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National Environmental Factors for Implementing Total Quality Environmental Management in the Libyan Food Industry

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Investigates national environmental factors on implementing total quality environmental management (TQEM) in the Libyan food industry (LFI), in order to develop modern managerial techniques.
Study Design: A questionnaire was conducted with 62 managers and 518 employees from three companies in the LFI.
Place and Duration of Study: The study was carried out in Libya, the fieldwork was conducted in 2013.
Methodology: Using existing measures obtained from the literature and new ones specifically developed for this research, a battery of items was derived to investigate technical capability, organizational culture, competition, government policy and human resource.
Results: The results revealed that, five national environmental factors are identified. The findings show that the social responsibility factor is a new phenomenon that has not generally been studied

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in Libya, and particularly not in the LFI.
Conclusion: This research contributes to the knowledge by investigating the national environmental factors for implementation of TQEM in a different context (i.e., the Arab/North African context). The findings provide a valuable basis to establish a framework model for the implementation of the TQEM in the Libyan context.

Keywords: Food Industry; national environmental factors; total quality environmental management; total quality management; environmental management; Libya.

1. INTRODUCTION

There is some evidence that total quality environmental management (TQEM) can be considered as a potential competitive advantage and can improve public relations [1]. Curkovic and Sroufe [2] showed that, for most companies, compliance is a useful stance, since it allows the firm to do what is necessary to comply with the law by having a practice in place, but it is essentially a reactive position, because it means that the firm is addressing environmental factors. This is criticized as being ineffective, since it does not attack the causes, but merely the symptoms [3].

The deficiencies of previous TQEM studies have identified the most significant problems that are associated with the development and implementation of TQEM. Both Klassen [4] and Hanna et al. [5] have stated that if TQEM is to become the norm, top management must be willing to accept companywide implementation and to champion such developments. However, Curkovic and Sroufe [2] have shown that there was sometimes a claim, from top level management, of ignorance of such practices. Curkovic [6] showed that when a company became more efficient, it gave it an advantage over its competitors, if it were more environmentally responsible. However, there are also many cases which contradict this assertion and which have even resulted in negative effects [7]. A new approach that ensures the end of a product would therefore make the implementation of TQEM more credible. Curkovic [6] has shown that managers need frameworks or guidelines in order to better understand TQEM and what it can bring to projects. However, much of the information on TQEM was either found within a legal framework, or it had been gleaned from case studies, or even from anecdotal stories [2].

These possible shortcomings will be addressed in this paper by considering managers' and employees' opinions through the national environmental factors involved in the implementation of TQEM for the Libyan food industry (LFI). The ultimate focus of this paper is the difficulty which the LFI's managers face in both implementing and managing TQEM, due mainly to the absence of an investigation of the national environmental factors for the implementation of TQEM for the LFI. Curkovic and Sroufe [2] suggested that for TQEM to be given serious consideration by management, a process was needed that included both business and processes in the design of a project. However, there appeared to be a lack of investigation of the national environmental factors for TQEM implementation [3].

The implementation of a TQEM in the organization allows to control its significant impacts on the environment, such as reduce the risk of pollution incidents, increase their performance and to improve the quality of their products and services [1]. In addition, it supports their capacity to overcome the challenges and changes from all over the world, provides the tools with which to improve performance through achieving a higher quality of production, lower wastage, higher efficiency, and less in impact on the environment [3]. TQEM can also, assist Libyan companies to compete with goods and services from foreign imports, which have considerable price economies, higher quality and higher environmental standards due to their full integration of TQEM into production. As yet, therefore, there is little acceptance in Libyan companies of the advantages that TQEM can bring, nor is there the acceptance of environmental responsibility in relation to production. To become a viable participant in the global market place, this study helps LFI to adapt and change so as to come into line with modern global standards that are being set by the developed world. The LFI, in particular, is likely to become one of the first industries in Libya to wish to trade globally, so this provides an excellent opportunity for such a study.

This research considers the present situation in the LFI, paying particular attention to its production and its impact on the environment, then considers the benefits that may accrue from the importance of the food industry to Libya's economy, the opening up of the market to international partners, the consequent need for improvements in quality and environmental control, and the need to introduce management techniques, such as TQEM. The research presented in this paper outlines the problems that the LFI has suffered in recent years.

The Libyan government has put a great deal of interest and focus on the food industry because this sector represents approximately 25% of the total size of Libyan industry and provides jobs for more than 15% of the total Libyan workforce. Undoubtedly, this makes the food industry in Libya an extremely important entity and, consequently, it is one that requires further development and better organization.

In order to study TQEM in the LFI it is necessary to explore the current problems and need for the research in this sector. Hence, in aiming to pave the way towards conducting the major fieldwork for this research on the Libyan food industry, the researcher went to Libya (July, 2010), to undertake a provisional view on the population and information resources. We:

1. Gathered evidence in order to ensure that there was still a need for research in the TQM and EMS field.
2. Explored the Libyan food industry in order to identify any relevant issues or problems.
3. Identify Libya's companies' sizes and their intentions about participating in this research.
4. Determined a responsible organizational unit for quality and operation in these companies. The researcher visited three food companies to collect data.
5. The researcher conducted several face-to-face informal interviews with managers at the three managerial levels in these companies, as well as the employees in the quality and operations departments. These interviews established the argument of this research, and enabled him to explore the contemporary TQEM implementation within the Libyan food industry sector.

