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Validation of Employers Views on Soft and Hard Job Skills of Nigeria Polytechnic Construction Graduates

Shirka Kassam Jwasshaka [1*], Nor Fadila Amin [2], Adibah Abdul Latif[3]

[1] *School of Technical Education, Plateau State Polytechnic, Barkin Ladi, Nigeria*
[2,3] *School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia*

*Corresponding author: cassak4real@yahoo.ca

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ABSTRACT

In a perfectly competitive labour market, the demand for skills is the duty of employers to supply the necessary skills. Knowledge and abilities of graduate competencies should represent the needs of the industry. Such qualities include both academic and generic skills in their chosen professions needed for work. To prepare completely for the unpredicted and ever-changing nature of the workplace, graduates need a range of skills specific to labour-employers. The aim of this pilot study is to identify whether the polytechnic building graduates have the right job skills from the perspective of employers. The cross-sectional survey was adopted to select 60 experts who responded to 169 items questionnaire, purposeful sampling technique was used. The items comprised of components of both hard and soft job skills. Inferential statistics and Rasch measurement model were used to analyse construct reliability and to determine fit statistics, point measurement correlation and standard residual. The result showed that the validity of the instrument's contents values was almost perfectly accepted. In addition, employers were unanimous in their views on the essentials of hard and soft skills in establishing a competency framework. The feasibility study will have a huge impact on researchers as it will direct them in carrying out the main analysis relating to the development of competences for employment.

Introduction

Scholars have recognized that new skills will emerge in a changing world, in particular with the advent of the Fourth Industrial Revolution [4IR] (Kafai & Peppler, 2011; Teixeira & Davey, 2010). Therefore, Stewart (2016), Dunbar, and Wynder (2016); Walker, and Roberts (2015); and Adrian (2014) have tried to divide competencies into two categories namely hard and soft competencies. Hard skills are those related to the technical aspects of knowledge acquired in order to perform a specific task, while soft skills are those relevant to personal contact which in essence are behavioural (Matsouka, (2016). There has been a paradigm shift over the years to equipping workers with the appropriate hard and soft skills, and this can only be done successfully if employers are involved in the process. Blaquière, Nolan and Wray (2019) discover that employability needs to be regarded more holistically as continuous, life-long, situated learning. It is important to have a clear image of skill

requirements from experts alongside other best practices for successful skills framework. Neglect to employers' feedback in providing the skills required for productivity has negatively grievous consequences because it will contribute to widening the skill gap in Nigeria's construction industry. According to Winterbotham *et al*. (2018), a number of people and personal skills and the lack of technical and practical skills among applicants caused skill-shortage vacancies.

The integral part of efficient and productive workforce participation is the quality of hard and soft skills, individual possessed. Enterprises are constantly demanding for employability skills, and as a result, learners and applicants need to know what these skills are and how they can be learned (Thomasson, Cleary & Flynn, 2006). Awareness of these skills can help students focus on and prove that they are not only technically qualified, but also have the skills needed to obtain and sustain successful employment. However, this feasibility study is not a systematic guide to the development of competencies, but rather an aid to the comprehension and incorporation of employability skills into training and evaluation practices.

Evoh and Agu, (2015) and International Labor Organization, (2013) Notes that factors leading to unemployment among graduates are inefficient nations curriculum contents which do not meet the needs of the teaming applicants. The report added that higher institutions produce graduates lacking in basic skills required by the labor-force. For this reason, Nigeria tertiary education curriculum content is perceived to have lacks elements of entrepreneurial skills that should allow graduates to become employers than workers, job seekers, unemployed, and so on.

The key challenge is to increase training institutions' sensitivity to labor market demands as a way of bridging the skills gap (Wheelahan & Moodie, 2016). Since there is a growing need for skilled graduates by public and private employers (Pang, Wong, & Coombes, 2019). Employer voice is vital to any discussion of employability skills because they are the ones that employ the graduates, and are often a source of feedback about the inefficiency in the skills set for their new employees (Herrnstein et al., 2012). A collaboration of learning institution with employers offers vital access to the skills and ideas needed by graduates in order to become active members of their societies and to lead a fuller life. It is therefore necessary for educators to provide graduates with soft skills in addition to the conventional technical skills in their program of learning. Industry professionals' value soft skills and it will be important to prepare graduates to become industry ready graduates in a competitive job environment (Walker et al., 2015).

