DELIVERING FOURTH INDUSTRIAL REVOLUTION-READY GRADUATES THROUGH QUALITY ASSURANCE: AN IMPACT STUDY

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ABSTRACT: This paper determined the impact of Quality Assurance (QA) in delivering fourth industrial revolution (4IR)-ready graduates with the technology, language and human skills, cultural readiness and ethical values. The study operates on a quantitative framework using a sample of 198 students of UPHSD-Calamba, with an achieved power of .99 for regression analysis of 10 predictor variables.

Results revealed that the re-engineering of the UPHSD direction and targets, learning facilitators, teaching-learning processes, learning resources, laboratory set-up, physical plant and facilities, services to the learners, community engagement and social actions, organization and administration, knowledge innovation and management positively affected the delivery of the skillsets for the 4IR. Furthermore, the increased QA preparations in the directions and targets, learning resources, services to the learners and knowledge innovation and management, and the higher levels of accreditation delivered 4IR-ready graduates. Based on these significant findings, the researcher recommends the charting of QA blueprints to align with the evolving workforce demands of the 4IR landscape.

KEYWORDS: Fourth industrial revolution, 4IR skillsets, quality assurance, Accreditation

I. INTRODUCTION

Statement of the Problem and Its Background

Quality Assurance (QA) systems have been integral part of Higher Education Institutions (HEIs) to ensure continuous quality improvement and eventually, fulfill its mission-vision. Philippine HEIs accept QA as a necessity and that it benefits all the stakeholders. The Commission on Higher Education (CHED) advocated this practice through the release of CMO 46, s. 2012. This order aimed at enhancing QA in the HEIs. The response for this call for ensuring quality in the academe has been highly positive. Since then, QA had been synonymous with accreditation among schools. The Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA) cites in its 2017 report that for the past year, it has surpassed the target number of accredited programs by an overwhelming margin of 285.60% accomplishment versus the target. During the year 2016-2017, there were a total of 714 programs visited from 309 schools for accreditation from the agency (PACUCOA Directory, 2017). This clearly highlights the commitment of the HEIs on the drive for external QA measures. The delivery of quality education translates to the production of quality graduates as outcomes. The thinking of the end in mind enables the institutions to prepare for the most anticipated and probable work demands. Thereby, making education relevant for the future employment landscape.

The employability of the graduates has been a major parameter for the success of HEIs. Towards this end, efforts have been made to objectively identify the required skillsets of the future. These then serve as bases in crafting rationally the current plans and projections. The Fourth Industrial Revolution (4IR) is on its full-swing. The labor market is characterized mainly by massive automation of operations, full digitization, an industrial internet of things (IIoT) platform for complex systems, and extensive use of Artificial Intelligence (AI) in the industries. Certainly, there is a shift of skillset requirements and that this is the inevitable context to which the graduates are expected to operate on. It is therefore imperative for the academe to produce graduates who possess 4IR-ready skillsets. Otherwise, the 4IR shall become a disruptive reality for both the HEIs and its graduates. Competency gaps may be better circumvented when the academe has (QA) systems that are closely grounded and aligned to the 4IR demands.

The University of Perpetual Help System-Dalta (UPHSD) is at the forefront of ensuring quality education through QA. It has been consistently acknowledged for its persistence toward higher levels of accreditation of its programs. IN 2018, UPHSD was awarded as the institution with the most number of level I programs in the Philippines (Calamba Campus), for being granted ISO 9001:2015 (Molino Campus), and for attaining Autonomous Status (Las-Pinas Campus). With the progress achieved in QA, it remains mindful of the emergent external demands due to the 4IR. The institution is ever bullish in innovating for the best possible responses to this. This prompted the researcher to conduct a study in determining the impact of QA preparedness to the 4IR on the quality of the graduates, considering the skills required for the future work landscape. Specifically, the study aimed to determine:

