environmental pollution and emissions, wherever possible, and, in their companies, to
 395 manage any such emissions in environmentally friendly ways. Two hundred eighty-four
 396 responses were 'never' or 'rarely', 121 were 'I don't know', and 145 were 'sometimes' or
 397 'always'.

398

399 Descriptive analysis of hazardous materials disposed of in an environmentally suitable
 400 manner shows that 281 responses said 'never' or 'rarely', 148 were 'I don't know', and
 401 121 were 'sometimes' or 'always'. According to this, the LFI is not used to, or disposed
 402 to, acting in an environmentally friendly manner to protect the environment.

403

404 Descriptive analysis of the questionnaire shows the results relating to work towards
 405 reducing the pollution emitted by the companies. Three hundred twenty-eight responses
 406 said 'never' or 'rarely', 117 said 'I don't know', and 105 said 'sometimes' or 'always'. With
 407 regard to focusing on the environmental aspects, 336 responses said 'never' or 'rarely',
 408 120 were 'I don't know', and 94 were 'sometimes' or 'always'. This indicated that the LFI
 409 has not taken responsibility to protect the environment, which has caused risk to human
 410 health, safety, and the environment. The LFI has not given enough support to green
 411 products to assist in the preservation of the environment.

412

413 Table 3 reveals that 340 answered 'never' or 'rarely', in regard to attending courses to
 414 address the problem of dust and pollution, while 93 said 'I don't know', and 117

415 'sometimes' or 'always'. From the above, managers in the LFI know that pollution could
 416 have a bad impact on the environment; 302 responses were noted as being 'sometimes'
 417 or 'always', 114 were 'I don't know', and 134 were 'never' or 'rarely'. According to this,
 418 the main problem is that planning strategies for training in environmental protection are
 419 not available in the LFI. The LFI does not encourage employees to protect the
 420 environment. Managers in the LFI are not concerned with the aspects of production that
 421 could have a bad impact on the environment.

422
 423 As shown in Table 3, 281 answered 'never' or 'rarely' to the question on the LFI's
 424 procedures to check and revise environmental performance, while 192 said 'I don't
 425 know', and 77 'sometimes' or 'always'. In regard to their relationship with stakeholders,
 426 368 responses said 'never' or 'rarely', 114 were 'I don't know', and 68 were 'sometimes'
 427 or 'always'. This indicates that the LFI does not have good relationships with
 428 stakeholders (government, clients, suppliers, etc.) in dealings relating to environmental
 429 protection.

430
 431 In regard to the notion that an 'environmental audit is primarily a means of identifying
 432 opportunities for improving environmental performance', 129 answered 'never' or 'rarely',
 433 133 'I don't know', and 288 'sometimes' or 'always'. Although Libyan managers and
 434 employees know that an environmental audit is primarily a means to identify
 435 opportunities to improve environmental performance, the LFI does not encourage staff to
 436 do their work correctly to improve environmental performance.

437
 438 The results regarding 'managers in LFI know that pollution to the environment could
 439 have a bad impact on the environment' and 'environmental audit is primarily a means of
 440 identifying opportunities for improving environmental performance' show positive
 441 feedback, with environment in the LFI showing a mean average of 3.47 and 3.37. While
 442 company support prevents pollution and emissions, hazardous materials disposed of in
 443 an environmentally suitable manner, work towards reducing pollution, focus on
 444 environmental aspects, attending courses, procedures to check and revise the
 445 environmental performance, and the relationship with stakeholders have a mean
 446 average of below 3. This has indicated that all these elements show overall negative
 447 engagement with the environment by the LFI.

448 6.2 Quality Management Issues in the LFI

449
 450
 451 As stated in the previous section, quality management issues in the LFI are an important
 452 part of the survey. For this paper, quality management was measured through eight
 453 questions. Table 4 shows the results of the analysis for quality management.