Fortune, et al. (2019) conducted a research to examine how professional skilled labor acts as the basis for increasing productivity in the construction industry in Nigeria. The results outlined basic skill categories missing in the construction industry to include; professionals such as; architects, engineers, craftsmen and traders, tilers, machines / equipment operators. The study recommended recognition of the need for further enrolment in TVET courses, enhancing opportunities for professional construction industry

workers to increase efficiency in order to prevent attrition. Similarly, a study conducted to investigate the current condition of the skilled workforce of the construction industry, impact of skilled labour shortages on the delivery of construction projects in Edo state Nigeria's construction industry by Oseghale, Abiola-Falemu, and Oseghale, (2015) the results showed that the key factors responsible for skill shortages include: no clear career path, high turnover of staff and low salaries. Moreover, the study found that construction firms do not allow their skilled employees for training and retraining.

Currently, Nigeria's construction industry is experiencing skill shortages as the old hands age and retire, the apprenticeship system is obsolete and unstructured; graduates lack the skills required by employers (Fortune, et al. 2019). Building construction site is a complex one where people of different backgrounds, culture, race and attitudes work, therefore, managers of such sites needs competency both in hard and soft skills in order to succeed. The key source of quality construction production is skilled labour, so the quantity and quality of skilled workers in the construction industry should not be compromised because it could have a significant effect on construction industry (Odusami & Oyediran, 2015) in (Fortune, et al. 2019). Training institutions have to play a vital role to provide the skills demanded by employers, if not, labour ineffectiveness may persist because individuals who desire to acquire these skills may only waste time and resources in skills that do not give necessary or relevant training, in line with their employment choices. Therefore, this study hoped to provide reliable and legitimate skills that employers require graduates to possess for jobs and efficient results in the construction industry. One technique to determine a broad range of reliability of the constructs under study is by adopting Rasch measurement (Boone & Noltemeyer, 2017) .

Rasch measurement model measures both respondent separation, item reliability, and ensures that there is no other secondary dimension to the measurement other than the model. Rasch is appropriate for adoption because measurement of reliability and validity is comprehensive in testing both items and persons. Rasch model is able to provide accurate, technically sound, and reliable information to researchers for decision-making in all circumstances (Boone & Noltemeyer, 2017). Additionally, it provides precise results when assessing the individual's basic competencies, correct items and person measurements in terms of expertise, skills, abilities or output are obtained via Rasch measurement model.

The calibration of both items and respondents during Winstep analysis represents the unique features of the Rasch measuring model and has an advantage over other measuring models Johanson and Brooks, (2010); Viechtbauer et al., (2020) recommends sample size between 10-40 as adequate for feasibility study. Linacre, (2015) suggests a sample of thirty (30) respondents as appropriate for general purposes. This study however uses 60 respondents because adequate sample and item produce a good item, person separation and reliability in Rasch measurement (Fisher, Elbaum, & Coulter, 2010).

Research Methods

The study employed a cross-sectional survey research design using questionnaire to elicit information; and to draw inferences from experts views, about soft and hard skills in the field of building construction. The instrument adopted 5-point Likert scale where the respondents were required to respond on the importance of the constructs to the employers. The instrument consisted of Part 'A' and Part 'B'. Part 'A' consists of demographic information while Part 'B' constituted the constructs and sub-constructs under study. The instrument which consisted of 169 items was subjected to validation by three experts, from private, public and academia. WINSTEP software version 3.72.3 was used to provide information about the worthwhile of the items and person about the elements of the sub-constructs to be measured. Table 1 below shows the specific sub-constructs for building hard and soft skills obtained by need assessment and from literatures.

Table1 hard and soft skills constructs

Hard Skills Constructs	Soft Skills Constructs
Plumbing Skills	Communication skills
Tiling Skills	Composure
Carpentry/Joinery Skills	Self-discipline
Bricklaying and Block laying Skills	Collaboration
Concreting Skills	Leadership/Teamwork Skills
Plastering Skills	Problem Solving Skills
Blueprint/Drawing/Specifications	Interpersonal relationship Skills
Roofing Skills	Innovation Skills
Scaffolding skills	Observant of Safety issues
Site Preparation skills	Site Management Skills
Setting out skills	
Estimating and Scheduling Skills	
Maintenance and Repairs Skills	
Painting and decoration	
Iron Bending Skills	
Domestic Electrical Installation	
Welding skills	

Accordingly, 60 experts from the academy, employers from the public and private sectors in Bauchi state of north eastern zone of Nigeria, were purposively selected to respond to the survey instrument in order to determine whether the quantitative instrument would produce the anticipated results, in line with the Rasch measurement model indices.