1. The level of QA of the programs of the institution;

2. The level of preparedness of the QA for the 4IR along the areas of:

    2.1   Philosophy and Objectives,

    2.2   Faculty,

    2.3   Instruction,

    2.4   Library,

    2.5   Laboratory,

    2.6   Physical Plant and Facilities,

    2.7   Student Personnel Services,

    2.8   Social Orientation and Community Involvement,

    2.9   Organization and Administration,

    2.10   Research.

3. The level of proficiency of the students along the following skillsets required for the 4IR:

    3.1   Cultural Readiness,

    3.2   Language Skills,

    3.3   Technology Skills,

    3.4   Human Skills,

    3.5   Well-being and Ethical Values.

4. The significant difference in the level of preparedness of the QA areas for the 4IR when they are grouped by QA levels;

5. The significant difference in the level of proficiency of the students for the skillsets of the 4IR when they are grouped by QA levels;

6. The significant relationship between the level of preparedness of QA areas and the proficiency level on the skillsets for the 4IR;

7. The impact of QA on the skillsets of the 4IR.

II. REVIEW OF RELATED LITERATURE AND STUDIES

Quality Assurance in HEIs

Higher Educational Institutions ensures delivery of quality services and outcomes through QA. These are two considerations and used as parameters in determining quality in the academe (Lundberg & Schreiner, 2004; Vincent, 1987). Although QA frameworks vary and the model which they follow, the improvement targeted on common areas such as learning content and pedagogy remains consistent (Puzziferro & Shelton, 2008). Regardless of how institutions define the broad concept of quality (Schindler et al., 2015), accreditation appears to be an agreed reflection of it (Harvey & Green, 1993). The trend in higher education is engagement in quality assurance reviews through the process of accreditation from external agencies. This is due to many factors such as the growing competition among HEIs in a nation, the regionalization of nations and mutual recognitions due

to globalization of education (CHEA, 2007). There are numerous regional accrediting agencies catering to different institutions which share a common goal of determining quality and effectiveness through assessment of compliance to certain standards (Eaton, 2011). Literatures provide diverse QA processes based on prevailing QA models being adhered to by accrediting agencies. Institutions subject themselves to certain agencies with aligned QA frameworks and considering other factors such as cultural sensitivity. Studies have been made to measure and ascertain the effectiveness of QA practices, also revealing success stories and struggles and recommending greater involvement of stakeholders (Ryan, 2015).

The Fourth Industrial Revolution

The 4IR offers opportunities and challenges to many industries. This poses concerns since the changes it caused can be considered as sweeping and dramatic, citing the increased presence and dependence on IToT, AI, digitization and massive automation which are deemed beneficial most especially to manufacturing industries (Of Technology and Transformation in the 4th Industrial Revolution, 2016). This phenomenon is a global concern which is why world leaders convened during the World Economic Forum and examined its implications with the aim of taking control over the concerns of 4IR. The issue is discussed along with other crucial global concerns of political, economic, social and environmental nature (Onyanga-Omara, 2016).

Skillsets for the 4IR

The demands of 4IR have direct impact on career experiences. Certain career development models have so far been forwarded to address this concern (Hirschi, 2018). The changes rooted from 4IR has been described as exponential that cut across every aspect of every individual. It may be a disruptive event which is why there is an immediate need to forecast the crucial future skillsets which may include language skills and intercultural communication and readiness (de Andrade Régio, et al., 2016). Aside from the obvious technological skills as necessary skillsets and the cultural considerations, it should also include ethical values and happiness of the workers of this industrial landscape. These additional skills are considered important especially in the light of the changing norms brought about by the 4IR (Lee, 2017). The combination of these skills promote in developing the total human person in adherence to the four pillars of learning which humanizes amidst a dehumanized context (Delors, 1996).

