A Foresight Study about the Skills and Competencies Needed for Quality Professionals in 2030

An Empirical Study of Saudi Arabia

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Abstract−**This paper presents the results of a foresight study examining the future knowledge, skills, and competencies required by quality professionals to meet the goals and objectives of the Saudi Vision 2030. The study aims to develop a methodology allowing the forecasting of skills and competency demands in the future. Data collection was conducted through the design of a web-based questionnaire that was distributed online to academic and quality management specialists in Saudi Arabia. The questionnaire consisted of four sections and forty items aiming to identify the necessary competencies that quality professionals should develop to deal with the changing business environments. The validity and reliability of the questionnaire were confirmed by Cronbach's alpha and the data were analyzed using descriptive tests (mean and standard deviation). One-way ANOVA method was also used to test the significant differences in participants' attitudes. The results of the study clearly emphasize on the emerging need for new effective skills to face this new era of the rapid pace of technological changes. The outcomes of this study may be used by policy-makers, local authorities, employers, academics, and researchers to set up future-oriented education and training policies to bridge the gap between skills demand and supply which arises out of labor market changes.**

Keywords-foresight; knowledge; skills; competencies; quality professionals; Saudi Vision 2030

I. INTRODUCTION

The Kingdom of Saudi Arabia is undertaking an enormous development through the implementation of its ambitious 2030 vision. Launched in 2016, the vision intends to build a thriving, diversified and sustainable economic model away from the dependence on oil and making the private sector the key generator of growth and jobs [1]. The vision envisages a more productive and prosperous society in which people are at the heart of economic growth and social development. To achieve these goals, a series of programs and national strategic plans were developed by the Saudi government for the industrial sector in order to turn the vision objectives into practice and move on with the achievement of its goals. Within this significant socio-economic transition combined with fast technological breakthroughs and the advent of the 4th industrial revolution, best known as Industry 4.0, it is of great importance to foresee the skills, competencies, and new job tasks that the Saudi labor market must develop to successfully address this new era of rapid change and innovation. However, what the future of work market may hold and how will this be affected by the accelerating technological changes has sparked widespread debate among politicians, businessmen, scholars and academics [2-3]. The Industry 4.0 is characterized by the development of smart factories able to govern themselves by means of cyber-physical systems, Internet of Things (IoT), Internet of Systems (IoS), artificial intelligence, cloud technology, and big data [4]. As a result, public and private sectors need to up-skill their workforces to prepare them for the tasks and competencies required by this new industry revolution. It is widely agreed that knowledge and skills are the key factors for employability and economic growth of countries [5-6].

During recent years, the topic of foresight has attracted many government agencies, organizations, and academic researchers in order to design strategies, scenario planning models, and visions [7]. The increasing importance of foresight as a strategic policy development at national and organizational levels can be assessed by the extensive published papers and technical reports that can be found in the literature [8-9]. With the availability of a bench of foresight methods and techniques that have been successfully implemented in different contexts, it is possible to anticipate the required skills and competencies

that the job market needs. By using foresight techniques, decision-makers, organizations, and companies can develop the ability of formulating a broader framework of the necessary qualifications, skills and competencies needed for the job market over the next years. Authors in [10] conducted a foresight study on the necessary competencies that leadership should develop to deal with the rising uncertainties of the changing business environments. Similarly, authors in [11] investigated the variation in skill demands across the United States labor market during the period 2010-2015. They reported similar techniques to anticipate skills and future job requirements based on big data analysis of job postings in professional networks. Their results showed a large correlation between firm wages and employee levels of cognitive and social skills. Despite the growing body of research in the area of the future of work, there are only limited studies conducted on the skill requirements across the Saudi labor market. Organizations in Saudi Arabia, either public or private, are working within a national momentum driven by the Saudi Vision 2030. It is in this context that the Saudi Ministry of Education is supporting researches for the anticipation of future skill needs in order to enable strategic responses and bridge the gap between demand and supply of skills.

This paper presents the results of a foresight study on future knowledge, skills, and competencies needed by Saudi quality professionals to meet the requirements of the new labor market. The study aims to develop a methodology allowing the forecasting of future competency needs based on the analysis of the Saudi Vision 2030 goals. The significance of the study lies in the fact that the obtained results would support Saudi decision-makers to identify key strategies and investments in human capital development through education and training programs. It is expected that the outcomes of this study will be of considerable value for the Saudi government, companies, and academics in their efforts to bridge the gap between the skill demand and supply, which arises out of labor market change.