The data was subjected to fit statistics to ensure that all negative Point Measure Correlation (PTMEA Corr.) values were eliminated; Point Measure Correlation (PMC) indicates the strength of items in construct measurement. The items were run severally until all point measure correlation were all of positive values. Linacre suggested that item with PMC below 0.4 and more than 0.8 is to be omitted. Afterwards INFIT Mean Square was treated to detect and eliminate extreme values. According to Rashidi, Begum, Mokhtar, and Pereira, (2014), tendency to identify misfit data is one of the important principles of the Rasch measurement model. Included during the observed fit statistical key element were

INFIT, OUTFIT Mean Square (MNSQ), standardized mean score (ZSTD), standard residual value.

This research adopted the appropriate fit order between 0.5 logit and 1.5 logit for both fit indices, i.e., INFIT and OUTFIT mean-square (MNSQ) while Z-score (ZSTD) with a range between -2 logit and + 2 logit, as indicated by Intisar, et al (2016). According to Salzberger (2015), log-residual fit statistics testing within the range from -2.5 logit to + 2.5 logit is generally appropriate.

The total of hard skill sub constructs was 19 with 104 items, and 13 soft skills with 85 items, but during validation by experts, two hard and three soft skills sub constructs were dropped. Therefore, a total of 27 constructs were subjected to analysis in the feasibility study, after which analysis for each group of items under hard and soft skills sub constructs was carried out.

The indices considered for the feasibility study in line with Rasch Measurement Model were; person and item separation, reliability, Standard residual in eigenvalue, and variable map. Rasch Measurements Model calibrates person and item separation in logit, in other words it shows level of difficulty of the instrument and categorization of person's ability on a scale. Person reliability can be interpreted the same way with the conventional reliability index of classical theory (KR-20) and Cronbach's alpha according to the WINSTEP Manual (Linacre, 2012). Boone, Yale, and Staver, (2014) Suggests using the real reliability index for research conducted in the field of education, medicine and marketing using Rasch because the value gives more precise estimate of the person and item separation and reliability.

Results and Discussion

Analysis for 27 Hard and Soft Skill Sub Constructs

From the statistical summary of the result in Table 2, person separation of 3.19 logit shows that the entire 27 competency sub-constructs were able to separate the persons into 3 levels of ability and into up to 3 groups of difficulty with item separation of 2.86 in this case into 'Novice' 'Advance beginner', 'Competent', and 'proficient'. Also, the value for person and items reliability were 0.91 and 0.89 respectively which is above benchmark of 0.60 (Fisher, Elbaum, & Coulter, 2010). This indicates that the sample and items were sufficient. The high score of 0.94 reliability value for Cronbach Alpha means that the entire instrument is reliable. Table 2 shows the Winstep out-put table of the statistical summary of the 27 hard and soft skills sub-constructs.

Table 2 *Winstep Output table for 27 hard and soft skills sub constructs*

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	112.7	26.9	2.28	.31	.98	.0	.98	.0
S.D.	13.5	.2	1.10	.05	.20	.8	.20	.7
MAX.	130.0	27.0	4.19	.48	1.37	1.4	1.31	1.2
MIN.	59.0	26.0	-1.48	.24	.61	-1.7	.61	-1.6

```
| REAL RMSE    .33 TRUE SD    1.05 SEPARATION 3.19 PERSON RELIABILITY .91     |
|MODEL RMSE    .32 TRUE SD    1.05 SEPARATION 3.31 PERSON RELIABILITY .92     |
| S.E. OF PERSON MEAN = .18                                                   |
-------------------------------------------------------------------------------
                          DELETED:     23 PERSON
                PERSON RAW SCORE-TO-MEASURE CORRELATION = .98
        CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .94

                          SUMMARY OF 27 MEASURED ITEM
-------------------------------------------------------------------------------
|          TOTAL                          MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE    ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     154.4      36.9         .00      .27       .97     .0    .98     .0 |
| S.D.      12.0        .3         .84      .05       .17     .7    .16     .6 |
| MAX.     180.0      37.0        1.31      .51      1.40    1.8   1.41    1.7 |
| MIN.     132.0      36.0       -2.55      .23       .53   -2.2    .61   -1.3 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .28 TRUE SD     .79 SEPARATION 2.86 ITEM   RELIABILITY .89     |
|MODEL RMSE    .27 TRUE SD     .80 SEPARATION 2.93 ITEM   RELIABILITY .90     |
| S.E. OF ITEM MEAN = .17                                                     |
-------------------------------------------------------------------------------
```

