A Survey on the Effectiveness of the Curriculum for the Libyan Manufacturing Industry

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Abstract

The rapid development in technology and manufacturing industry has affected the national economies and education system of countries. New challenges and new demands are making necessary to re-design curricula of Technical and Vocational Education and Training (TVET) programmes with industry partnership and business sectors for global economy. The development of curricula should stress the need for flexibility in structure and modes of delivery of TVET programmes. The aim of this paper is to describe the results of a survey which was conducted in Libya in two sectors, viz. manufacturing industry (Engineers' and Technicians' Perception) and Higher Education Institutions (Students' Perception). Conclusion points out that these curricula profile should be designed to meet globalisation and manufacturing industry demands, concerning 21st century higher education in general and TVET in particular. The curricula must therefore be viewed as one of systematically making decisions about the objectives of the educational programmes, content, organisation and methods, and evaluation of the programme outcomes. These decisions will guide and direct the activities of all those who are engaged in the educational enterprise.
Index Terms: Curriculum Development, Higher Education, TVET, Libya.

Introduction and Background

As in many other countries, Higher Education (HE) in Libya has undergone a massive expansion over the last 10 years or more [1]. However, despite significant effects of this expansion on the whole society, a number of analysts argue that Higher Education Institutions (HEIs) have increased in number at the expense of qualitative aspects. They also argue that the HE in general suffers from a lack of appropriate planning mechanisms and procedures [2] [13] [4]. Libya has suffered a shortage of skilled manpower [11]. This problem has become more marked over the last 10 years or so, the country has tried to keep pace with technological changes that affect many developing countries [12]. To address this critical problem, a network for Technical and Vocational Education and Training institutions (TVET) was introduced in the 1990s to enhance and improve the provision of the necessary highly skilled workforce needed for national socio-economic development plans. The TVET are post-secondary institutions and provide theoretical and practical curriculum [15]. In 2000, there were 84 TVET throughout the country [13] [14].

Curriculum Design

Providers of TVET should design their curriculum in line with the needs of industry and individual students, and should update the curriculum regularly to accommodate advances in technology, learning and teaching methods, social and cultural development, job market needs and globalisation. TVET providers should also design and run short courses for continued professional development (CPD) and life-long learning.

According to [7], the curriculum designer should consult diverse sources that play significant roles in the development of the programme and see the course as part of a whole. Authors in [8], argue that the engineering science curriculum has a significant role in the development of professional engineers. It is critical for future economic development that the engineering programmes address the skills needs of the industry and prepare the graduates to play effective roles in their future employment [21]. According to [16], maintains that curricula design should match the needs of students and cater for their aspirations and requirements. [19], argues that, the importance of considering the workplace as a learning environment for CPD is emphasised, as the tensions arise for learners meeting the demands

of academia in full-time employment.

Methodology

This study is exploratory and descriptive in nature and the main research methods adopted were literature review and questionnaire survey. Data used in this study were based on a survey data conducted among 9 higher education institutions (Universities/ Institutions) and manufacturing industry. To meet the objectives of this study, a questionnaire was generated to obtain information to examine some aspects of the study under investigation. The questionnaire aimed to elicit the students' perception of the skills and knowledge they are acquiring during their study at the engineering departments in different Libyan Higher Education Institutions (HEIs), and the engineers and technicians working in manufacturing industry about the education and training they received before joining the organisation. The questionnaire was administrated to students in the above mentioned nine HEIs (universities/institutions) and engineers and technicians in manufacturing industry. The questionnaire used a six-point Likert scale format. This format allows the students and engineers to place themselves on an attitude continuum for each statement-running from (1=Strongly Disagree to 6=Strongly Agree) [18]. The sample size was 625 and 137 for students and engineers respectively, and this represented a high response rate (85% for students and 61% for engineers). The results of curriculum design was analysed and are presented in this paper.

Results of Curriculum Design and Discussion

* Students' Perception

(Q1). Subjects studied are relevant for future profession as engineers

Data presented in (Q.1) show that 53.6% of the sample agreed or strongly agreed with the statement indicating that subjects they were studying relate to their future profession as engineers. In contrast, about 14.3% of these students either strongly disagreed or disagreed with the statement. However, 32.1% of respondent students were not decisive in their responses, either slightly disagreeing/slightly agreeing with the statement. This pattern of response reveals that more than half of respondent students perceived these subjects as relevant to their study and would qualify them after graduation to work as engineers. On the other hand, this raises a major concern that a relatively large number of students were not decisive or do not agree with this statement. In the researcher's view, the curriculum and subjects taught to students might need extra practice, and require further training to help them respond to the aspirations and requirements of their jobs in the future. According to [20], the Libyan education system is not providing the skills required to drive the economy forward. The system suffers from poor quality curricula, teachers and infrastructure.