The authors obtained company documents and reports which provided information on the current situation in the Libyan food industry. Consequently, the researcher has gained a general understanding of the situation in the food industry in Libya. This sector is still suffering from a number of problems. They are suffering from high price of their products with low quality, a decline in production efficiency, lack of employees' skills and productivity, decline in production efficiency and display a high rate of employee turnover. Moreover, LFI suffered from high storage risks, less developed technologies, high waste and recycling of materials. This could influence their ability to meet international standards, and also, to be able to compete with foreign imports into the market.

As a result of the initial fieldwork research, it puts forward the notion of a TQEM framework that should be implemented in the Libyan food industry in order to address its deficiencies. The research lays out the research aims, which are intended to assist the companies in the LFI to increase the volume and quality of their production and to attend to the resulting problems for the environment, while still enabling their competiveness in relation to external competitors.

2. NATIONAL ENVIRONMENTAL FACTORS FOR THE IMPLEMENTATION OF TQEM IN THE LFI

In TQEM literature [1-3,8-10], it has been revealed that the environmental factors are critical to the implementation of TQEM. However, one overriding consideration is that the organizations can use TQEM that relies on the level of technology. Those that are technologically advanced can engage in continuing product and service improvement, or in advanced process management, while those with low technological advancement concentrate on customer satisfaction in order to achieve a competitive advantage [11,12].

TQEM is related to the development of an organizational culture; TQEM consists of two parts, TQM and EMS, which are heavily related to the business culture of an organization that is committed to customer satisfaction through continuous improvement. In such a culture, resources, material and equipment are cost effectively implemented and fully utilized [8,13,14]. The environment for firms is dynamic, uncertain and complex, which can create difficulties of uncertainty for the organizations.

However, should any firm ignore, or be unresponsive to environmental factors, it inevitably creates the potential for problems which can diminish their competitively. Since competition is created within their environmental factors (e.g., culture, resources, and technical), as the pace of change accelerates the necessity for managers to change their products and services [15]. They derive their knowledge of customer requirements and the performance of their products from observing the environmental factors, and then they can respond to changes using the customer data that they have gathered. Further, firms must move away from existing customer needs and seek to satisfy the potential needs, since market volatility, competitive intensity and technological volatility increase if they are to maintain a competitive advantage [16].

TQM and EMS literature reveals that there are some environmental factors that deserve special attention in developing countries which are aiming to achieve organizational objectives and that are considering the possibility to implement TQM and EMS [17-19]. In Libya, the implementation of TQM and EMS is relatively new, as the culture and environment are different from those in developed countries which have already implemented TQM and EMS [20,21,9]. The Libyan government has looked for opportunities for Libyan organizations to expand into emerging markets, at the same time as they are expanding their share in existing markets [20,22,23]. So, managers in Libyan companies are attempting to examine the extent of TQM and EMS factors, awareness, and the difficulties facing its implementation towards TQEM [10].

In the report of the Ministry of Libyan Industry [24], the national factors are stated:

> "G*overnment policy and organizational culture are important national factors. There are limited efforts towards the implementation of any new managerial methods in Libya and yet there is a desire to develop an industrial nation that has been on the agenda for the past 10 years. This has led to investment in industrial plans and to encouraging education and the up skilling of all the staff and employees to develop their knowledge and to have the technical capability and organizational culture to operate the Libyan industry".*

According to [20,25,26], because of the high competition in the Libyan market, the Libyan industry should pay attention to human resources, competition, and organizational culture, and this is reflected in the overall planning of quality and environment management efforts. These researchers have identified no evidence at present about the ability of the LFI to consistently produce the quality and environment that are required to compete at the highest levels in world markets.

Accordingly, the significant role of environmental factors in the implementation of TQEM in Libya can be realised, and this is also applicable to other developing countries. In the particular case of this current research, TQEM can be impacted upon by different factors [3,12]. The current research intends to investigate TQEM implementation by studying environmental factors from the same context (Libyan/Arab), and to investigate the impact of national environmental factors on the implementation of TQEM in the LFI. The research also focuses on specific factors and determines their statistical impact on TQEM implementation. The national environmental factors appear to be an appropriate framework to adopt in order to study the impact of the implementation of TQEM in Libya.

Using empirical evidence gathered through fieldwork in Libya, this paper sets out to discuss the benefits and downsides of the use of TQEM practices in the LFI. Questionnaire was conducted with management and employees in the LFI in order to discover where the problems lay in TQEM use. The authors considers that one of the major problems is the lack of consideration of the relevant environmental conditions at a national level, together with the often perceived notion that management is both ignorant of TQEM's benefits and is unwilling to implement it.

In addition, the authors considers the connection between technology and TQEM implementation, together with the needs that he perceives to increase the quality and production volumes of the products that the LFI produces, and other factors that relate to the competition of that industry. TQEM and EMS are both related closely to the business culture of an industry and there are a number of factors, dealt with in this paper, which have an impact here, as well as the environmentally related problems and benefits that TQEM/EMS may offer. The topics that are deal with in this paper can be listed as: Technical

capability, organizational culture, human resources, competition, and government policies.

From the literature discussion, therefore, the current research hypotheses to investigate are:

H1: The technical capability within the LFI impacts the potential to implement TQEM.
H2: The organizational culture impacts on the potential to implement TQEM.
H3: Human resources impact on the potential to implement TQEM.
H4: Competition impacts on the potential to implement TQEM.
H5: Government policy impacts on the potential to implement TQEM.

The paper aims to test the research hypothesis in relation to the potential for TQEM implementation. The quantitative method is appropriate for examination within such a hypothesis.