II. METHODOLOGY

The methodology used in this study was based on an online survey questionnaire that was designed with the primary objective to identify future competencies needed by Saudi quality professionals to align with the Saudi Vision 2030. Google Forms was used to create and manage the questionnaire. The design of the survey has undergone different stages and pre-tests which have resulted in eliminating, reclassifying, and rephrasing its elements. The resulting questionnaire is organized into 4 sections and comprises of 40 items (Appendix A):

- Section I: Respondents' Characteristics: aimed to identify respondents' characteristics such as position, education level, age, gender, professional experience, organization size, work sector, existence of a quality manager at the organization, certification status of the organization, and the development of a strategic plan in line with the vision 2030.

- Section II: Future Knowledge Needs: aimed to recognize respondents' attitudes towards future knowledge needs and specializations required for Saudi quality professionals.

- Section III: Future Skill Needs: aimed to anticipate the future skills required for Saudi quality professionals.

- Section IV: Future Competencies Needs: assesses respondents' attitudes toward future competencies needs of Saudi quality professionals.

The questionnaire was sent out to 200 academics, researchers, and quality practitioners working in different organizations across the Kingdom of Saudi Arabia. Survey respondents were asked to assess each statement according to a five-point Likert rating scale which enables eventual comparative deductions since the same scale is used in similar studies. After answering the questionnaire by the respondents, the data was automatically recorded in a Google Docs spreadsheet. The data were analyzed using descriptive tests (mean and standard deviation). The internal consistency of the questionnaire same group elements was measured by Cronbach's alpha and its content validity was examined based on expert's reviews from academic institutions.

III. DATA ANALYSIS AND RESULTS

Out of the 200 questionnaires sent, 120 replies were received, making a 60% response rate. The authors believe that such a high response rate is mainly attributed to the efficiency of online web surveys. The respondents were of different ages, qualifications, and have different jobs.

A. Survey Validity

In survey studies, internal consistency is a common concern before data analysis is performed. Internal consistency is a measure of how well the different items measure the same concept in the survey. Internal consistency is measured by calculating Cronbach's alpha statistical factor. It measures the internal consistency among a group of items combined to form a single scale, and reflects the homogeneity of the scale. A value of Cronbach's alpha greater than 0.7 indicates homogeneity and consistency of the survey element. Table I shows the Cronbach's alpha coefficients of the survey elements of this study. As can be seen, the values of the Cronbach's alpha range from 0.860 to 0.943, indicating the reliability of the scales in achieving valid results for the objectives of the study.

TABLE I.   CRONBACH'S ALPHA

Domain	No. of items	Cronbach's alpha
Knowledge	10	0.920
Skills	10	0.860
Competence	20	0.943
Scale	40	0.947

The survey's internal consistency was further evaluated through Pearson correlation coefficients between the terms of each dimension and the dimension to which they belong. The results are shown in Table II and indicate clearly that there is a highly statistically significance at the 0.05 level of significance between the items and the elements of the survey (knowledge, skills, competencies). The high values of the coefficients presented in Tables I and II, indicate the validity and the reliability of the survey to measure what is designed for, i.e. the future skills and competencies of the quality professional in the Saudi context.

TABLE II. PEARSON CORRELATION COEFFICIENTS

Knowledge		Skills		Competence			
Item	Pearson Corr. Coef.	Item	Pearson Corr. Coef.	Item	Pearson Corr. Coef.	Item	Pearson Corr. Coef.
1	0.741**	1	0.717**	1	0.732**	11	0.734**
2	0.641**	2	0.658**	2	0.654**	12	0.854**
3	0.915**	3	0.576**	3	0.679**	13	0.783**
4	0.634**	4	0.842**	4	0.822**	14	0.501*
5	0.820**	5	0.799**	5	0.704**	15	0.487*
6	0.910**	6	0.512**	6	0.860**	16	0.583**
7	0.826**	7	0.707**	7	0.496*	17	0.783**
8	0.626**	8	0.654**	8	0.582**	18	0.570**
9	0.903**	9	0.694**	9	0.677**	19	0.805**
10	0.820**	10	0.578**	10	0.897**	20	0.887**

** Significant at 1%level   * Significant at 5% level

B. Respondent Profiles

The respondent profiles are summarized in Appendix B. The participants are of both sexes, of different ages, from different social stata, with different scientific qualifications, different jobs, experiences, have different monthly incomes, and are of different nationalities. A careful examination shows that 51.7% of the respondents are from middle and executive leadership categories, and the majority of them (70.8%) work in organizations that possess single certificates for global management such as ISO 9001, 14001, 26001, or accreditation certificates specific to the organization's field of activity.

