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Multivariate Assessment of Industrial Attachment by Students of Tertiary Institutions in Ghana

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ABSTRACT

The paper examines the latent benefits as well as the challenges that are associated with industrial attachment exercise undertaken by tertiary institution students in Ghana. It makes use of exploratory factor analysis of high-dimensional datasets generated on likert scale using a total of forty-eight indicators of the usefulness and challenges of the exercise along various dimensions. The results show a general acceptance of the usefulness of the exercise. However, there is equally a general acceptance of challenges. Specific dimensions of these challenges are issues related to distance that students and supervisors have to cover to access attachment centres; lack of monitoring and supervision; and lack of suitability of training programmes. Using factor scores, the results further show that the extent of usefulness and challenges associated with industrial attachment are almost equally experienced by all students irrespective of sex and programme of study.

KEYWORDS: Industrial Attachment, Graduate Unemployment, Training Programme

1 INTRODUCTION

Many countries including Ghana, employ technical tertiary education to provide middle-to-high level human resource for national socio-economic development. Students' industrial attachment is a work-based practice programme designed by most tertiary institutions globally in collaboration with firms and industries to bridge the knowledge gap between theory and practice. In this respect, it aims at furnishing student-trainees with requisite skills by integrating theories learnt at lectures to real-life situations, develop students' career pathways, affords students enough exposure to employment avenues and diverse practical training, and also to assist student-trainees acquire competence and confidence in their careers. Students' industrial attachment is optional to many university and other tertiary students, but mandatory to all technical university students in Ghana. The duration for the attachment may vary

slightly from one technical university to the other. Before the attachment commences, students in consultation with Industrial Liaison Office of their school, select appropriate firm or institution related to their respective fields of study. While students are on the attachment programme, workplace supervisors as well as supervisors from the students' institution play their roles to ensure that students go through the attachment programme successfully. On this note, workplace supervisors assign student-trainees to their routine duties in their areas of specialisation. This enables the students some exposure to the use of equipment and other machines and helps make theoretical knowledge acquired more practical. During this time, the institutional supervisors come round to supervise students to see how they are faring on the programme and resolve their challenges, if any. Students on attachment are supposed to be monitored continuously by both workplace and institutional supervisors till the end of the programme. Upon completing the industrial attachment, students and supervisors prepare their report. Students' report details; terms of reference, purpose of the attachment, the profile of the firm or organisation, field of experience, lessons learnt, challenges, recommendation, conclusion, references, and appendix (Narteh, 2015). School supervisors; per their observation, experience on the attachment, and also in consultation with workplace supervisors' report (in a form of appraisal about the students on attachment), compile their attachment report. Considering the description of students' attachment programme, there is no doubt that we could achieve meaningful success in students' training to provide the desired middle-level manpower. The Government of Ghana continues to make commitment to creating jobs by establishing entrepreneurial programmes and making industrial attachment obligatory for all technical university students. The latest effort at this is the recent conversion of all polytechnics to technical universities in 2016, in order to motivate students with requisite abilities to pursue technical tertiary education rather than regular education. In spite of these efforts, there are students who appear to hold pessimism about the attachment programme. This is further worsened by the numerous challenges that students encounter on attachment. For instance, Effah et al. (2014) in their research identified; students unable to have free access to machines and equipment to work with, lack of appropriate skills, task and jobs relating to students' programme of study, and difficulty in getting attachment close to where the students live as some of the challenges. Furthermore, Owusu-Acheampong et al. (2014) also revealed students' difficulty in securing placement in industry for attachment and long distance from place of residence to industry as some of the challenges of students' industrial attachment. Also, Akortsu (2002), in his report on industrial attachment about art-

related discipline discovered among other things; inadequate funding of the attachment programme, inefficient organization and administration of the attachment programme, inadequate demonstration of skills on the part of students due to inadequate practical training on campus, lack of well-organized attachment to industries, lack of proper supervision as a result of poor remuneration, and the seemingly negative attitude toward the art in general by administrators.

In the results identified by these researches, descriptive research design is mostly used. Inferences are then made based on these designs by using either the chi-square test or the ANOVA. They also considered only the challenges associated with the attachment programme, but not the benefits. This paper, which is also on the same issue, would adopt a multivariate approach in assessing, not only the challenges, but also the usefulness of the programme. The study has also considered a much larger sample size which is even more than twice that considered in most of the reported research. Another effort to strengthen the current findings on the issue is made by taking our sample from a different location other than those already examined.