3. METHODOLOGY

The research is conducted with a deductive approach which allows the researcher deduce the study's hypotheses based on known facts (theories). A questionnaire was used to collect data in order to investigate national environmental factors in the LFI for TQEM implementation. Existing measures in TQEM literature have been adopted. Also, new ones have been developed specifically for this research [3,1,27,28].

Five items have been investigated (i.e., Technical capability, Organizational culture, Competition, Government policy, Human resource). Five point scale (1= Never, 2= Rarely, 3= Do not know, 4= Sometimes, 5= Always) were extracted from previous studies [18, 28]; a mean above 3 shows a positive feedback with the statements, while a mean below 3 shows an overall negative feedback.

3.1 The Research Sample

In this research, authors conducted an empirical study on one of important sectors in Libyan industry; Libyan food industry which consists 15 companies. The reasons behind the choice of this sector for this study are (1) the food industry in Libya represents about 25% of the total of Libyan industry; (2) some sectors in Libya have received investigative treatment, whilst food industry has been neglected from the previous studies; (3) the originality and uniqueness of the research means that results will contribute to the development of both Libyan managers and organizations; (4) the importance of this sector as Libyan government support non-oil industry ; (5) given that this is the first study researching the food industry in Libya, it is expected that its results will contribute development of both Libyan managers and organizations. With taking into account the companies of food industry lies across the four Libyan geographic regions (northern, eastern, western and southern). Also, this current research has limitations relating to time and the cost of fieldwork. Therefore, the researcher unable to cover the whole of the Libyan food industry, we select the food companies that are in the eastern of Libyan region. Further, as this research focuses on the environment and quality management, only the large companies in this region are studied. This is because the environment and quality management as a process and department in the large companies appears in a higher position more than in small companies (Grace Duffy, 2004).

The research sample was conducted within 62 managers at three levels (top, middle, and low) and 518 employees of three companies in the LFI. Given the small number of managers in the three levels (12, 15, and 35); the questionnaire was delivered to them all in person as a comprehensive survey. Multi-sampling technique was used with the employees. The table of Kregcie and Morgan [29] was used in order to draw a sample of employee so as to facilitate the collection of information from a large number of employees concerning responses and reaction towards the implementation of TQEM. Table 1 shows the sample from the three selected companies in the Libyan food industry.

3.2 Questionnaire Reliability

The reliability of the data derived refers to the extent to which any procedure produces similar results when repeated, under similar or constant conditions, at all attempts [30]. An analysis of internal consistency was carried out on 15 questions about national environmental factors in the LFI. The reliability of the questionnaire was confirmed using Cronbach Alpha measurements. In line with these measurements, achieving a score of 0.70 or more for a reliability coefficient is considered 'good' [31]. As a result, the method developed to measure the items was considered to have high reliability and to be an acceptable

instrument for this test. The reasons for this surrounded the fact that the correlation coefficients equalled or exceeded 0.70, and this was considered to be sufficient to indicate that the test- retest reliability is good [32]. The reliability 'alpha' measured of this research was 0.716; this was considered to have high reliability and to be an acceptable instrument for this test.

3.3 Questionnaire Validity

Validity refers to the truthfulness or accuracy of the results, and the extent to which the questionnaire measures what it was set up to record. Flynn et al. [33] indicate that there is no a one way to determine the validity of a measuring instrument.

The validity of the questionnaire was tested by a review carried out by academics and research staff in university of Benghazi (Abu baker Buera, Izzudin Busnaina, and Omar Gnieber), and by 12 managers and 60 employees in the LFI. This rigorous testing was conducted before the circulation of the questionnaire in order to ensure accurate assessment. In the current study, SPSS (Statistical Package for the Social Sciences) software (Version 22) was used to analyse the data and identify which items were appropriate for each of the dimensions.

3.4 Statistical Analyses

Two types of statistical analyses were used in this research. First, data collected from the questionnaire were coded and entered into a pre-set Statistical Package for the Social Sciences (SPSS) software. A factor analysis was carried out using descriptive analysis (observation of frequencies, percentages, means, and standard deviations) as a method for data examination. The second statistical technique used was Pearson's correlation coefficients to test each hypothesis and to assess the correlation between the independent and dependent variables, and to show the correlation between the independent variables themselves [34,35]. The multiple regression result is introduced for each hypothesis, which was achieved by using a model summary Analysis of variance (ANOVA) and a coefficients model.

4. DATA ANALYSIS

The next sub sections show the results collected from the questionnaires, relating to national environmental factors for implementing TQEM in the LFI on a five-point Likert scale. All the respondents had been asked to state to what extent they had a negative or positive attitude to the given statements regarding the technical capability, organizational culture, competition, and government policy, in their companies.

4.1 Technical Capability

Table 2 presents the results that are related to technical capability aspects in the LFI and the response in each company. The researcher measured this by three questions related to qualified engineers who were available for maintenance at all times; that technical capability support provided is able to ensure high quality production; whether technical in their company are operating in a way that is friendly to the environment.

From Table 2, we can observe that the respondents consider that there are not qualified engineers available for maintenance at all times if any fault occurs in one of the machines. Here, 317 answer this question as 'never' or 'rarely', 93 with 'do not know', and 140 with 'sometimes' and 'always'. This result conforms to the 344 responses which were answered with 'never' or 'rarely' about the questions relating to technical capability provided and its capability in quality production.