C. Data Analysis and Interpretation

The data obtained were analyzed using the Statistical Package for Social Science (SPSS) 25.0 program. A descriptive statistical analysis using mean, frequency, percentage, and standard deviation was used to describe the demographic variables and to answer the research question: "Which knowledge, skills and competencies should the country develop towards 2030?" The participants answered the survey using a 5-point Likert-type scale ranging from 1 for Strongly Disagree, to 5 for Strongly Agree. The range between the maximum and minimum mean values was classified into five levels reflecting the respondents' attitudes towards the questionnaire components (Table III). The mean scores and standard deviation values for the questionnaire components are presented in Table IV. As shown, all components scored mean values between 4.29 and 4.15, giving an overall mean score of 4.21. This result indicates a very strong attitude of the participants towards the needs for new knowledge, skills and competencies.

Analysis of variance (ANOVA) was used to determine if there are significant differences between the means of the groups. An important question was raised in this study: "Do the attitudes of participants vary based on the participant's background, such as years of experience, nature of their jobs, or the nature of the organization's work?". A null hypothesis (H0) was set for the study as follows: "There are statistically significant differences in the way participants view the future of quality professionals in align with the Vision 2030." These differences are based on the participants' background, such as their positions, years of experience and nature of work. The level of statistical significance of the data is expressed in terms

of the p-value as shown in Table V. The p-value approach is usually used as a substitute to rejection points to provide the smallest level of significance at which the null hypothesis would be rejected. A p-value above 0.05 is not considered statistically significant and indicates strong evidence for the null hypothesis. As can be seen in Table VI, the data analysis gave p-values between 0.159 and 0.781 (>0.05) for all groups, which indicates no statistically significant differences in how participants view the future of quality professionals and the null hypothesis should be accepted.

TABLE III. MEAN RANGES AND PARTICIPANT ATTITUDES

Mean range	Respondent attitudes
1.00 to 1.80	Very Weak
1.81 to 2.60	Weak
2.61 to 3.40	Moderate
3.41 to 4.20	Strong
above 4.20	Very Strong

TABLE IV. OVERALL MEANS AND STD DEVIATIONS

Questionnaire components	Mean	Std. deviation	Respondent's attitude
Knowledge	4.29	0.506	Very Strong
Skills	4.21	0.518	Very Strong
Competencies	4.15	0.546	Strong
Total	4.21	0.468	Very Strong

TABLE V. ANOVA FOR PARTICIPENTS ATTITUDES WITH RESPECT TO THE NATURE OF JOBS

Job Type	Knowledge		Skills		Competencies		Total	
	Mean		Mean		Mean		Mean	
Senior leadership category	4.23		4.14		4.10		4.14	
Middle leadership category	4.38	p-value = 0.781	4.35	p-value = 0.491	4.34	p-value = 0.159	4.35	p-value = 0.330
Executive leadership category	4.33		4.17		3.96		4.10	
Academic	4.21		4.05		4.10		4.11	
Administrative employee	4.28		4.17		4.22		4.22	
Other	4.19		4.23		4.13		4.17	

The respondents were asked to rank, from the most to the least important, the future domains of knowledge, skills, and competencies with reference to the Saudi Vision 2030 requirements. The outcomes of the survey are presented in Figures 1-3 and Table VI. As can be seen, all items scored high values of mean ranging from 4.64 to 3.78. Moreover, more than 80% of the surveyed domains attained mean values above the target level (4), indicating very strong attitude of the respondents towards the need for new/evolving knowledge and skills. The results showed that particular knowledge domains such as good knowledge of TQM tools, Organizational Context and customer needs are greatly required by quality professionals. The study outcomes also emphasize the importance of the interpersonal competencies that quality professionals should develop to address this new era of technology and job market changes. This is consistent with previous studies that have shown an increasing demand for social skills in the new labor market all over the world [12].

There are good reasons to think that these demands will continue to increase as technological and managerial approaches in economy are keeping to progress incessantly. Table VI incorporates the most required domains of knowledge, skills and competencies according to the outcomes of this study and the recommendations of other researchers [7-13]. These findings may serve as a reference for Saudi decision-makers to design future-oriented education and training policies for quality professionals to ensure sustainable employment, economic growth, and social development.
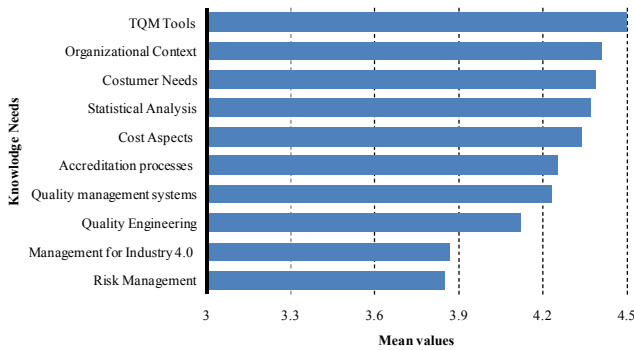