Fit Statistics for 27 Hard and Soft Skills Sub-constructs

In addition, fit statistics show a good INFIT and OUTFIT mean square MNSQ with no extreme value, whereas the point measure correlation PTMEA were all positive with values within the acceptable index ranging from .54 to.64. This is an indication that the item is fit in measuring the construct based on the model. Similarly, the raw variance explained by measure with empirical value 46.9% and model value 46.4% above 40% index indicates that the items are sufficient in explaining the dimension. The result of the 27 sub-constructs also show the eigenvalue of 4.2 with empirical value of 8.2% less than 15% recommended threshold indicates that there is no any obvious secondary dimension measured by Rasch. The result in Table 3 shows the fit statistics of the entire hard and soft skill sub-constructs. All the sub-constructs show acceptable values, therefore found essential to make up the contents of a competency framework.

Table 3 *Fit Statistics for the Entire 27 Hard and Soft Skills*

Entry Number	INFIT MNSQ	OUTFIT MNSQ	PTMEA CORR	ITEM ID
6	1.40	1.41	.62	TBB6
26	1.20	1.00	.57	NTSF9
24	.99	1.17	.60	NTIR7
2	1.15	1.13	.64	TE2
23	1.15	1.12	.57	NTPS6
18	1.08	1.13	.61	NTC1
21	1.09	1.13	.59	NTCL4
8	1.12	1.10	.63	TPL8
7	1.11	1.08	.61	TCC7
10	1.06	1.04	.64	TRS10
22	.92	1.05	.54	NTL5
11	.97	1.02	.60	TSC11
3	1.01	.98	.64	TT3
4	.99	.91	.61	TW4
17	.94	.97	.60	TIB17

12	.96	.93	.54	TSP12
1	.94	.94	.64	TP1
5	.94	.92	.59	TCP5
9	.94	.94	.63	TD9
15	.93	.94	.64	TMT15
16	.92	.89	.62	TPD16
19	.84	.89	.61	NTCP2
25	.82	.85	.57	NTIN8
13	.82	.81	.60	TSO13
14	.77	.77	.62	TES14
27	.72	.67	.46	NTM10
20	.53	.61	.56	NTSD3
Raw variance explained by measures = 46.9% >40%				
Unexplained variance in 1st contrast in eigenvalue = 4.2 8.2% < 15%				

Person and Item Separation for Hard Skills Sub constructs

Table 4 shows the output for individual reliability and item separation index for 17 hard skill sub-constructs based on analysis using the Winstep. The reliability of the individual and the reliability of the items was found to be very high at 0.84 and 0.89 respectively. Any reliability value that is closed to 1 is deemed internally consistent (Oon et al., 2016). This suggests that the items were supposedly as necessary to measure constructs. While the separation index less than 2 logit validate the 2.0 logit index, indicated by (Linacre, 2013). The separation index of the person refers to the spread of all respondents along a continuum line based on a pleasing aspect. While separation of items represents the ability to group the respondents. As a result, up to three distinguished groups of respondents were based on their level of competence. Table 4 show the Winstep output table for person and item separation.

Table 4 *Winstep Output table for person and item separation for 17 Hard Skills Sub-constructs*

INPUT: 60 PERSON 17 ITEM REPORTED: 27 PERSON 17 ITEM 4 CATS WINSTEPS 3.72.3

SUMMARY OF 27 MEASURED PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	70.3	17.0	1.74	.41	.97	.0	.98	.0
S.D.	6.8	.2	1.07	.05	.27	.8	.26	.7
MAX.	81.0	17.0	3.65	.56	1.41	1.2	1.41	1.2
MIN.	55.0	16.0	-.52	.37	.50	-1.6	.56	-1.2

REAL RMSE .43 TRUE SD .98 SEPARATION 2.26 PERSON RELIABILITY .84
MODEL RMSE .41 TRUE SD .99 SEPARATION 2.39 PERSON RELIABILITY .85
S.E. OF PERSON MEAN = .21

DELETED: 33 PERSON
PERSON RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .85

SUMMARY OF 17 MEASURED ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	111.7	26.9	.00	.33	.98	.0	.98	.0
S.D.	9.7	.2	1.05	.07	.24	1.0	.32	1.1
MAX.	132.0	27.0	1.42	.62	1.32	1.2	1.49	1.4
MIN.	97.0	26.0	-2.88	.29	.55	-2.0	.49	-2.0

```
|-------------------------------------------------------------------------------|
  | REAL RMSE    .35 TRUE SD     .99 SEPARATION 2.79 ITEM   RELIABILITY .89 |
  |MODEL RMSE    .34 TRUE SD     .99 SEPARATION 2.92 ITEM   RELIABILITY .89 |
| S.E. OF ITEM MEAN = .26                                                     |
-------------------------------------------------------------------------------
```