III.   CONCEPTUAL FRAMEWORK
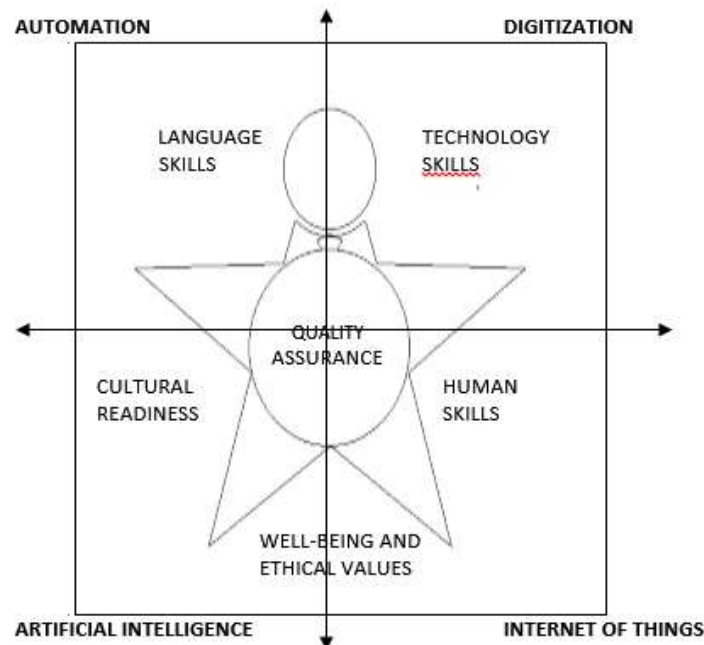
Figure 1.Development of Graduates for Skillsets of 4IR

The figure depicts the work-realities shaped by the 4IR, which is characterized by automation, digitization, AI and IIoT of the workplace. These serve as the contexts to which HEIs must proactively respond to in developing the learners. The academe must produce graduates equipped with the expected relevant skillsets of cultural readiness, human skills, technological skills, language skills, and well-being and ethical values. These are

anchored on the four pillars of learning as universal bases for development of skills (Delors, 1996). This humanist perspective in education stresses the need for the academe to develop the total person amidst the 4IR. QA, when placed at the core of the complex systems, may serve as a tool for HEIs towards realizing this. The more the institutions pursue higher QA levels (as signified by the direction of the arrows), the better they develop the skillsets of the students. Hence, the more they meet the demands of the 4IR work environment.

IV. METHODOLOGY

This quantitative study is conducted in the UPHSD-Calamba, with a sample of 198 students, selected randomly from the different programs of the institution of varying QA levels. The sample size may yield .99 statistical power, having 10 predictor variables for regression analysis. The respondents are mostly 1st and 4th year, and male students. The breakdown of respondents according to program is shown in Table A.

The instrument used was a researcher-made survey questionnaire which is composed of three parts. Part 1 is a checklist type question on the QA level through the program affiliation of the students. Part 2 contains the areas of QA where in the respondents rate its level of preparedness on a 4-point Likert-type scale ranging from low to high. The final part of the instrument is composed of 20 statements, which correspond to the five skillset areas (4 statements each). Responses are in 4-point Likert-type options ranging from not proficient to highly proficient. The instrument has attained face validity and very high internal consistency with reliability estimates (Chronbach's alpha coefficient) of .925.

In the analysis of quantitative data, the SPSS version 20 was utilized where: 1. the frequency and percent were used to describe the profile of the respondents and the level of QA of their programs, 2. the weighted mean was used to describe the level of preparedness of the QA areas of the programs and the level of proficiency of the students in the skillsets for the 4IR, 3. fractional ranking is made in determining the relative order in position of the set of indicators, 4. in determining the differences in the aforementioned variables, the ANOVA One-Way was used, 5. in determining the correlation among the variables, the bivariate correlation was used (Pearson r) and finally, in conducting the impact analysis, the multiple linear regression analysis was used.