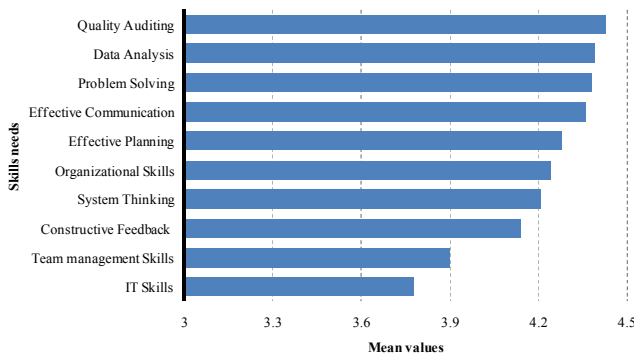Fig. 1.   Respondents' assessment of future knowledge needs.

Fig. 2.   Respondents' assessment of future skills needs.

analyzing the labor market evolution in an attempt to anticipate future skills in most organizational contexts. The outcomes of this study may be used by policy-makers, local authorities, employers, and researchers to build up a vision for skill development, and therefore could set up future-oriented education and training policies to bridge the gap between skill demand and supply which arises from the labor market changes.

Fig. 3.   Respondents' assessment of future competencies needs.

TABLE VI.   RANKING OF REQUIRED DOMAINS OF KNOWLEDGE, SKILLS AND COMPETENCIES

Knowledge Needs	Rank	Skills Needs	Rank
TQM Tools	1	Quality Auditing	1
Organizational Context	2	Data Analysis	2
Statistical Analysis	3	Problem Solving	3
Costumer Needs	4	Effective Communication	4
Cost Aspects	5	Effective Planning	5
Accreditation Processes	6	Organizational Skills	6
Quality Management Systems	7	System Thinking	7
Quality Engineering	8	Constructive Feedback	8
Management for Industry 4.0	9	Team management Skills	9
Risk Management	10	IT Skills	10
Competencies Needs	**Rank**	**Competencies Needs**	**Rank**
Leadership Behavior	1	Objective Driven	11
Business Strategy	2	Organizational Experience	12
Efficient Communication	3	Achieving Goals	12
Promote Acceptance	4	Creativity & Innovation	14
Conscientiousness	5	Adaptive Thinking	15
Problem Solving	6	Social Intelligence	16
Decision Making	7	Research Intelligence	17
Change Management	8	Emotional Intelligence	18
Critical Thinking	9	Entrepreneurial Thinking	19
Educating and Training	10	Conflict Management	20

IV. CONCLUSIONS

This study sought to develop a methodology that would allow the forecasting of future knowledge, skills and competencies required by quality professionals to align with the Saudi Vision 2030 goals. The analysis and interpretation of the collected data were made with various statistical tools. The results of the study clearly emphasize on the emerging need for new effective skills to face this new era of rapid pace of technological change. The data showed that particular knowledge domains such TQM tools, Organizational Context, and customer needs are greatly essential for quality professionals in the future. The results also emphasize the importance of the interpersonal competencies that quality professionals should develop to address the emerging requirements of the job market.

The findings of this study complement the current research on skills needs, by infusing a foresight methodology capable of

Please complete the following sections by ticking (√) where appropriate:

Section I: Characteristics of Survey Participants

No.	Profile of Respondents		√
1	Nature of Job	Senior leadership category (General Manager / CEO) or Owner of a Company	
		Middle leadership category (Director of Quality / HR / Projects Manager...)	
		Executive leadership category / Supervisor / Section Head	
		Academic / Researcher	
		Administrative Employee	
		Other	
2	Educational Qualification	Ph.D.	
		MSc	
		BSc	
3	Age (years)	21 to 30	
		31 to 40	
		41 to 50	
		More than 50	
4	Gender	Male	
		Female	
5	Work Experience (years)	Less than 1	
		1 to 5	
		6 to 10	
		11 to 20	
		More than 20	
6	Organization Size (employees)	Less than 50	
		51 to 100	
		101 to 500	
		501 to 1000	
		More than 1000	
7	Work Sector	Government sector	
		Private sector	
8	Does the organization have a quality management department?	Yes	
		No	
9	Does the organization possess single certificates for global management or accreditation certificates?	Yes	
		No	
		I don't know	
10	Does the organization have a strategic plan in line with the Saudi vision 2030?	Yes	
		No	
		I don't know	

Section II: Future Knowledge Needs

With reference to the Saudi Vision 2030, how would you assess the following knowledge needs for quality professionals in the future?