Table 1. 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

Table 2. The results of data analysis for factor 1: Technical capability in the LFI

Questions	Companies	Never	Rarely	do not know	Sometimes	Always	Mean	Std. Deviation
Engineers available for maintenance at all times.	Al-Rayhan	47	53	26	30	22	2.59	1.363
	Abu-Ante	82	24	62	49	27	2.65	1.405
	National Mills	65	46	5	4	8	1.78	1.094
	Total	194	123	93	83	57	2.34	1.28
Technical capability is able to ensure high quality production.	Al-Rayhan	41	31	44	44	18	2.81	1.312
	Abu-Ante	97	102	22	13	10	1.92	1.033
	National Mills	32	41	30	14	11	2.46	1.223
	Total	170	174	96	71	39	2.39	1.189
Technical capability is operating in a way that is friendly to the environment.	Al-Rayhan	45	28	63	26	16	2.66	1.253
	Abu-Ante	100	106	7	7	24	1.97	1.202
	National Mills	52	38	17	12	9	2.13	1.242
	Total	197	172	87	45	49	2.25	1.232

To understand whether the lack of technical capability support in the LFI is affecting and damaging the environment inside and outside their companies, the researcher asked the respondents about whether the technical capability support in their company operated in an environmentally friendly way. 369 answered 'never' or 'rarely', 87 'do not know', and 94 'sometimes' and 'always'.

According to the data analysis above, the responses relating to technical capability factor in the LFI were negative, with a mean of 2.34 for engineers available for maintenance at all times, 2.39 for technical provided is capable of quality production, and 2.25 for technical in LFI are friendly to the environment. These shows a lack of technical support where it is needed in the LFI.

4.2 Organizational Culture

Another important area to investigate is the national environmental factors for implementing TQEM in the LFI's organizational culture. Table 3 presents the results relating to a clear vision the future, the creation of quality and environmental awareness among employees, and a culture of continuous improvement in the products.

Table 3 shows the results relating to the existence of a clear vision for the future, the majority of (294) respondents answered this with 'never' or 'rarely', 137 with 'do not know', and 119 with 'sometimes' and 'always'. Quality and environmental awareness building amongst employees is not ongoing in the LFI, showing 50% of the responses were 'never' and 'rarely', 108 were 'I do not know', and 167 were 'sometimes' and 'always'. With regard to focusing on the culture of continuous improvement of products, 266 answered 'never' or 'rarely', 142 with 'do not know', and 142 'sometimes' or 'always'.

It can be seen that items relating to organizational culture show a negative response to this factor in the LFI, with the lowest mean. Clear vision had a mean 2.4; creation of quality and environmental awareness 2.64, and a culture for the continuous improvement of products was 2.53.

4.3 Human Resources

Table 4 shows the results of data analysis for Factor 3: human resources in the LFI. The next three questions investigated focus on: A system that links reward to employees' quality and environmental achievement, teams to generate ideas and explore issues for environmental protection and the quality of production, and teams available for employees' training needs and development.

Table 4 show that more than 70% of the 550 respondents answered 'never' or 'rarely' in regard to rewards for employees' quality and environmental achievement, 50 answered 'I do not know', and 111 answered 'sometimes' or 'always'. Regarding whether teams are used to generate ideas and explore issues for the best practicable environmental and quality options, 235 of the 550 respondents answered 'never' or 'rarely', 120 with 'I do not know', and 95

answered 'sometimes' or 'always'. To understand the availability of teams in the LFI, the researcher asked managers and employees in LFI teams whether they are available to cover employees' training needs and development. More than 60% of the 550 respondents answered 'never' or 'rarely, 93 answered 'I do not know', and 119 answered 'sometimes' or 'always'.

Accordingly, items that were investigated were answered negatively with factor 3: human resources in the LFI, with a mean of 2.22 for rewards for employees' quality and environmental achievement, 2.27 for the teams used to generate ideas and explore issues for the best practicable environmental and quality options, and 2.26 for the availability of teams in the LFI to cover employees' training needs and development. They show a low level of support within the LFI for enhancing the knowledge and skill base for employees in respect of enhancing their knowledge and performance with regard to the environment.

4.4 Competition

In this part, the researcher asked managers and employees in the LFI to what extent its products require a Libyan market, to compare offerings with foreign products, and how the LFI face competition with foreign products in the Libyan market due to imports' high quality and competitive prices. Table 5 shows the results of data analysis for factor 4.

Table 3. The results of data analysis for factor 2: Organizational culture in the LFI

Questions	Companies	Never	Rarely	Do not know	Sometimes	Always	Mean	Std. deviation
Clear vision of the future	Al-Rayhan	40	32	39	45	22	2.87	1.349
	Abu-Ante	106	33	74	18	13	2.18	1.220
	National Mills	57	26	24	11	10	2.15	1.293
	Total	203	91	137	74	45	2.4	1.287
Creation of quality and environmental awareness	Al-Rayhan	38	45	34	38	23	2.79	1.343
	Abu-Ante	46	56	64	42	36	2.86	1.317
	National Mills	40	50	10	18	10	2.28	1.261
	Total	124	151	108	98	69	2.64	1.307
A culture of continuous improvement in products	Al-Rayhan	26	22	43	49	38	3.29	1.328
	Abu-Ante	66	43	87	8	40	2.64	1.352
	National Mills	69	40	12	5	2	1.68	.913
	Total	161	105	142	62	80	2.53	1.197