(Q2).Subjects studied prepare students to be engineers

Nearly 60% of responding students agreed to strongly agreed that the subjects they are studying prepare them well to be engineers (Q.2). This statement links up with that of Q. 1 above, given that 53.6% of students agreed/strongly agreed. This pattern of response clearly indicates that 30.6% of the sample did not express their views decisively (slightly disagree/slightly agree), and some of them (11.7%) did not perceive these subjects as relevant to their study to qualify them after graduation to work as engineers. This pattern of responses ties up with that expressed concerning Q.1. This substantiates the authors' view that subjects taught lack adequate practical experience to help students qualify as engineers after their graduation; hence, requiring further practical training to qualify them in their career in the future.

(Q3).Extent of knowledge and skills offered by the course studied

Responses to Question 3 clearly indicate that 47.3% of respondent students expressed their agreement with its statement, in contrast to a large percentage of them (37.4%) who were not sure about their views (slightly disagree/ slightly agree), and some of them (11.7%) did not agree with it. This pattern of responses ties, though to some extent, with those expressed concerning (Q.1 and Q.2). It clearly shows that many students did not think that the breadth of knowledge and skills offered by their course qualify them to be successful engineers.

(Q4).The depth of knowledge and skills offered to students

Students were also asked (Q.4) to indicate their perception of the depth of knowledge and skills offered by course of study. It was considered important to know the depth of knowledge and skills offered by course to be successful engineers. 45.0% of the sample agreed with this statement indicating that the depth of knowledge and skills offered by the course qualify them to be successful engineers. Nonetheless, 39.4% of the sample did not express their views decisively (slightly disagree/slightly agree), and some of them (15.6%) did not agree with it. This pattern of responses ties up with that explained for the previous statement (Q.3). This means that many engineering students did not believe that the depth of knowledge and skills offered by the course qualify them to be successful engineers. The researcher thinks that the curriculum needs to be redesigned, re-engineered and developed much further than it is in its current status to provide graduates with the depth of knowledge and skills that qualifies them to be successful engineers after their graduation. Authors on [17] argue that the development of engineering education is fundamental for the establishment of the skills and knowledge required, and as they claim, this will also drive the expansion of industry academia linkages; hence, develop the linkages that are essential for the efficient operation of universities.

(Q5).The balance between theoretical and practical sessions

When students were asked about their perception to whether the balance between the theoretical and practical sessions is appropriate (Q.5), only 41.4% of the respondent students expressed their agreement with the statement, whereas 27.2% of them disagreed with it and 31.3% of them did not express their views decisively (slightly disagree/ slightly agree). This is a high percentage of respondents who either disagreed or were not sure about it. It can possibly be argued that many students thought that there is an imbalance between theoretical and practical sessions. This is a serious matter that higher education institutions need to address adequately to include more practical work in their curricula. This pattern of response may point to some fault in the curriculum design, and that there is more reliance on theory than on practice, and is further evidence and ties up with that explained for the previous statement (Q.1and Q.2). According to article 14 Law 114 (1994) which covers regulations of TVET, 60% of curriculum instruction time should focus on practical training and 40% for the theoretical knowledge [6, p. 14]. However, it is clear from the findings that instructions in TVET tend to emphasise theoretical issues rather than practical applications. Similar findings have been previously reported by [5] [3].

(Q6).Students' perception of the appropriateness of course assessment strategy

In response to the statement whether the course assessment strategy is adequate (Q.6), 37.1% of respondents agreed with this statement, whereas more (38.1%) did not agree or disagree with it in a decisive way (slightly disagree/ slightly agree). Nonetheless, almost (24.8%) of them disagreed with the statement. This pattern of response clearly indicates that the majority of students did not perceive course assessment as appropriate. This, in the researcher's view, is due to the reliance on theoretical examination as the major strategy for the assessment of students, and not much on laboratory-based (practical) assessment strategy. This ties up with responses to Q.5, in terms of the unbalance between theoretical and practical sessions.

(Q7).Link of study modules from one level to another

When asked whether the modules of study are linked from one level to another, slightly less than half of the students (47.3%) agreed with the statement, whereas nearly (36.2% of the sample) were not decisive in their response (slightly disagree/slightly agree), and 16.5% of them disagreed with it. This pattern of response may indicate that a large percentage of the respondent sample did not think that their modules of study are satisfactorily linked and appropriately progress from one level to another. This is further evidence that the curriculum is not adequately designed; hence, it needs redesigning and development so that modules given in one level tie up with those given at the following higher level.

(Q8).Curriculum covers employability issues and career advice

When asked to indicate their perception whether the curriculum covers the employability issues and career advices (Q.8), 32.4% of respondent students agreed with the statement, whereas the remaining 41.8% of them expressed their non-decision approach (slightly disagree/slightly agree). Furthermore, 25.7% of them disagreed with it. This high disagreement percentage may indicate that there are some loopholes in the curriculum which do not adequately

prepare students for future employment. This is further evidence of the nature of the curriculum which is more geared towards theory than practice; hence, fails to prepare students adequately for employment and future career. This pattern of responses ties up with those concerning Q.1 and Q.2 above.