454
 455 **Table 4. The results of data analysis for quality issues in the LFI**

Items	Companies	Never	Rarely	I Don't Know	Sometimes	Always	Mean	Std. Deviation
<i>Reduce cost of quality process</i>	Al-Rayhan	29	36	28	52	33	3.13	1.371
	Abu-Ante	76	30	102	28	8	2.43	1.140
	National Mills	49	26	40	9	4	2.16	1.114
	Total	154	92	170	89	45	2.60	1.27
Understands the product cost during product development	Al-Rayhan	30	34	30	49	35	3.14	1.385
	Abu-Ante	91	28	107	12	6	2.24	1.085
	National Mills	57	45	13	6	7	1.91	1.10
	Total	178	107	150	67	48	2.45	1.296
Applies statistical	Al-Rayhan	25	55	22	39	37	3.04	1.389
	Abu-Ante	32	44	51	93	24	3.14	1.211

process control	National Mills	19	24	25	43	17	3.12	1.284
	Total	76	123	98	175	78	3.10	1.286
Uses ISO 9000 as a quality technique to drive quality improvement	Al-Rayhan	41	26	14	40	57	3.26	1.588
	Abu-Ante	73	12	16	50	93	3.32	1.699
	National Mills	13	23	15	46	31	3.46	1.310
	Total	127	61	45	136	181	3.33	1.579
Reward employees' for achieving quality performance.	Al-Rayhan	17	27	45	73	16	3.25	1.118
	Abu-Ante	122	64	48	6	4	1.80	.951
	National Mills	58	31	23	12	4	2.01	1.140
	Total	197	122	116	91	24	2.31	1.236
Uses a good information system to improve performance	Al-Rayhan	50	53	47	21	7	2.34	1.124
	Abu-Ante	89	85	58	7	5	1.99	.951
	National Mills	33	21	54	17	3	2.50	1.087
	Total	172	159	159	45	15	2.27	1.054
Qualifications and experience required for the improvement of employees' work	Al-Rayhan	10	62	78	26	2	2.71	.826
	Abu-Ante	64	60	90	10	20	2.43	1.162
	National Mills	36	19	50	18	5	2.51	1.157
	Total	110	141	218	54	27	2.55	1.048
Has framework needed for environmental and quality management implementation.	Al-Rayhan	25	34	22	34	63	3.43	1.480
	Abu-Ante	22	31	82	49	60	3.39	1.237
	National Mills	4	10	19	46	49	3.98	1.065
	Total	51	75	123	129	172	3.6	1.260

456

457 Table 4 indicates that 246 responses noted work towards reducing the cost of the quality
 458 process as 'never' or 'rarely', and also, 170 respondents did not know if their companies
 459 worked toward reducing the cost of the quality process. However, 134 of the responses
 460 were 'sometimes' or 'always'. This result is slightly similar to that of understanding the
 461 product cost during product development. It can be seen that 285 respondents answered
 462 'never' or 'rarely', 150 'I don't know', and 115 'sometimes' or 'always'. Descriptive
 463 analysis of 'applies statistical process control' shows that 199 responses said 'never' or
 464 'rarely', 98 replied 'I don't know', and 253 'sometimes' or 'always'.

465

466 This result indicates that the LFI believed that reducing costs resulted in a reduction in
 467 quality. Some of the LFI companies use statistical process control and other systems,
 468 such as Libyan standards, to help them control quality in their products.

469

470 The quality management methods implemented in the LFI were investigated by asking
 471 the following question: Does your company use ISO 9000 as a technique to drive quality
 472 improvement? Of the 550 respondents, 188 said as 'never' or 'rarely', whereas 45 did not
 473 know. Three hundred seventeen answered 'sometimes' or 'always' on whether they
 474 knew if the company had formally implemented ISO 9000: 2000 as the quality
 475 management system.

476

Descriptive analysis of the item on rewarding employees' quality achievement in improvement initiatives shows that 319 answered this question as 'never' or 'rarely', 116 as 'I don't know', and 115 as 'sometimes' or 'always'.

In responding to the question 'Does the company use a good information system to improve its performance', 331 responses said 'never' or 'rarely', and also, 159 respondents 'did not know' if their company used a good information system. Descriptive analysis shows that 251 responses said 'never' or 'rarely', 218 'did not know', and 81 replied 'sometimes' or 'always' in relation to the qualifications and experience required to improve employees' work. This indicated that the LFI has to compete with foreign products in the Libyan market because of their high quality and competitive prices. The LFI has not paid attention to their external and internal customers.