FIT STATISTICS FOR HARD SKILLS SUB CONSTRUCTS

The fit statistics indicated both INFIT and OUTFIT mean square has no extreme values which is the evidence of sufficient data, furthermore the principal component analysis indicated that the measurement was in one direction [one-dimensional]. Consequently, the observed variance explained by the measure was 45.4%, higher than the 40% benchmark. In the first contrast, the unexplained variance was 9.3 % [Eigenvalue: 2.9] and less than the variance explained by the items. Those values represent acceptable evidence for uni-dimensionality for the purposes of this study. Table 5 shows the fit statistics for hard skills sub constructs, and standard residual values.

Table 5 *Fit Statistics for Hard Skills*

Entry Number	INFIT MNSQ	OUTFIT MNSQ	PTMEA CORR	ITEM ID
7	1.32	1.49	.52	TCC7
17	1.12	1.49	.51	TIB17
11	1.31	1.34	.52	TSC11
6	1.31	1.33	.58	TBB6
2	1.31	1.32	.59	TE2
8	1.08	1.10	.57	TPL8
13	1.08	1.04	.53	TSO13
16	1.07	1.03	.58	TPD16
14	1.01	.98	.57	TES14
4	.96	.81	.53	TW4
5	.92	.67	.49	TCP5
10	.86	.86	.59	TRS10
1	.82	.81	.59	TP1
12	.73	.49	.45	TSP12
3	.71	.71	.58	TT3
15	.58	.58	.59	TMT15
9	.55	.55	.59	TD9
Raw variance explained by measures = 45.4% >40%				
Unexplained variance in 1st contrast in eigenvalue = 2.9, 9.3%<15%				

Person and Item Separation for Soft Skills Sub-Constructs

The reliability of the item was found at a good 0.81 rate, with a separation index of 2.10 logit. The separation of items distributes the items along the interval scale. Any low value for separating items indicates poor division of items which is low reliability. More respondents are needed to overcome this issue so the reliability value can be increased. All values match the Good Measurement criterion. In the measure of constructs, it has a high probability value which is due to the number of samples. As the sample increases, the reliability value that indicates the instrument is stable increases (Arasinah, Bakar, Ramlah,

Soaib, & Zaliza, 2015; cited in Maat & Rosli, 2016). Table 6 shows the Winstep output table for person and Items separation.

Table 6 *Winstep output table for Soft skills sub constructs*

```
INPUT: 60 PERSON  10 ITEM REPORTED: 27 PERSON  10 ITEM  3 CATS WINSTEPS 3.72.3
-------------------------------------------------------------------------------
                SUMMARY OF 26 MEASURED (NON-EXTREME) PERSON
-------------------------------------------------------------------------------
|          TOTAL                          MODEL          INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE    ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      44.5      10.0        1.61      .66       .99     .1    .92     .1 |
| S.D.       3.0         .0        1.17      .14       .23     .5    .27     .5 |
| MAX.      49.0      10.0        3.82     1.06      1.44    1.1   1.39    1.0 |
| MIN.      38.0      10.0        -.58      .55       .60   -1.0    .51    -.7 |
|-----------------------------------------------------------------------------|
  | REAL RMSE    .69 TRUE SD     .94 SEPARATION 1.35 PERSON RELIABILITY .65 |
  |MODEL RMSE    .67 TRUE SD     .95 SEPARATION 1.42 PERSON RELIABILITY .67 |
| S.E. OF PERSON MEAN = .23                                                   |
-------------------------------------------------------------------------------
                    MAXIMUM EXTREME SCORE:      1 PERSON
                            DELETED:     33 PERSON

        CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .72
                SUMMARY OF 10 MEASURED (NON-EXTREME) ITEM
-------------------------------------------------------------------------------
|          TOTAL                          MODEL          INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE    ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     120.8      27.0         .00      .41       .99     .0    .92    -.1 |
| S.D.       6.1         .0        1.00      .08       .25     .9    .30     .9 |
| MAX.     132.0      27.0        1.25      .64      1.50    1.8   1.53    1.8 |
| MIN.     112.0      27.0       -2.21      .35       .61   -1.6    .36   -1.4 |
|-----------------------------------------------------------------------------|
  | REAL RMSE    .43 TRUE SD     .90 SEPARATION 2.10 ITEM   RELIABILITY .81 |
  |MODEL RMSE    .41 TRUE SD     .91 SEPARATION 2.21 ITEM   RELIABILITY .83 |
| S.E. OF ITEM MEAN = .33                                                     |
-------------------------------------------------------------------------------
                        UMEAN=.0000 USCALE=1.0000
```