Table 4. The results of data analysis for factor 3: Human resources in the LFI

Questions	Companies	Never	Rarely	Do not know	Sometimes	Always	Mean	Std. deviation
Reward for employees' quality and environment achievement	Al-Rayhan	52	74	24	14	14	2.24	1.184
	Abu-Ante	84	85	9	32	34	2.37	1.424
	National Mills	48	46	17	12	5	2.06	1.114
	Total	184	205	50	58	53	2.22	1.240
Generates ideas and explores issues for the environmental and quality management	Al-Rayhan	24	45	45	56	8	2.88	1.131
	Abu-Ante	112	76	46	8	2	1.82	.907
	National Mills	62	16	29	15	6	2.12	1.265
	Total	98	137	120	79	16	2.27	1.101
Available resources for employee's training needs and development	Al-Rayhan	53	60	17	20	28	2.49	1.423
	Abu-Ante	81	32	75	44	12	2.48	1.255
	National Mills	63	49	1	7	8	1.81	1.121
	Total	197	141	93	71	48	2.26	1.266

Table 5. The results of data analysis for factor 4: Competition in the LFI

Questions	Companies	Never	Rarely	Do not now	Sometimes	Always	Mean	Std. deviation
Competitive benchmarking	Al-Rayhan	45	20	55	47	11	2.77	1.261
	Abu-Ante	112	111	14	5	2	1.66	.749
	National Mills	36	39	30	15	8	2.38	1.191
	Total	193	170	99	67	21	2.27	1.067
Compare offerings with foreign products	Al-Rayhan	48	25	67	24	14	2.61	1.236
	Abu-Ante	100	118	2	2	22	1.89	1.120
	National Mills	55	35	15	12	11	2.13	1.300
	Total	203	178	84	38	47	2.21	1.218
Identify the best practice for competing with foreign companies.	Al-Rayhan	61	35	45	36	1	2.33	1.163
	Abu-Ante	110	103	4	5	22	1.88	1.162
	National Mills	43	55	19	5	6	2.03	1.034
	Total	214	193	68	46	29	2.08	1.119

Table 5 show that the LFI being researched is not using a benchmarking against primary competitors. This shows that 363 answered 'never' or 'rarely', while 99 'do not know'. However, 88 answered 'sometimes' or 'always'. From Table 5 about 70% confirm that the LFI do not compare their offers with foreign products. On the other hand, 74% of 550 responses show that the LFI do not have any programme to identify the best practice for improvements and opportunities to compete against foreign companies.

The 550 responses were negative about the competition factor in the LFI. The mean average of benchmarking was 2.27, comparing their offers with foreign products with a mean 2.21, and 2.08 for a programme to identify the best practice for improvements and opportunities to compete with foreign companies. This shows that engagement with competition is low, so LFI firms pay little attention to the competition and do not consider best practice or the competition's offerings with a view to being more competitive themselves and to increasing sales profits.

4.5 Government Policy

In this part, the researcher asked managers and employees in the LFI to investigate how the government is supporting social and economic priorities, including improved food quality, safety, health, and the environment, attendance on the programme for TQM and EMS sponsored by government, government encouragement of the clients of the industry, and the encouraging of more environmental practices.

Table 6 shows that the Libyan government is not supporting quality, safety, health, and the environment. This is confirmed by the 246 who answered 'never' or 'rarely', 170 with 'do not know'. However, 134 answered 'sometimes' or 'always'. When asked about whether or not they had attended programmes on TQM and EMS that were sponsored by the government, the Table and Figure above show 286 answers as 'never' or 'rarely', 150 were 'do not know', 114, answered 'sometimes' or 'always'. With regard to the government encouraging the clients of the industry and more environmental practices, 281 answered 'never' or 'rarely', 123 'do not know', 146 answered 'sometimes' or 'always'.

Descriptive analysis of the factor of government policy shows they were negative about this factor. The mean average of whether the government supports social and economic priorities, including improved food quality, safety, health, and the environment, was 2.57, attending the programme on TQM and EMS that was sponsored by the government had a mean of 2.43, the government encouraging clients of the industry and more environmental practices had a mean of 2.63. The responses therefore showed an overall negative response to governmental promotional encouragement and to the program to improve food quality and environmental practice.

At the end of this part of the questionnaire the researcher asked respondents if there were any national environmental factors for implementing TQEM in the LFI. Around 80% said social responsibility was one of the important external factors for implementing TQEM in the LFI. They confirm that the LFI should consider Libyan culture when they need to implement TQEM.

Table 6. The results of data analysis for factor 5: Government policy in the LFI

Questions	Companies	Never	Rarely	Do not know	Sometimes	Always	Mean	Std. Deviation
Promoting social and economic priorities, improved food quality, safety, health, and environment.	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	2.57	1.208
Attended programme on TQM and EMS that was sponsored by your government.	Al-Rayhan	30	34	30	49	35	3.14	1.385
	Abu-Ante	91	28	107	12	6	2.24	1.085
	National Mills	56	47	13	2	10	1.93	1.145
	Total	177	109	150	63	51	2.43	1.205
Encouraging the clients of the industry, more environmental practices.	Al-Rayhan	29	27	40	49	33	3.17	1.342
	Abu-Ante	54	94	64	24	8	2.34	1.031
	National Mills	39	38	19	26	6	2.39	1.93
	Total	122	159	123	99	47	2.63	1.434

4.6 Hypotheses Testing

This section aims to test the five hypotheses that were formulated in this research related to the impact on the potential to implement TQEM which are the dependent variable on the national environmental factors, as independent variables. Pearson's correlation coefficients were used to test each hypothesis and to assess the correlation between the independent and dependent variables, and to show the correlation between the independent variables themselves [34,35]. A multiple regression result is introduced for each hypothesis, which was achieved by using an ANOVA model and a coefficients model. In order to fit a model which explains TQEM in terms of (technical capability, organizational culture, human resource, competition, and government policy) it is needed look at the degree of correlation between TQEM and the independent variables.