Table A Frequency and Percent Distribution of the Respondents in Terms of Program Affiliation

Program/Degree	Frequency	Percent
BS Accountancy	1	.5
BS Architecture	6	3.0
BS Business Administration	9	4.5
BS Tourism	26	13.1
BS Civil Engineering	21	10.6
AB Communication	27	13.6
BS Criminology	33	16.7
BS Computer Engineering	7	3.5
BS Education	13	6.6
BS Electrical Engineering	4	2.0
BS Hotel and Restaurant Management	23	11.6
BS Industrial Engineering	3	1.5
BS Mechanical Engineering	9	4.5
BS Medical Technology	5	2.5
BS Pharmacy	1	.5
BS Psychology	7	3.5
BS Radiologic Technology	3	1.5

n=198

V.   FINDINGS OF THE STUDY

1.   QA Level

Table 1 Frequency and Percent Distribution of the Respondents in Terms of QA Level of the Program

QA Level	Frequency	Percent
Consultancy/Preliminary	41	20.7
Level 1	15	7.6
Level 2	142	71.7
n=198		

Most of the students belong to academic programs that have undergone formal visit for level II accreditation (71%). Some students belonged to academic programs with consultancy/preliminary status (20.7%) while only a few are in programs with Level I accredited status. The findings reveal that there has been a strong push towards higher levels of accreditation. It must be noted that during the previous year, most of the programs of the institution were granted level I status only. Findings indicate that most of these programs have already undergone level II visit, thereby increasing its QA level.

2.   Preparedness of the QA Areas

Table 2 Descriptive Statistics on the Level of Preparedness of the QA Areas for the 4IR

Areas	Mean	Interpretation	Rank
1. Philosophy and Objectives	3.16	Fair	2
2. Faculty	3.21	Fair	1
3. Instruction	3.12	Far	4
4. Library	3.03	Fair	9
5. Laboratory	3.05	Fair	8
6. Physical Plant and Facilities	2.98	Fair	10
7. Student Personnel Services	3.11	Far	3
8. Social Orientation and Community Involvement	3.08	Fair	5
9. Organization and Administration	3.06	Fair	6.5
10. Research	3.06	Fair	6.5
Total	**3.08**	**Fair**	

Legend: 1.00-1.49 (1) Low, 1.50-2.49 (2) Moderately Low, 2.50-3.49 (3) Fair, 3.50-4.00 (4) High; Sd=.517

It can be seen in table 2 that in general there is fair preparation of the areas of QA for the 4IR. Of these areas, the faculty is most prepared for the 4IR, followed by the preparation in the areas of philosophy and objectives, and student personnel services of the programs. Conversely, the respondents rated as least prepared the areas of physical plant and facilities, followed by library and laboratory.

3.   Proficiency on Skillsets of 4IR

Table 3.0 Summary Statistics on the Level of Proficiency of the Students for the Skillsets Required of the 4IR

Required Skillsets	Mean	Interpretation	Rank
Cultural Readiness	3.06	Fairly Proficient	3
Language Skills	3.10	Fairly Proficient	2
Technology Skills	2.96	Fairly Proficient	5
Human Skills	3.04	Fairly Proficient	4

Well Being and Ethical Values	3.13	Fairly Proficient	1
Over-all Mean	**3.06**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd= .466

Table 3.0 reveals that in general, the respondents are fairly proficient in the skillsets expected for the workforce of the 4IR (3.06). This is level of proficiency is consistent to all the skillset areas of cultural readiness, language skills, technology skills, human skills and well-being and ethical values. It appears that the students are most proficient in terms of well-being and ethical values while they are least proficient in terms of technological skills.

The results are consistent with the thrusts of the institution wherein values and ethical practices are given significant value and being inculcated in the system as evidenced by its guiding principle of "Helpers of God" and "Character-building is Nation-building". However, it may have to focus also on the development of the technology skills of the students, most especially that the workplace in the 4IR is highly characterized by technological advancements.

As shown in table 3.1, the respondents are fairly proficient in all the indicators of cultural readiness. They have the highest proficiency level in having positive attitudes and interests that are essential in communication with co-workers and clients of different cultures. However, they are least proficient in desiring to understand the cultures of others that may affect their perspectives on them.