Fit Statistics for Soft Skills Sub-constructs

The fit statistics of all Soft skills sub constructs are shown in Table 7. For both INFIT and OUTFIT the mean square falls within the acceptable 0.5 logit and 1.50 logit index. Similarly, the PTMEA CORR were all positive which means that all sub constructs fulfilled content validity of the constructs with the values range from 0.42 to 0.59, which is more than 0.4 and not more than 0.80 as indicated by Linacre, (2019). The INFIT describes the performance on which the samples are based (Oon et al., 2016). The low value experienced in the raw variance explained by measure which is less than a threshold of 40% and an unexplained variance in the first contrast above an index of 15%, is an indication that the analysis has a secondary dimension. Table 7 below shows the Fit statistics for 10 Soft skills sub constructs.

Table 7 *Fit Statistics for Soft Skills Sub constructs*

Entry Number	INFIT MNSQ	OUTFIT MNSQ	PTMEA CORR	ITEM ID
1	1.50	1.53	.56	NTC1
5	1.17	1.10	.42	NTL5
6	1.15	1.03	.49	NTPS6
9	1.13	.93	.50	NTSF9
2	1.06	1.03	.59	NTCP2

7	.91	1.04	.57	NTIR7
8	.98	.85	.53	NTIN8
4	.74	.72	.59	NTCL4
10	.69	.36	.48	NTM10
3	.61	.59	.52	NTSD3
Raw variance explained by measures =		37.1%	37.7%	
Unexplained variance in 1st contrast in eigenvalue =		2.4	15.4%	24.5%

Person and Item Separation for 167 Elements Hard and Soft Skills Constructs

The item separation index was 1.24 logit, and reliability for the item was 0.61. These values indicate that the sample was not enough to confirm the hierarchy of the item difficulty. However, the person separation of 4.70 logit and reliability of 0.96 is excellent and the separation between the respondents is acceptable (Maat & Rosli, 2016). Table 8 shows Winstep output for Person and Item separation for entire elements of hard and soft skills.

Table 8 *Winstep Output for hard and soft skills Elements*

INPUT: 62 PERSON 169 ITEM REPORTED: 32 PERSON 62 ITEM 3 CATS WINSTEPS 3.72.3

SUMMARY OF 27 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	270.7	61.4	1.62	.30	.99	.0	.95	-.1
S.D.	24.0	.7	1.68	.16	.24	1.5	.30	1.5
MAX.	309.0	62.0	5.85	1.01	1.40	2.3	1.42	2.4
MIN.	216.0	60.0	-1.35	.23	.50	-3.5	.18	-3.5
REAL RMSE	**.35**	**TRUE SD**	**1.64**	**SEPARATION 4.70**	**PERSON RELIABILITY .96**			
MODEL RMSE	.34	TRUE SD	1.64	SEPARATION 4.83	PERSON RELIABILITY .96			
S.E. OF PERSON MEAN = .33								

CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .99

SUMMARY OF 62 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	140.8	31.7	.00	.40	1.00	.0	.95	.0
S.D.	5.6	.7	.67	.02	.24	.9	.25	.6
MAX.	150.0	32.0	1.99	.47	1.49	1.7	1.46	1.6
MIN.	122.0	27.0	-1.36	.37	.62	-1.6	.52	-1.1
REAL RMSE	**.42**	**TRUE SD**	**.52**	**SEPARATION 1.24**	**ITEM RELIABILITY .61**			
MODEL RMSE	.40	TRUE SD	.54	SEPARATION 1.34	ITEM RELIABILITY .64			
S.E. OF ITEM MEAN = .09								

DELETED: 107 ITEM

Fit Statistics for the entire Elements of Hard and Soft Skills

The fit statistics for the whole hard and soft skills item show the INFIT and OUFIT MNSQ value range from 0.50 to 1.50 for all positive PTMEA CORR (PMC) values, and within the appropriate index. Which is an indication that the data conforms to the Rasch model using the thumb rule that MNSQ outfit must be between 0.5 logit and 1.50 logit. Table 9 shows the output table for the responses on each of the elements of hard and soft skills required from the graduates.