*** Engineers' and Technicians' Perception about Education and Training before Employment**

(Q9).Relevance of study to jobs

The analysing of responses to Q.9 shows that almost 52% of engineers and technicians expressed their agreement with the statement, whereas the remaining respondents were either not decisive in their responses (32.9%), or disagreed with it (15.3%). The researcher's view is that technicians' study may have equipped them well with knowledge and skills relevant to their jobs, possibly the method of training them in Higher Technical and Vocational Institutes is more geared to practice than theory; hence, they found their study as relevant to their jobs or which required by the engineering profession. This might have tilted the balance towards high agreement with the statement.

(Q10).Knowledge and skills acquired during study

When engineers and technicians were asked about knowledge and skills they acquired during period of their study (Q.10), 51.1% of them agreed with the statement, in contrast to 36.5% of them who were not decisive. This indicates that not all engineers and technicians gained the knowledge and skills during their study. This pattern of responses ties up with that presented for the previous questions (Q.9).

This pattern of responses also ties, though to some extent, with those expressed concerning (Q.1, Q.2 and Q.3) in students' perception. It clearly demonstrates that many engineers and technicians did not think that the knowledge and skills offered by their course qualify them to be successful in their jobs. This is further evidence that the courses they have attended need further knowledge and practice to qualify them for future career.

(Q11).Learning knowledge and skills independently

With regard to the respondents' perception of acquiring knowledge and skills independently (Q.11), most of them agreed (62.1%) with the statement; thus, indicating that they can acquire knowledge and skills independently. However, a large percentage of them (36.5%) were not decisive in expressing their views. This, as the researcher sees it, is the ability of some people to acquire knowledge and skills independently, by reading more about new developments in their fields, in contrast to some others who are not keen to improve and develop their knowledge and skills outside the domain of their study. It is these people who need further training to motivate them develop their knowledge and skills independently.

(Q12).Respondents' perceptions of effectiveness of on-job-training

Results show that the majority (70.8%, Q.12) of Engineers and Technicians expressed their agreement with the statement, indicating that on-job-training is much more effective than learning through academic institutions. This pattern of responses indicates the importance of on-the-job training to develop their knowledge and skills. It is an essential technique in which people acquire suitable knowledge and skills at work [9]. This type of training is the most extensively used technique by organisations [10]. It is employed to approach the primary skills training, in view of the fact that it is very effective.

(Q13).Respondents' perception of subjects studied and current job

When asked to indicate their perception as to whether the materials they studied relate to their current jobs (Q.13). 44.5% of respondents agreed with the statement, whereas more of them (45.3%) were not decisive (slightly disagree/ slightly agree). This clearly indicates that many respondents could not relate most of the material they studied to their current practices. In the researcher's view, this is further evidence that the curriculum is not adequately designed; hence, it needs redesigning and development for required by the engineering profession.

(Q14).Respondents' perception of their study issues in relation to globalisation

Engineers and technicians were also asked to indicate their perception of whether their study issues prepared them well to globalisation and international businesses (Q.14); 31.3% agreed with this statement and (30.6%) disagreed

with it. However, 38.0% of them were indecisive in their approach to responding to the statement (slightly disagree/ slightly agree). This may indicate that academic curricula do not address the globalisation agenda. Furthermore, Libya had been isolated from the international community for decades and curricula seemed to have been designed to address local or, possibly, limited regional agenda. It can be argued that the role of engineers in Libya has not changed due to globalisation as is the case in advanced societies. The role of the future engineer in technically developed modern societies has become more challenging as a consequence of the globalisation of industry and engineering practice [17]. To resolve future problems, engineers should acquire much more advanced core knowledge and technical skills as well as soft skills to acquire the growing share of engineering employment in non-traditional, less-technical engineering work and knowledge-based "services" economy [17]. This is not the case in the Libyan context.

Conclusion

Based on the above findings and discussion, it can be concluded from students' responses to items concerning curriculum design that the majority of students were positive that the subjects studied are relevant for future profession as engineers, and prepare them to be engineers. Many students, however, found that study modules are linked from one level to another, and expressed their agreement with the extent of knowledge and skills offered by the course studied. On the other hand, it can be concluded that many students were not happy with (i) the depth of knowledge and skills offered to them,(ii) the balance between the theoretical and practical sessions is appropriate, (iii) the adequacy of the course assessment strategy, and (iv) the curriculum covering employability issues and career advice.

From the engineers and technicians' perception of education and training before employment, it can be concluded that most of them indicated that their study was relevant to their jobs, that the knowledge and skills they gained during their study prepared them well to be engineers and technicians; that they acquire knowledge and skills independently, on-the-job-training is being effective. However, many of them were not satisfied with that the materials they studied relate to their current jobs, or that their study issues prepared them well to globalisation and international businesses.

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