(1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree and 5=Strongly Agree)

No.	Item	1	2	3	4	5
1	The quality professional must have a good knowledge of quality management systems					
2	The quality professional must have a good knowledge of the cost aspect.					
3	The quality professional must have a good knowledge of statistical analysis.					
4	The quality professional must have a good knowledge of how to use TQM tools.					
5	The quality professional must have a good knowledge of quality engineering.					
6	The quality professional must have a good knowledge of risk management.					
7	The quality professional must have a good knowledge of the requirements of the 4th Industrial Revolution.					
8	The quality professional must have a deep understanding of customer needs.					
9	The quality professional seeks to understand the context of the organization.					
10	The quality professional must ensure that professional certificates are accredited by international bodies.					

Section III: Future Skills Needs

With reference to the Saudi vision 2030, how would you assess the following skills needs for quality professionals in the future?

(1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree and 5=Strongly Agree)

No.	Item	1	2	3	4	5
1	Quality professional must have team management skills					
2	Quality professional must have effective planning skills					
3	The quality professional is skilled in organizing effectively					
4	The quality professional must have a system thinking methodology					
5	Quality professional is competent to provide constructive feedback					
6	Quality professional must have data analysis skills					
7	The quality professional has skills in auditing quality management systems					
8	Quality professional must have problem solving skills					
9	Quality professional must have IT skills					
10	Quality professional must have effective communication skills					

Section IV: Future Competencies Needs

With reference to the Saudi Vision 2030, how would you assess the following competencies needs for quality professionals in the future?

(1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree and 5=Strongly Agree)

No.	Item	1	2	3	4	5
1	The quality professional must have the ability to strategically understand of the organization's policy for linking quality goals to the organization's strategy					
2	The quality professional has the skill to manage change					
3	The quality professional has teamwork skills					

4	The quality professional shows appropriate driving behavior					
5	The quality professional has the competence for methodologies to solve problems in operations					
6	The quality professional must be fully aware and pay attention to detail					
7	The quality professional must have sufficient experience in the organization's field of work					
8	The quality professional must focus on achieving goals.					
9	The quality professional must be able to make decisions					
10	The quality professional must have analytical and critical thinking					
11	The quality professional must be qualified to teach and train his coworkers					
12	The quality professional must have effective communication skills					
13	The quality professional must work to gain quality acceptance for all members of the organization					
14	Emotional intelligence is an essential feature of a quality professional.					
15	Social intelligence is a required feature of a quality professional.					
16	creativity and innovation skills are essential for the quality professional					
17	Personnel management and conflict management are key features of a quality professional					
18	Entrepreneurial thinking is an important skill for the quality professional					
19	Research intelligence is an essential feature of the quality professional					
20	Thinking with the methodology of adapting to the emerging data (adaptive thinking) is a required feature for the quality professional in the era of technical acceleration and digital transformation.					

APPENDIX B: CHARACTERISTICS OF THE RESPONDENTS

No.	Profile of Respondents		No.	P%
1	Nature of Job	Senior leadership category (General Manager / CEO) or Owner of a Company	21	17.5
		Middle leadership category (Director of Quality / HR / Projects Manager...)	36	30.0
		Executive leadership category / Supervisor / Section Head	26	21.7
		Academic / Researcher	13	10.8
		Administrative Employee	9	7.5
		Other	15	12.5
2	Educational Qualification	Ph.D.	17	14.2
		MSc	47	39.2
		BSc	56	46.7
3	Age (years)	21 to 30	31	25.8
		31 to 40	30	25.0
		41 to 50	42	35.0
		More than 50	17	14.2

4	Gender	Male	112	93.3
		Female	8	6.7
5	Work Experience (years)	Less than 1	4	3.3
		1 to 5	31	25.8
		6 to 10	14	11.7
		11 to 20	34	28.3
		More than 20	37	30.8
6	Organization Size (employees)	Less than 50	14	11.7
		51 to 100	9	7.5
		101 to 500	29	24.2
		501 to 1000	12	10.0
		More than 1000	56	46.7
7	Work Sector	Government sector	69	57.5
		Private sector	51	42.5
8	Does the organization have a quality management department?	Yes	109	90.8
		No	11	9.2
9	Does the organization possess single certificates for global management or accreditation certificates?	Yes	85	70.8
		No	25	20.8
		I don't know	10	8.3
10	Does the organization have a strategic plan in line with the Saudi Vision 2030?	Yes	85	70.8
		No	14	11.7
		I don't know	21	17.5

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