Table above shows a correlation between every pair of variables. Then, the 2-tailed significance of each correlation is displayed and the number of cases contributing to each correlation (N=550) is shown. TQEM, as a dependent variable, is positive correlation at a 1% level of significance. This indicates that there is a positive correlation between the independent variables themselves. Table 9 explains the way the correlation is assessed, based on the range of coefficients, according to Hair et al. [36].

According to this analysis, the organizational culture (46.5%) and human resources (46.7%) were moderately correlated with the level of TQEM. The factor of competition (34.9%), government policy (24.2%), and technical capability (21.2%) were correlated as having a small but definite relationship with TQEM.

It is expected that the coefficients in the regression model may not measuring the individual impact of the independent variables; they can, however, be used for the prediction of TQEM.

> Hair et al. [37] have pointed out that *"there are three recommended methods for assessing multi-colinearity: The presence of high correlation; the tolerance values; the variance in inflation factor values. However, the variance inflation factor (VIF) showed no values that exceed the generally accepted maximum level of 10 (an indication of high levels of multi-colinearity) and the tolerance values showed no values less than the maximum level of 0.2".*

According to Field [38] *"multi-colinearity causes a problem for multiple regressions since it can affect the parameters of a regression model"*. Examining the colinearity diagnostics variance inflation factor and tolerance) for this model, (the values of tolerance and variance inflation factor (VIF) are from Table 8).

Table 7. Correlation results

		TQEM	Technical	Culture	Human resource	Competition	Government	Environmental factors
TQEM	Pearson Correlation	1	.212**	.465**	.467**	.349**	.242**	.542**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	550	550	550	550	550	550	550
Technical capability	Pearson Correlation	.212**	1	.153**	.407**	.349**	.107*	.648**
	Sig. (2-tailed)	.000		.000	.000	.000	.012	.000
	N	550	550	550	550	550	550	550
Organizational culture	Pearson Correlation	.465**	.153**	1	.221**	.364**	.191**	.610**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	550	550	550	550	550	550	550
Human resource	Pearson Correlation	.467**	.407**	.221**	1	.441**	.157**	.692**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	550	550	550	550	550	550	550
Competition	Pearson Correlation	.349**	.349**	.364**	.441**	1	.162**	.737**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	550	550	550	550	550	550	550
Government policy	Pearson Correlation	.242**	.107*	.191**	.157**	.162**	1	.490**
	Sig. (2-tailed)	.000	.012	.000	.000	.000		.000
	N	550	550	550	550	550	550	550
Environmental Factors	Pearson Correlation	.542**	.648**	.610**	.692**	.737**	.490**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	550	550	550	550	550	550	550

***. Correlation is significant at the 0.01 level (2-tailed).*

**. Correlation is significant at the 0.05 level (2-tailed).*

Table 8. Correlation coefficient size*

Coefficient range	Strength of association
-/+.91- -/+1.00	Very strong
-/+.71- -/+.90	High
-/+.41- -/+7.0	Moderate
-/+.21- -/+4.0	Small but definite relationship
-/+.01- -/+2.0	Slight

**Assumes correlation coefficient is statically significant*
Source: Hair et al., (2003, p.282)

Table 9. Coefficient results for dependent variable: TQEM (Coefficients[a])

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Colinearity statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.646	.077		21.366	.000		
Technical capability	-.008-	.018	-.017-	-.437-	.662	.798	1.254
Organizational culture	.172	.018	.349	9.433	.000	.847	1.181
Human resource	.190	.021	.357	8.926	.000	.725	1.379
Competition	.025	.020	.052	1.283	.200	.701	1.426
Government policy	.060	.019	.113	3.220	.001	.946	1.058

a. Dependent Variable: TQEM

Table 10. ANOVA output for the hypotheses (ANOVA[b])

Model		Sum of squares	Df	Mean square	F	Sig.
1	Regression	34.988	5	6.998	64.106	.000a
	Residual	59.381	544	.109		
	Total	94.368	549			

a. Predictors: (Constant), Government policy, Technical capability, Organizational culture, Human resource, Competition.
b. Dependent Variable: TQEM

Accordingly, The researcher checked the multi-colinearity problem in the regression model using VIF; it found all of the VIF values were less than 10. this means there is no multi-colinearity. The variance inflation factor range from 1.058 to 1.426, all below 10. Tolerance values range from .946 to 0.701. None should be below 0.1, since tolerance = 1/VIF values below 0.2 are a cause for concern [39].

The rearward elimination is suggested in order to fit the regression model to test the hypothesis regarding the relationship between the national environmental factors and TQEM. The five national environmental factors in LFI are examined to see if it contributes to the predictive impact of the model. The Table below demonstrates that the three independent variables (organizational culture, government policy, and human resource) have p-values below .005. This indicates that they make a significant contribution to the model. The R2 = 0.371, the model explains 37.19% of the variation in TQEM. Since, technical capability has a p-value of .662 and competition has p-values of .200.

The ANOVA model shows that the F-statistic = 64.106 with a p-value = 0.000. This indicates that the multiple regression model fitted, and this includes the organizational culture, government policy, and human resources as independent variables, and is significant at 1% level in TQEM.