To understand the need for a framework for the implementation of quality and environmental management, the questionnaire asked the following: 'Can quality and environmental management problems be solved by a clear framework for the LFI?' In responding to this question, 126 said 'never' or 'rarely', whereas 123 'did not know', and 301 answered 'sometimes' or 'always'.

In Table 4, we can see that the questions that were negatively worded showed means of less than 3. In general, participants indicated negative attitudes towards reducing the cost of the quality process, understanding the product cost during product development, rewarding employees for their quality achievements, using a good information system to improve its performance, and requiring qualifications and experience to improve employees' work in the LFI, whereas the positively worded items have mean values that are greater than 3; these items relate to the application of statistical process control, the use of ISO 9000 as a quality technique to drive quality improvement, and the need for a framework to implement quality and environmental management.

7. RESULTS AND DISCUSSION

The LFI's problems in both *environmental management* and *quality management* have been presented in sections 5.1 and 5.2, above. It must be pointed out that the problems in the two areas are not independent but are interrelated. This is because, today, their products' impact on the environment is an important measure of a company's performance, and hence, it should be included in the company's quality management framework. On the other hand, environmental management must be implemented within the company's quality management framework, without which proper environmental management cannot be achieved.

The related literature indicates that several EMS approaches are advocated, and some suggest that the development of EMS may go alongside the establishment of other management tools, for instance, total quality management [4, 7, 18, 36]. General behaviour is changing towards becoming a more proactive approach to environmental practices, rather than the old reactive one, as companies are beginning to recognise that the relationship between environmental quality and opportunities for economic growth, with improved environmental performance, can have a positive impact on profits.

Generally, both environmental management and quality management seek to increase the quality of operations and environmental protection. Quality management's cost-saving ambition, to minimise errors in a 'right first time' approach, is seen to be in conflict with the philosophy of environmental management. This can incur costs for preventative measures to minimise environmental impact, and this will affect profitability. However, once a firm has made the philosophical shift in thinking to the prevention of either error or environmental impact, the benefits of both quality management and environmental management can be seen, and both have been incorporated into the philosophy of many

companies globally. However, systems do not yet conform to the business environment in the Arab world, and some change in knowledge and benefits still needs to occur for a positive effect.

7.1 Environmental Management Issues

The results confirm that environmental management in the LFI has not yet developed the necessary methods to drive environmental improvement within companies. Generally, Libyan managers and employees should know how to implement any approach that protects the environment, that achieves some increase in sales and market shares and in cost reduction for materials, energy, and services; better distribution networks; better corporate management; and better risk management.

One of the results of this paper is that the LFI has not yet started to be more socially responsive in dealing with pollution and waste disposal or in beginning to develop environmentally friendly packaging or attempting to introduce numerous other improvements to bring the LFI in line with current thinking on environmental protection. Managers in the LFI also had no concern for the aspects of production that could have a bad impact on the environment.

The results confirm that the LFI does not have any plans for environmental policy in their companies, and their support for EMS is still very low. The LFI has also given little importance to the reduction and recycling of waste. The LFI, according to the research, is reaching low levels of achievement for EMS, and this includes, for example, the reduction of environmental damage. In this, these companies are particularly unsuccessful.

It can be seen from the data analysis that green products are unknown in the LFI as being ecological or environmentally friendly products. A green product is one that has more environmentally sound content or packaging to reduce its environmental impact. To ensure a balance between development and environmental sustainability is, in itself, a challenge [37]. The LFI must ensure environmental sustainability and resource management in production.

From the questionnaires' answers, there is no concern about pollution in the environment. So waste has an impact on the environment in the LFI. Reducing energy consumption will not be a priority for the companies in the foreseeable future. The reasons for this are the low price of energy and the high cost of green technology.

This study found that there is a lack of the training that would be beneficial to address the problems of dust and pollution. So the LFI has a high level of dust pollution and its effect on the environment. As a result, the main problem is that planning strategies for training to environmental protection in the LFI are not available. The LFI does not encourage employees to protect the environment.