Table 3.1 Descriptive Statistics on the Level of Proficiency of the Students for the Cultural Readiness Required of the 4IR

Cultural Readiness Skills	Mean	Interpretation	Rank
1. desiring to understand the other worlds with the aspiration to change own point of view	2.99	Fairly Proficient	4
2. mastering the formation of a cultural outlook towards an improvement of a society	3.02	Fairly Proficient	3
3. having positive attitude and interests that motivate intercultural communication	3.12	Fairly Proficient	1
4. considering cultural diversities in the use of new methods and technologies	3.09	Fairly Proficient	2
Over-all Mean	**3.06**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd= .506

Table 3.2 reveals that the respondents have fair levels of proficiency in the language skills of listening, speaking, reading and writing. It is worth noting that they have similar mean scores for listening skills, reading skills and writing skills (3.12) which indicates that the respondents are equally proficient in these areas. It may be said that their strengths in the language skills are along these areas. However, they are least proficient in their speaking skills (3.05).

Table 3.2 Descriptive Statistics on the Level of Proficiency of the Students for the Language Skills Required of the 4IR

Language Skills	Mean	Interpretation	Rank
1. Listening skills: comprehending language being spoken by others	3.12	Fairly Proficient	2
2. Speaking skills: producing correct and proper language through oral communication	3.05	Fairly Proficient	4
3. Reading skills: comprehend written knowledge	3.12	Fairly Proficient	2

4. Writing skills: produce written symbols that represent spoken languages.	3.12	Fairly Proficient	2
Over-all Mean	**3.10**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd=.56418

The institution has strengthened its support structures for the improvement skills through the establishment of the language center. Diagnostic measures and interventions through partnerships with agencies specialized to deliver TOIEC examinations and remediation on the noted weaknesses in the language skills in reading and listening of both the faculty and students are being implemented. These are made in recognition of the reinforced need for language skills development for the future world of work.

Table 3.3 Descriptive Statistics on the Level of Proficiency of the Students for the Technology Skills Required of the 4IR

Technology Skills	Mean	Interpretation	Rank
1. Working in automated environments	3.02	Fairly Proficient	1
2. Handling complex systems through an internet of things	2.99	Fairly Proficient	2
3. Performing digitized transactions that cuts across physical boundaries.	2.95	Fairly Proficient	3
4. Manipulating Artificial Intelligence (AI) driven work operations.	2.89	Fairly Proficient	4
Over-all Mean	**2.96**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd=.549

As shown in table 3.3, the respondents are fairly proficient in all the indicators of technology skills. It can be said that the respondents are most proficient in working with automated work environments while they are least proficient in performing work which may require manipulation of AI. The institution has already tailor-fitted the curriculum and other academic structures that support learning for highly automated work environments. Simulation laboratories and linking with partner industries have been strengthened to immerse the students to the technology at work. However, the operations involving artificial intelligence may not have been fully practiced and simulated by the students.

Table3.4 Descriptive Statistics on the Level of Proficiency of the Students for the Human Skills Required of the 4IR

Human Skills	Mean	Interpretation	Rank
1. Conducting scientific inquiry	2.90	Fairly Proficient	4
2. Interacting with others with passion/emotion	3.07	Fairly Proficient	3
3. Creating new knowledge/ideas and products	3.11	Fairly Proficient	1
4. Performing complex tasks with physical flexibility and mobility	3.08	Fairly Proficient	2
Over-all Mean	**3.04**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd=.503

Table 3.4 reveals that the respondents have fair level of proficiency in all the indicators of human skills. Furthermore, the human skill to create knowledge and outputs is considered as the strength of the respondents. On the other hand, they may need to improve on the skill to conduct scientific inquiry. The human component is

still irreplaceable in the workplace of the future, highlighting the human capabilities beyond the limitations of the machines.