It can be said here TQEM and the five national environmental factors' independent variables, it is shown that all five of the independent variables are positively correlated with TQEM at 1% level of significance.

5. RESULTS AND DISCUSSION

The findings from the current investigation have identified five national environmental factors including: Technical capability, organisational cultural, human resource, government policy, and competition. This section presents the results and discussions relating to implementation of the national environmental factors of TQEM. This focus on the data derived from the quantitative investigations that consider the LFI and sustainability overall.

5.1 Technical Capability

Overall the answers to the technical capability questions showed that the managers in the LFI believed that although their machines existed to produce products, they still needed updating and renewing using a better system to achieve higher levels of productivity and efficiency. The analysis indicated that the three companies mainly operated with old machinery that was likely to have higher rates of machine breakdown. The main findings from the questionnaire showed that the technical capability of the LFI and suggest that this industry may need to update or replace equipment and new machines. In fact, the Libyan government has invested a great deal of money to improve every aspect of the companies, but because of corruption in the management system and the way in which the government funding is deployed, this is obstructed [245]. Such corruption leads the government to minimise the amount of funding that is dedicated to improving and updating the machines.

To implement modern techniques and equipment in developing countries, such as Libya, would be difficult, because the production system can be described as being at the 'base of the pyramid' [40]. The attempt to implement new techniques and strategies for existing systems could lead to an unstable system that is difficult to implement [13,20,28,40]. This finding could be summarised as follows:

- A lack of training may be the main reason for the negative attitudes in the technical capability of the LFI.
- The LFI has very limited resources in expertise with which to improve and maintain the productivity quality of their technical capability.
- The technical capabilities used in the LFI are not friendly to the environment.
- The technical capabilities of the LFI are insufficient to do the jobs required, and this may cause low quality production and a lack of environmental protection.
- Equipment in the three companies is outdated, and this may affect and damage the environment both inside and outside their companies and this is caused by the high level of dusts and pollutants.
- The machinery in the LFI is quite old and must have an efficient maintenance system in order to keep it running.

5.2 Organisational Culture

In terms of organizational cultures the results confirm that, managers and employees were as being one entity with an organization, which had the greatest impact on TQEM implementation. Therefore, organisational culture plays a great role in connection with Libyan managers' management and staff behaviour [20]. The managers and employees in the LFI indicated that organisational culture should be considered in training programmes in order to successfully implementation of TQEM. The LFI has attempted to develop techniques in order to overcome this issue, or at least to minimise its negative impacts on TQEM implementation. This issue could also be applicable to other industries in Libya. Organisational culture is one important key element that should be addressed when implementing TQEM in the LFI [28]. The findings on this factor can be summarised as follows:

- Organisational culture has not been given any attention in the LIF and it does not play a part in influencing an organisation's level of quality and environmental management practices.
- The LFI does not support the changes in style or structure that are required to adapt to changes in the business environment.
- Managers and employees have no clear vision of organisational culture in the future.
- Libyan management does not encourage employees to do their work correctly to work towards a continuous improvement in the products.

5.3 Human Resources

Employees are one of the most important assets of an organisation, since they contribute to its growth and success [41]. From this, it could be suggested that the main aspect to improve productivity is to focus on the human resources of an organisation; this may be inside the company or outside of the business. From this revealed, human resources were seen to be one of the most important national environmental factors affecting TQEM implementation in the LFI. This study has revealed that the key findings regarding human resources in the LFI are:

- Human resources in the LFI show little improvement in relation to health, safety, and the environment.

- The human resources in the LFI do not understand what is expected from them and they are not given the freedom to become proactive within the companies.
- The LFI does not focus on what human resources need or on top management, whose commitment and support is lacking, so there has been little encouragement for TQEM implementation.
- The LFI are seeking to develop managers and employees who are capable of designing and enacting changes which will enhance environmental protection and improve the quality of operation and who will impact significantly on the quality of products and services.

5.4 Competition

This research revealed that Company A has a quite solid competitive position, in spite of several Libyan and foreign competitors in the market. Considering that this company was the juice and milk manufacturer in the Libyan market, this has enabled it to be a shaper of Libyan consumers' juice and milk preferences. However, as the situation changes (e.g., through competitors and importing), this company will face a notable challenge if it is to maintain its competitive position. The findings for this factor are:

- The LFI are facing increased competition and rapid advances in technology.
- Most managers in the LFI do not understand the complex nature of international trade and world markets have become globalised.
- The LFI does not identify best practice for improvements and opportunities to compete with other foreign companies.
- Although the LFI makes an effort to compare their offerings with those of other companies (i.e., imported products) when aiming to achieve higher quality, they are still unable to compete with foreign entrants into the Libyan market.
- Clearly, under the effects of such problems, it might be difficult for the LFI's products to meet international standards.

5.5 Government Policy

This research also suggests there is no concern about the aspects of production that may have negative impacts on the environment (e.g., through pollution). So, the LFI being researched has negative impacts on health and the environment. Pollution may be the most important external impact of the company that can be linked directly to a lack of cleaning and updating of their machinery. As the Libyan government does not implement environmental protection regulations that could be put in place by the government and local authorities in order to force factories with a similar profile to take positive measures regarding pollution, health and safety. The findings for this factor are:

- The Libyan government does not support a programme for TQEM that is sponsored by government.
- The lack of encouragement for the food industry to take up more environmental practices by the Libyan government.
- The Libyan government is not supporting social and economic priorities, including improved food quality, safety, health, and the environment.
- The Libyan government is not supporting Libyan industries to deliver the latest technology, which supports the local company's contributions to environmental protection.