The environmental management issues relating to the LFI, identified through the questionnaire, could be summarised as follows:

- The LFI does not have a good control system for obtaining raw materials.
- Managers in the LFI are not supporting the planning of environmental management and have given little importance to reducing and recycling waste.
- The LFI has not provided support for green products to preserve the environment and reduce their negative environmental impact.
- Libyan managers do not attend enough training courses relating to environmental management, and they do not have clear ideas about environmental management systems.

- 588 • There is no program with which to measure pollution and inspection procedures
589 in the LFI.
- 590 • Reducing energy consumption will not be a priority for the companies in the
591 foreseeable future.
- 592 • The LFI suffers from a lack of support from the Libyan government policy relating
593 to environmental management.
- 594 • Employees in the LFI are not encouraged to accept responsibility for
595 environmental protection, recognition, and appreciation of environmental effort or
596 the success of individuals and teams.
- 597 • The LFI has a negative impact on society and culture through their
598 environmental management implementation within the Libyan context.
- 599 • The main problem is that there are no planning strategies in companies'
600 procedures in the LFI to check and revise environmental performance and
601 training in environmental protection in the industry.
- 602 • The LFI does not have a good relationship with stakeholders (government,
603 clients, suppliers, etc.) in regard to environmental protection.
- 604 • The LFI does not encourage employees to do their work correctly to improve
605 environmental performance.

607 7.2 Quality Management Issues

608 The findings have revealed that managers and employees in the LFI have a fairly low
609 level of understanding of the product cost during product development, which negatively
610 affects the companies' productivity and, consequently, their competitive position. Clearly,
611 under the effects of such problems, it might be difficult for their products to meet
612 international standards. The impact on product quality and productivity was limited and
613 had little to do with reducing or controlling defective product units. A reduction in costs
614 resulted in a reduction in quality, and companies generally accepted that this trade-off
615 between quality and cost was inevitable. Improved quality can be achieved without extra
616 cost and, indeed, can be seen as a way to reduce costs [38]. The LFI, as with most other
617 emerging economy organisations, is generally run by managers with a lack of
618 experience, whose main interest is to guard their own existence at any cost.

620 The main findings of the questionnaire are the lack of sufficient support from top
621 management in the LFI for the tracking of reworking, waste and rejects, and for
622 continuing improvement. This has indicated that some of the greatest challenges that are
623 faced by the LFI are associated with changing consumer taste, a poor consumer
624 perception of green products, and the high cost of developing green products. An
625 understanding of this issue is therefore essential for both sustainability and
626 environmentally friendly products.

628 These responses confirmed that the LFI applies a statistical process, the ISO 9002: 2000
629 system, and the Libyan quality standard, to control quality in some of the LFI's
630 processes. This indicated that levels of quality in the LFI are poor. Although the LFI was
631 using quality management systems (i.e., ISO 9000: 2000), the whole program was just a
632 response to pressures from clients abroad who buy their products [11].

634 The results regarding the quality management issues that are identified from the
635 questionnaire could be summarised as follows:

- 637 • The majority of managers in the LFI have a lack of motivation for quality
638 management implementation, and there is little awareness of it.
- 639 • The LFI does not support and encourage employees to achieve quality and
640 productivity improvement.
- 641 • Most managers have not received formal quality management training.

- 642 • Quality measurement systems and benchmarking are not clear in the LFI, and
643 staff are not encouraged to attend training on these areas.
- 644 • The LFI does not have a good information system with which to improve its
645 performance; the companies do not use information to make decisions within
646 their company.
- 647 • The employees in the LFI do not have the appropriate qualifications and
648 experience required to improve their work, and their companies do not provide
649 them with sufficient resources to implement an educational plan.
- 650 • Top management in the LFI is encouraged to change within a new framework of
651 quality implementation and environmental management.
- 652 • Developing a TQEM framework could be beneficial for LFI companies, and the
653 quality and environmental management problems could be solved by a clear
654 framework in the LFI.

655 8. RECOMMENDATIONS

656 The authors' recommendations, below, are categorised into three levels—managers, the
657 LFI authorities, and the Libyan government—to resolve the issues in environmental and
658 quality management and to help the LFI prepare for TQEM implementation.