2 DATA AND METHODS

Data were obtained from the students of Takoradi Technical University, and involved 525 students. Structured questionnaires were used which contained forty-eight indicators of benefits and challenges. Twenty of the indicators covered issues of benefits of the exercise whilst twenty-eight covered issues of challenges. Data on these indicators were obtained on a five-point Likert scale: strongly agree (1), agree (2), not sure (3), disagree (4) and strongly disagree (5). The two sets of indicators are seen in Tables 5 and 7. The data generated on these indicators are high-dimensional in nature and requires reduction in dimensionality to determine the salient latent dimensions. Factor Analysis is thus found appropriate for the study. Our perspective of the use of the technique would be one of exploration, in line with the nature of the study. For a study of this nature, it would suffice to determine just the first few factor dimensions. Thus, we are interested in the equation of the form

$$x_{j_k} = \sum_{i=1}^{m} \beta_{ijk} f_{ik} + e_{j_k} \; ; \qquad k = 1, 2 ; \quad j_k = 1, 2, \ldots, p_k \tag{1}$$

In the structural equation in (1), $p_1 = 20$ and $p_2 = 28$. We have distinguished two types of factors f_i; f_{i1} are latent factors of benefits, and f_{i2} are latent factors of challenges of the

industrial attachment exercise. The value e_{j_k} is the usual variance specific to the indicator x_{j_k}. Discussion on the conditions and further mathematical representations of (1) can be seen in notable texts (e.g., Sharma, 1996; Johnson and Wichern, 1992; Everitt and Dunn 2001). Since our approach is one of exploration, we have not adopted any transformation (such as the polychoric correlation) of the correlation matrix. To forestall the effect of the measurement scale on our result, we intend to determine the factors for a very small *m*. This measure would also reduce the effect on the ordering of the factors and over-dimensionalisation (Van der Eijk and Rose, 2015). In effect, the ratio of the eigen-value $\sum_{j_k=1}^{p_k} \beta_{ijk}^2$ of the *i*th factor to the total p_k is not essential. It would however, strengthen our final *m*-factor solution to obtain a reasonably large eigen ratio. Thus, we would eventually rely on a non-quantitative consideration of the plausible interpretability of the factor solution, an approach supported by Norris and Lecavalier (2010).

Background information was also obtained about students and included gender, age and faculty of affiliation. Table 1 shows distribution of students by the three demographic characteristics.

Table 1: Distribution of students by demographic characteristics

	Gender		Age (in years)					Faculty of affiliation			
	Male	Female	<18	18-23	24-29	30-35	≥36	FAAT	FAS	FOB	FOE
Number	365	160	2	306	201	14	2	67	89	217	152
Percent	69.5	30.5	0.4	58.3	38.3	2.7	0.4	12.8	17.0	41.3	29.0

Table 1 shows the distribution of students by demographic characteristics such as; gender, age, and faculty of affiliation. The modal age range was (18-23) years. Students were sampled from Faculties of Applied Art and Technology (FAAT), Applied Science (FAS), Business Studies (FOB), and Engineering (FOE), respectively. We used relevant background characteristics to perform further analysis using important factor scores in (1). We will define (see Table 9) three main levels of influence of a factor by specifying three ranges of factor scores. We will perform a test of independence of the background of the respondent on the extent of effect of the factors.

3 ANALYSIS AND RESULTS

3.1 PRELIMINARY ASSESSMENT OF DATASETS

3.1.1 Suitability of Data for Factor Analysis

To verify that our data are appropriate for factor analysis, we examine the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMOMSA), and Bartlett's Test of Sphericity. Table 2 presents the suitability measures of the two datasets.

Table 2: Some Measures of Suitability of Data for Factor Analysis

Measures	Perceived Benefits of Industrial Attachment	Perceived Challenges of Industrial Attachment
KMO	0.924	0.823
Bartlett's Test of Sphericity	2964	2856
Df	190	378
Sig.	0.000	0.000

Table 2 shows KMO values which are much greater than the thresh hold of 0.5 suggested by many (e.g., Sharma, 1996). This indicates that the variables are generally inter-correlated. Hence the data are suitable for factor analysis.

3.1.2 Distribution of Responses on Indicators

A common feature of the distribution of responses on the indicators of Benefits is that there are all positively skewed. This shows that there is a general acceptance of all indicators of benefits. However, on indicators of Challenges, the direction of skewness is mixed. Table 3 shows some features of the distribution of responses on selected indicators that are worth noting. The selected indicators for both the benefits and challenges are those with extremities of skewness and kurtosis. The numbering of the indicators are in accordance with the ordering in Tables **5** and **7**.