Table 9 *Fit Statistics of 167 Hard and Soft Skills Elements*

Entry Number	INFIT MNSQ	OUTFIT MNSQ	PTMEA CORR	ITEM ID
147	1.49	1.36	.68	NTIN7
17	1.48	1.18	.65	TW3
83	1.15	1.46	.74	TES8
116	1.46	1.22	.69	NTCL2
91	1.45	1.41	.71	TPD3
115	1.44	1.23	.69	NTCL1
53	1.15	1.41	.68	TRF6
75	1.36	1.40	.70	TSO8
159	1.38	1.14	.67	NTST11
139	1.37	1.28	.67	NTIR6
129	.84	1.36	.67	NTPS4
23	1.33	1.00	.66	TCJ4
24	1.31	1.10	.68	TCJ5
84	1.02	1.24	.68	TM1
18	1.18	1.22	.67	TW4
108	1.22	1.20	.66	NTC4
113	1.20	1.12	.69	NTSD3
111	1.20	1.04	.69	NTSD1
123	1.19	1.14	.68	NTL3
140	1.14	1.17	.66	NTIR7
109	.74	1.17	.68	NTC5
86	1.15	1.16	.72	TM3
102	1.06	1.15	.65	NTCM5
69	1.14	1.00	.71	TSO2
153	1.13	.94	.68	NTST5
66	1.12	.85	.66	TSP7
101	.99	.64	.64	NTCM4
142	.94	.96	.67	NTIN2
32	.93	.94	.72	TCC2
141	.62	.91	.68	NTIN1
57	.91	.72	68	TSC3
70	.90	.82	.73	TSO3
146	.88	.79	.67	NTIN6
151	.86	.77	.66	NTST3
72	.86	.77	.70	TSO5
117	.86	.70	.67	NTCL3
150	.85	.71	.66	NTST2
107	.85	.69	.66	NTC3
152	.83	.82	.67	NTST4
55	.78	.68	.69	TSC1
124	.77	.74	.68	NTL4
162	.75	.66	.67	NTM2
71	.74	.66	.69	TSO4
105	.73	.65	.68	NTC1
98	.73	.68	.71	NTCM1
100	.72	.69	.69	NTCM3
160	.71	.63	.66	NTST12
127	.70	.62	.69	NTPS2

Entry Number	INFIT MNSQ	OUTFIT MNSQ	PTMEA CORR	ITEM ID
145	.68	.70	.64	NTIN5
67	.69	.61	.70	TSP8
144	.68	.52	.65	NTIN4
68	.68	.61	.70	TSO1
143	.63	.55	.67	NTIN3
Raw variance explained by measures = 42.4% >40%				
Unexplained variance in 1st contrast in eigenvalue = 7.8 7.2% < 15%				

Person-Item Distribution Map

A variable map may also be referred to as a person-item map, offering relationships between persons and items on an equal logit scale of interval (Boone & Noltemeyer, 2017). Person-item map helps researchers to; assess an instrument's strength and weaknesses; document the hierarchy of items and so on. The lower part is for respondents with low ability and the top is for those respondents with high ability. The items are placed on the right side of the line and are sorted accordingly. The easiest items are placed at the bottom and gradual ly the most difficult items are on the top. Only the items part will be presented on the map in this study, since the emphasis is on determining the validity and reliability of the items. The dispersion of the item along the scale shows in Figure 1 that there is clear evidence that the items can produce a functional framework that can divide graduates into different skill levels.

```
INPUT: 62 PERSON  169 ITEM REPORTED: 32 PERSON  62 ITEM  3 CATS WINSTEPS 3.72.3
--------------------------------------------------------------------------------

     PERSON - MAP - ITEM
         <more>|<rare>

              S|
               |
    3          +
               |
               |
               |
               |
               |
    2          + TES8
               |
              M|
               | TBB3
               |T
               | TCC2    TM3
    1          + TSO3
               | TES1    TIP2    TPD3
               |S NTCM1   TRF7    TSO5    TSO8
               | TSO1    TSO2    TSO4    TSP8
               | NTCL5   NTSD1
               | NTCL1   NTCM3   NTPS2   NTSD3   TIB4    TSC1
    0          S+M NTC1    NTCL2   NTIN1   NTL4    TCJ5    TM1
               | NTC5    NTL3    NTM1    NTST5   TRF6
               | NTCL3   NTIN2   NTIN3   NTIN7   NTM2    NTST11 NTST4
                 TPL2    TPL4    TW4
               | NTIN6   NTIR6   NTPS4   TSC3
               |S NTIR7   NTST2   NTST3   TCJ4    TSP7
               | NTC3    NTC4    NTST12
   -1          + NTCM5   NTIN4
               | TW3
               |T NTCM4   NTIN5
               |
              T|
               |
   -2          +
```