5.6 Social Responsibility

In the TQEM literature [18], social responsibility is considered an important factor that measures the organisation with the external environment to improve citizenship and to recreate relationships. Khadour [3] argued that social responsibility is good and companies survive by improving the quality of people's lives by creating a high quality of goods and services.

In this study, social responsibility was not measured as a national environmental factor for the implementation of TQEM in the LFI questionnaire. However, managers and employees who participated in the questionnaire mentioned that social responsibility was one of the important national environmental factors they considered when implement TQEM in the LFI. About 80% of respondents considered social responsibility to be a new phenomenon in the LFI and that this should be considered more as national environmental factor in order to successfully implementation TQEM philosophy.

It can be seen that this result did not match the study's findings, although the literature mention the importance of social responsibility in TQEM

implementation. The researcher reflects that this is for two reasons. Firstly, there is no law and there is a lack of governmental control and of a plan to support this factor. Secondly, the LFI does not have a good understanding of the cultural issues that are related to this factor.

The national environmental factors for implementing TQEM in the LFI that are identified through this research can be summarised as follows:

- Technical capability
- Organisational culture
- Human resources
- Competition
- Government policy
- Social responsibility

5.7 The Impact of National Environmental Factors for the Implementation and Sustainability of TQEM in the LFI

In this part of the research, the researcher illustrates the findings that emerged from the application of the quantitative approaches. Exploring the impact of environmental factors fewer than 5 individual variables that related to the implementation in the LFI fulfils is the second objective of the current research. It is obvious that there is not enough information for the investigations of this study concerning the impact of individual TQEM implementation's outcomes. It is evident that there is a lack of investigations that study the impact of environmental factors for TQEM's outcomes [3,10,13,28]. The researcher therefore found that introducing this objective into the current study may contribute to the TQEM literature, in particular that concerning TQEM implementation in the Arab world.

The questionnaire findings in this current research indicates that national environmental factors, including technical capability, organisational culture, competition, government policy, and human resources, have an impact on the potential to implement TQEM. This means that national environmental factors must be the expected result of the implementation of the TQEM in the LFI. The findings from this hypothesis demonstrate that the three independent variables (organisational culture, government policy, and human resources) have p-values below .005. This indicates that they make significant contributions to the explanatory power of the model. Since 'technical capability' has a p-value of .662 and 'competition' has p-values of .200, these were removed from the model to assess the difference in R^2. The organisational culture, government policy, and human resources are independent variables, and are significant at the 1% level in explaining the variability in TQEM.

In this context, the findings suggest that even though there is a positive correlation between national environmental factors (independent variable) and TQEM (dependent variable). Given the non-significance of the impacts of the national environmental factors on TQEM, a separate test was conducted for each of the national environmental factors' elements. As far as the specific national environmental factors' elements were concerned, a positive coefficient with TQEM was expected for three elements (organisational culture, human resource and government policy) and a negative coefficient for the other two elements (technical capability and competition.

6. CONCLUSION AND FURTHER RESEARCH

The data analysis from the questionnaire identified the five national environmental factors in the LFI. Five hypotheses related to the impact on TQEM implementation on the national environmental factors have been tested. The adoption of national environmental factors in the implementation of TQEM for sustainability in the LFI is discussed. The results from this study have indicated that although the machines in the LFI existed to produce a satisfactory product, they still need updating and renewing through a better system in order to achieve higher levels of productivity and efficiency. Results show that managers and employees in LFI need more training and workshops to enable them to be aware of the importance of the process of TQEM's development and implementation. Environmental and quality management training should be provided to all levels of managers and employees, as the training will enhance their environmental culture; amend their knowledge through any new strategies and techniques that are adopted. These help to increase their skills for the programme and to ensure the continual improvement that is required by a formal TQEM. The Libyan managers and employees mentioned that the LFI need to regularly keep the employees up-to-date. It could thus be concluded that there should be focus on the human

resource factor as a separate factor from training in the Libyan context. Summarising the keys findings relating to competition shows that the LFI needs to adapt a new system/network through which to sort out its relationships with the international and national suppliers, who should be evaluated and selected based on their capabilities and their commitment to service quality. The LFI should pay attention to their external and internal customers. This is reflected in the overall planning of environmental and quality management efforts. The analysis indicated that the three companies mainly are suffering from a lack of support from the Libyan government in relation to environmental and quality management. This means that the Libyan government have no awareness of the significance of environmental protection, quality production and services, sustainability and global environmental issues to their stakeholders and local people. Social responsibility factor did not measure in the questionnaire. It was mentioned by the managers and employees in the LFI. Consequently, this factor is considered to be a new phenomenon that has not generally been studied in Libya, and particularly not in the LFI. Managers at all levels need to adapt new information systems in their departments so as to encourage them to have a high degree of social responsibility in TQEM planning and the information given to employees, and to provide all the information needed by the customer on the products and services provided by the company. This study could be replicated in other sectors: banking, education, health, etc., to investigate national environmental factors for TQEM implementation in those organizations. Social responsibility is one of the national environmental factors which should be studied in further research in developing countries, and in the Libyan context in order to evaluate its importance in the TQEM context. Future research is needed to identify the impact of the social responsibility factor for implementation and sustainability of TQEM in the LFI. The results of this investigation are to provide a starting point to design a framework for the LFI for implementing TQEM. The framework will increase their chances of success within the Libyan context. The analysis and results is to provide a starting point to design a framework model for the LFI for implementing TQEM.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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