Table 3.5 Descriptive Statistics on the Level of Proficiency of the Students for the Well-being and Ethical Values Required of the 4IR

Well-being and Ethical Values	Mean	Interpretation	Rank
1. Being in a state of comfort and contentment in diverse conditions	3.09	Fairly Proficient	3
2. Balancing members' needs against the needs of the society to maintain harmony	3.08	Fairly Proficient	4
3. Understanding of the cultural practices and values being upheld by other cultures	3.14	Fairly Proficient	2
4. Maintaining a moral principle that distinguishes acceptable and unacceptable behavior.	3.21	Fairly Proficient	1
Over-all Mean	**3.13**	**Fairly Proficient**	

Legend: 1.00-1.49 (1) Not Proficient, 1.50-2.49 (2) Moderately Proficient, 2.50-3.49 (3) Fairly Proficient, 3.50-4.00 (4) Highly Proficient
Sd= .528

Table 3.5 reveals that the respondents have consistently fair levels of proficiency in the indicators of well-being and ethical values as required skills for the 4IR. Specifically, they are most proficient at maintaining a moral principle for them to ascertain ethical behaviors. However, they are least proficient keeping a balance between their own needs and the needs of others to maintain a harmonious relationship.

4. Differences in the Preparedness of QA Areas

Table 4.0 Analysis of Variance in Over-all Preparedness of the QA Areas by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	6.975	2	3.487	14.904	.000
preparedness	Within Groups	45.627	195	.234		
	Total	52.601	197			

There were significant differences in the level of preparedness of the QA areas of the programs at p<.05 level for the three QA levels [F (2, 195) = 14.904, p=.000]. Post-hoc analysis using Duncan revealed that the mean scores of preparedness of the programs of consultancy/preliminary level (Mean=2.71) is significantly different compared to those of programs with level 1 (Mean=3.18) and 2 (Mean=3.18). Results suggest that the students whose programs are either in Level I or Level II status have significantly better preparedness in the areas of QA for the 4IR. This clearly points out the value of attaining higher levels of QA for preparing the institution and its academic programs toward the 4IR.

5. Differences in the Proficiency of Skillsets

Table 5.0 Analysis of Variance in Over-all Proficiency of Required Skillsets by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	4.237	2	2.119	10.741	.000
General readiness for alignment	Within Groups	38.466	195	.197		
	Total	42.703	197			

There were significant differences in the over-all level of proficiency of required skillsets for the 4IR at p<.05 level for the three QA levels [F(2, 195) = 10.741, p=.000]. Post-hoc analysis using Duncan revealed that the mean scores of over-all level of proficiency of consultancy/preliminary level (Mean=2.77) is significantly different compared to those of programs with level 1 (Mean=3.11) and 2 (Mean=3.13). It can be aid that the

over-all level of proficiency of the students whose programs have been evaluated for levels I and II accreditation is significantly better than compared to those whose programs are still in the consultancy and preliminary levels. This highlights the value of attaining higher levels of accreditation in the development of higher level proficiencies in the skillsets that are required for the 4IR.

Table 5.1 Analysis of Variance in Proficiency of Required Skillsets in terms of Cultural Readiness by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	3.913	2	1.956	8.209	.000
cultural readiness	Within Groups	46.476	195	.238		
	Total	50.389	197			

There were significant differences in the level of proficiency of required skillsets for the 4IR in terms of cultural readiness at p<.05 level for the three QA levels [F(2, 195) = 8.209, p=.000]. Post-hoc analysis using Duncan revealed that the mean scores of cultural readiness of consultancy/preliminary level (Mean=2.78) is significantly different compared to those of programs with level 1 (Mean=3.13) and 2 (Mean=3.13). The results are consistent with the over-all proficiency level and that those respondents whose programs have attained levels I and II accreditation have better cultural readiness skills compared to those under consultancy and preliminary programs.

Table 5.2 Analysis of Variance in Proficiency of Required Skillsets in terms of Language Skills by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	4.095	2	2.048	6.813	.001
language skills	Within Groups	58.609	195	.301		
	Total	62.705	197			

There were significant differences in the level of proficiency of required skillsets for the 4IR in terms of language skills at p<.05 level for the three QA levels [F(2, 195) = 6.813, p=.001]. Post-hoc analysis using Duncan revealed that the mean scores of language skills of consultancy/preliminary level (Mean=2.81) is significantly different compared to those of programs with level 1 (Mean=3.17) and 2 (Mean=3.17). This points out that those students belonging to programs with levels I and II in accreditation have better proficiency in speaking, listening, reading and writing skills compared to those under the programs with consultancy and preliminary levels.