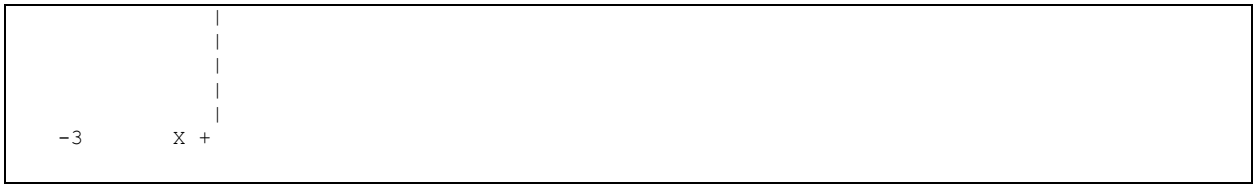

Figure 1. Person-Item Distribution Map

Discussion

The findings revealed that the entire sub constructs and their corresponding elements elicited from experts are accurate and consistent, thus able to measure the phenomenon under study. This result is consistent with Nurjannah and Siwi, (2017) view that reliability is an important factor for evaluating the accuracy and reliability of an instrument designed to assess student success in a specific skill. In addition, the 27 hard and soft skills show good separation for both person and items, reliability and high Cronbach alpha, whereas in the same vain is the standard residual value in eigenvalue < 15 which indicates that the Rasch model did not measure any secondary dimension. The appropriate index was consistent with the rating scale rule of thumb set by Linacre (2002), where MNSQ values between 0.5 logit and 1.5 logit are considered effective for measuring purposes. Linacre, (2013) argued further that the ZSTD should have between -1.9 logit and 1.9 logit measures for raw data to have fair predictability. The author further added that the index value of 1.5 logit to 2.0 logit MNSQ is acceptable even though it is not productive for measurement aimed at determining performance of students in a specific skill.

It is certain that the knowledge presented by the experts is capable of establishing a robust framework for competences. This result is in line with the study conducted by Fraser et al., (2019) where he believes that Rasch Model can promote the development of instruments that provide realistic guidance for researchers and practitioners with useful data (Fraser et al., 2019). The items were also sufficient to establish a hierarchy of distinguishing items along the measured variables given the high value of their reliability. The high value of Cronbach Alpha shows the items were consistent and accurate. Which is an indication that similar output can be obtained for the items on sample with the same characteristics.

A successful construction site needs people with skills such as project conceptualization, design, management, organization and coordination including time, money resources, technology, and methods (Ayetunde & Francis, 2018). Fortune et al., (2019) the secret to optimizing the productivity of construction graduates in Nigeria is professional skilled labour. However, this is evident from the accuracy of the result obtained from the responses of experts.

The high value for the separation of persons showed that the items are capable of grouping the persons into different levels of capacity while the separation of the items shows the sufficiency of samples to distribute the items according to levels of difficulty along the interval scale. Consequently, if given to the same sample of suitable items, the variable map indicates replicability of the person and item ordering on the interval scale.

Employability requirements analysis shows that employers are seeking students with practical skills and strengths of the 21st century such as problem solving and communication (Oraison et al., 2019). Employers value critical skills including literacy and numeracy but also other skills including teamwork, building relationships and solving problems (Oraison et al., 2019).

In this analysis, the finding revealed that the experts were consistent in their perception of hard and soft skills among graduates as regards to employability. Therefore, the items cluster on the person-item map clearly shows levels of person ability. Furthermore, the hard and soft competency elements from fit statistics provide very good results for use in the development of competency framework.

Conclusion

The outcome of this study is the product of a systematic procedure undertaken to obtain the experts' views about hard and soft skills to be acquired by construction graduates in Nigerian's Polytechnic. The study aimed to use the outcome to build a competency framework that will be rich with real-time skills the employers need. The whole elements of hard and soft skills demonstrate strong PMEA CORR, INFIT, OUTFIT values. Similarly, the dimensionality shows that there was no secondary dimension measured by the model. The distribution of the same items over an interval scale (variable map) often indicates a consistency of the opinion of the employers on the value of the items in the development of competencies. And also grouped the persons into different levels of abilities on a continuum. Consequently, the findings of this feasibility tests are suggested to researchers, scholars for a study aimed at creation of a framework for competences.

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