659 8.1 Libyan Managers

- 660 1. There should be training and workshop initiatives to qualify LFI managers and
661 employees in awareness of the importance of the process of TQEM's
662 development and implementation. Environmental and quality management
663 training should be provided at all levels to managers and employees, as the
664 training will enhance their environmental awareness and amend their knowledge
665 through any new strategies and techniques adopted. These help to increase
666 their skills for the program and to ensure the continual improvement that is
667 required by a formal TQEM.
- 668 2. An environmental department should be established for the LFI, and the
669 management structure should be improved to provide a higher level of authority
670 for this department.
- 671 3. Good relations and communication should be established between the LFI's top
672 managers and international EMS agencies so as to have more information about
673 responsibility for the evaluation and improvement of management systems and
674 to lead the environmental drive.
- 675 4. Managers at all levels should adopt new information systems in their
676 departments to promote high-level TQEM planning and information for
677 employees and to provide all the information needed by the customer about the
678 products and services of a company.

680 8.2 The LFI's Authorities

- 681 1. The LFI needs to adopt a new system/network to sort out relationships with
682 international and national suppliers, who should be evaluated and selected
683 based on their capability and commitment to service quality.
- 684 2. The LFI should pay attention to their external and internal customers. This
685 should be reflected in the overall planning of environmental and quality
686 management efforts.
- 687 3. An impact assessment of the LFI needs to be carried out by using Life Cycle
688 Assessment (LCA) models. This method's stages include the LFI's extraction,
689 production, transportation, processing, and distribution. The LFI therefore needs
690 to adopt the LCA method to control environmental impact.

4. The LFI must revise the ISO 9000 certification processes and apply the ISO 14001 requirements to guarantee an improvement in environmental performance.
5. The LFI needs to apply training programs to keep the employees up-to-date on a regular basis, so they can efficiently participate to the most recent strategies and approaches of environmental and quality management.

8.3 Libyan Government

1. Libyan government agencies should raise awareness of the significance of quality production and services, environmental protection, sustainability, and global environmental issues to stakeholders and local people.
2. The Libyan government should establish new regulations that encourage Libyan managers to take strong responsibility for environmental issues that cause risks to health, safety, or the environment.
3. The Libyan government needs to review their legislative framework and environmental policies to ensure that they are current and provide a clear vision, mission, and strategy.
4. The Libyan government needs to produce manuals to provide training on the environment, seeking external advice and support from specialised environmental agencies. This can be achieved through the publication of handbooks and guidelines.
5. The Libyan government should allocate more funds to sponsor workshops, sessions, and training for TQEM implementation (economically, environmentally, and socially) nationally and internationally.
6. The Libyan Ministry of Industry should support Libyan factories in delivering the latest technology, which supports the local company's contribution to environmental protection.

9. CONCLUSION AND FURTHER RESEARCH

To help the LFI achieve a high level of quality and a sustainable environment, this paper investigates both environmental management and quality management issues. This study presents the results from a questionnaire survey that investigated environmental management and quality management issues in the LFI. It finds that the major issue regarding environmental management and quality management in the LFI is that top management in this sector does not provide sufficient support for new quality and environmental management, and also, there is no concern about the pollution of the environment. The quantitative survey shows that quality management exists at modest and poor levels. There is also evidence from the LFI that showed that their machines were incapable of adhering to new quality programs that may have an impact on the environment. The LFI has little environmental awareness and has not given enough importance to the reduction and recycling of waste.

The opinions of the LFI's managers and employees are identified in relation to issues of environmental management and quality management. The investigation results will be used to establish a framework model for total quality environmental management (TQEM) implementation in the Libyan context, to improve quality and to provide more environmental protection. Further research will therefore propose a framework model for the implementation of the TQEM in the LFI. The successful implementation of TQEM will have a profound effect on the production system of countries such as Libya. However, TQEM will necessitate a shift in thinking about the environment. EMS itself requires attention to environmental impact, while TQEM requires responsible resource use and waste minimisation. The production systems must also incorporate sustainability into their philosophy as they seek to increase their output and their profitability. Achieving

751 such a development without negatively affecting the environmental system requires the
752 adoption of a philosophy of responsibility towards the environment.

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