Table 5.3 Analysis of Variance in Proficiency of Required Skillsets in terms of Technology Skills by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	6.692	2	3.346	12.375	.000
technology skills	Within Groups	52.730	195	.270		
	Total	59.422	197			

There were significant differences in the level of proficiency of required skillsets for the 4IR in terms of technology skills at p<.05 level for the three QA levels [F(2, 195) = 12.375, p=.000]. Post-hoc analysis using Duncan revealed that the mean scores of technology skills of consultancy/preliminary level (Mean=2.60) is significantly different compared to those of programs with level 1 (Mean=3.06) and 2 (Mean=3.07). Similar to the results in the over-all proficiency level and other specific skillsets, the respondents whose programs are in the levels I and II of Accreditation have better proficiency in technological skills compared to those whose programs are in either consultancy/preliminary levels.

Table 5.4 Analysis of Variance in Proficiency of Required Skillsets in terms of Human Skills by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	3.952	2	1.976	8.398	.000
human skills	Within Groups	45.889	195	.235		
	Total	49.841	197			

There were significant differences in the level of proficiency of required skillsets for the 4IR in terms of human skills at p<.05 level for the three QA levels [F(2, 195) = 8.398, p=.000]. Post-hoc analysis using Duncan revealed that the mean scores of human skills of consultancy/preliminary level (Mean=2.77) is significantly different compared only to those of programs with level 2 (Mean=3.12).The results suggest that only those respondents whose programs have been evaluated for the level II of accreditation have better human skills compared to those whose programs have consultancy and preliminary levels.

Table 5.5 shows that there were significant differences in the level of proficiency of required skillsets for the 4IR in terms of well-being and ethical values at p<.05 level for the three QA levels [F(2, 195) = 5.833, p=.003].

Table 5.5 Analysis of Variance in Proficiency of Required Skillsets in terms of Well-being and Ethical Values by QA Level

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	3.096	2	1.548	5.833	.003
well-being and ethical values	Within Groups	51.745	195	.265		
	Total	54.841	197			

Post-hoc analysis using Duncan revealed that the mean scores of well-being and ethical values of consultancy/preliminary level (Mean=2.88) is significantly different compared to those of programs with level 1 (Mean=3.19) and level 2 (Mean= 3.20). The findings indicate that the students whose programs have levels I and II accreditation status have better well-being and ethical values skillsets compared to those students under consultancy and preliminary accreditation levels.

6. Preparedness of QA and Skillsets of 4IR

Table 6 Correlations between QA Level and Preparedness on Profiency of Skillsets

Skillsets	QA level	QA Preparedness
cultural readiness	.263**	.724**
language skills	.243**	.675**
technology skills	.316**	.713**
human skills	.280**	.703**
well-being and ethical values	.224**	.661**
Over-all Proficiency	**.302****	**.791****

n=198, **p<.01

Table 6 reveals that there is a significant relationship between the QA levels of the programs to the proficiency level of the students on the skillsets required for the 4IR since the p-values are all lesser than the .01 level of significance. Furthermore, the relationships are described as moderate positive (r=.302). This implies that there is a moderate tendency that when the QA level of a program increases, the over-all proficiency of the students on the skillsets required for the 4IR also increases. This is similar with the specific skill of technology skills (r=.316). However the relationship is only weak positive to the skillsets of cultural readiness (r=.263), language skills (.243), human skills (.280) and well-being and ethical values (.224). It can be said that there is a weak tendency that when the QA level of a program increases, the profiency level on the required skillsets in these areas for the 4IR also increases.

Furthermore, the over-all profiency level is very strongly related to the level of preparedness of QA areas for the 4IR (r=.791). This indicates that there is a very strong tendency that when the level of preparedness of the QA areas increases, the proficiency level on the skillsets required for the 4IR also increases. This kind of relationship is also true to the specific skillsets of cultural readiness (.724), technology skills (.713) and human skills (.703) whereas strong positive relationships exists between the level of QA preparedness and the specific skillsets of language skills (.675) and well-being and ethical values (.661).

The results suggest that the level of proficiency of the students on the skillsets required for the 4IR may possibly be improved by increasing the preparedness of the areas of QA of the programs and achieving higher levels of accreditation.

7. Impact of QA on Skillsets for 4IR

Regression analysis, as shown in table 7, reveal that the preparedness of QA for the 4IR can be attributed to 64% change in the proficiency of the students on the skillsets required. Among the areas of QA, only the preparedness in the areas Philosophy and Objectives (.202), Library (.173), Student Personnel Services (.145) and Research (.198) significantly influence the level of proficiency of the students for the skillsets of the 4IR.

Table 7 Regression Analysis of QA on Skillsets

	B	Std. Error	Beta
Philosophy and Objectives	.155	.047	.202*
Faculty	.049	.044	.065
Instruction	.005	.045	.006
Library	.094	.034	.173*
Laboratory	.045	.040	.073
Physical Plant and Facilities	.084	.044	.121
Student Personnel Services	.099	.037	.145*
Social Orientation and Community Involvement	-.003	.051	-.004
Organization and Administration	.065	.049	.096
Research	.133	.043	.198*

Note: R^2=.644, F(187, 33.826), p=.000

Dependent Variable: Proficiency of Skillsets

Furthermore, the preparedness of the Research area for the 4IR has the greatest impact on the proficiency of the students for its required skillsets. It can be inferred that a unit increase in the research preparedness accounts to .198 unit increase in the proficiency level of the students for the 4IR. Therefore, the increased preparedness of the QA areas and having higher levels of accreditation have positive impacts on the students' proficiency level on the skillsets required for the 4IR.

VI. CONCLUSIONS

The following conclusions can be deduced from the findings of the study:

1. That the UPHSD has consistently pushed for higher levels of accreditation of its academic programs, as a QA mechanism, to ensure continual improvement.
2. That the UPHSD academic programs has prepared its directions and targets,learning facilitators, teaching-learning processes, learning resources,laboratory set-up,physical plant and facilities,services to the learners,community engagement and social actions,organization and administration,and knowledge innovation and management to meet the emergent demands of the 4IR.
3. That the UPHSD has delivered and developed 4IR-ready workforce with the cultural readiness, language skills, technology skills, human skills and well-being and ethical values.
4. That the attainment of higher levels of QA through accreditation of UPHSD helped the institution be more prepared towards the 4IR.

5. That the attainment of higher levels of QA through accreditation of UPHSD is crucial in the delivery of the skillsets for the 4IR.
6. That the re-engineering of the UPHSD direction and targets, learning facilitators, teaching-learning processes, learning resources, laboratory set-up, physical plant and facilities, services to the learners, community engagement and social actions, organization and administration, knowledge innovation and management positively affected the delivery of the skillsets for the 4IR.
7. That the increased QA preparations in the directions and targets, learning resources, services to the learners and knowledge innovation and management, and the higher levels of accreditation deliver fourth industrial revolution-ready graduates.

VII. RECOMMENDATIONS

Based on the aforementioned conclusions of the study, the following are hereby recommended:

1. Sustain the momentum towards higher levels of accreditation and reinforce with other QA mechanisms.
2. Devise long-term strategic institutional and departmental plans with 4IR-ready graduates as among the intended outcomes in collaboration for industry partners.
3. Develop sustainable programs aimed at identifying the areas of improvement and enhancement of the skillsets required for the future workforce.
4. Customize the QA preparations in context of the demands of the 4IR.
5. Widen and deepen the commitment for QA by increasing the number of programs for higher levels of accreditation.
6. Chart the QA blueprints to align with the evolving workforce demands of the 4IR landscape.
7. Develop plans to focus on enhancing the key QA areas of philosophy and objectives, library, and research to aid in delivering quality graduates who are relevant to world of work.
8. Comparative studies may be conducted within the system and with other HEIs of different nature, which may include other QA mechanisms as variables.

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