Table 3: Features of Distribution of Responses on Selected Indicators

SN	Indicators	Skewness	Kurtosis
Benefits			
1	Students' industrial attachment gives much exposure to students about the job market	2.595	10.865
5	Students' industrial attachment will enable me develop self-confidence in the pursuit of my profession	1.793	4.694
16	Doing students' industrial attachment will help me assess economic benefit of career and hence maintain or change it	0.709	0.495
18	Students' industrial attachment programme serves as one of the avenues for many companies to do recruitment	0.716	0.187
Challenges			
1	I am unable to acquire enough exposure because supervisors send me on errands	-0.197	-1.232
3	I am unable to have access to machines and equipment at workplace to enhance learning	0.007	-1.298
6	Eight weeks duration for attachment is not enough	-0.052	-1.536
20	Students' travel longer distances in search of new places whenever their intended places of attachment fail	1.856	3.669
24	Supervision from workplace supervisors is poor	-0.343	-1.129

Table 3 shows that exposure to job market by the industrial attachment is the most popular perceived benefit of the exercise. The extremely high kurtosis of the highly positively skewed distribution is an indication that almost every respondent holds this view. Development of self-confidence is next most acclaimed benefit. On some indicators such as providing avenues for assessing economic benefit of chosen career by students and recruitment by companies is generally acceptable but not overwhelming. On challenges indicators, the combined negative skewness and negative kurtosis indicate that respondent disagree more than they agree to the indicator. Since the values involved are not too large, the responses indicate division among respondents on the indicators as they appear controversial. Respondents are particularly divided on the issue of access to machines and equipment. However, there seem to be agreement of the difficulty of securing places of attachment.

3.2 ANALYSIS OF BENEFIT OF INDUSTRIAL ATTACHMENT

Table 4 shows a portion of the result on the eigen-values of the components. We notice that only the first four of the components have eigen-values greater than one. This suggests that only four factors may adequately underlie the correlation matrix. The first component alone would account for a third of the variation in the data, suggesting that the first factor alone provides a dominant dimension along which to assess the perceived benefit of the industrial attachment exercise.

Table 4: Eigen-Analysis of Benefit data

Component	Initial Eigenvalues		
	Total	Percent of Variance	Cumulative Percentage
1	6.636	33.180	33.180
2	1.349	6.746	39.926
3	1.056	5.279	45.204
4	1.007	5.035	50.239
5	0.933	4.666	54.905
6	0.899	4.495	59.399
7	0.832	4.161	63.561
8	0.794	3.969	67.529

The result of the eigen-analysis suggests that a one-factor solution may also be reasonable, at least as an exploratory solution.

A plot of the eigen-values against the corresponding components (see Figure A1 in Appendix A) shows a well-formed ‘‘elbow’’ point, an indication of the suitability of the technique adopted for the analysis. The figure suggests that a two-factor solution may be adequate as the elbow is on the second component. It could also indicate that a one-factor solution is possible. However, the plausibility of a one-factor solution would be critically examined.

3.2.1 Factor Solution for the Perceived Benefit

The initial solution (see Table B1) shows that the first factor loads highly on almost all indicators. This suggests that there is actually a general benefit of industrial attachment perceived by respondents. The influence of the general factor is overwhelming as all the remaining factors are not plausible. The plausibility of factor interpretation and the influence of this general factor suggest that the factor solution for this data may best be represented by a single (unrotated) factor model. The solution is an indication of the general acceptance of the usefulness of the industrial attachment exercise.

In spite of the solution identified above, it may be of interest to identify specific perceived benefits. Since four factors have eigen-values greater than one, we present a varimax rotation of four-factor initial solution in Table 5.

Table 5: Rotated Component Matrix of Perceived Benefit

Indicators	Component			
	1	2	3	4
Students' industrial attachment gives much exposure to students about the job market	0.071	**0.734**	0.134	0.178
I am of the view that students' attachment helps students develop their competencies in their areas of study	0.088	**0.673**	0.208	0.227
Students' industrial attachment will eventually enable me acquire my profession	**0.565**	0.422	0.006	-0.031
If I undertake students' attachment, it will enhance my personality	0.465	**0.499**	0.187	-0.179
Students' industrial attachment will enable me develop self-confidence in the pursuit of my profession	0.378	**0.587**	0.049	0.202
Students' industrial attachment will up-date me on modern technology being applied in industries	0.222	**0.506**	0.050	0.410
Undergoing students' industrial attachment will serve as a motivation for industries to employ polytechnic graduates	0.474	0.108	0.136	0.409
Students' industrial attachment bridges the gap between practical and theoretical knowledge	0.120	0.200	0.045	**0.755**
Students' industrial attachment will equip me with the skills to acquire a job	0.479	0.225	-0.007	0.439
Taking part in students' industrial attachment will enable me adjust to challenging working environment	0.185	0.135	0.267	**0.584**
Embarking on students' industrial attachment will nurture me to become a good entrepreneur	**0.656**	0.017	0.196	0.150
The practical skills acquired during students' attachment will make me more competitive over other graduates	**0.537**	0.181	0.071	0.249
Part taking in students' industrial attachment will make me more innovative in my profession	**0.635**	0.237	0.008	0.217
The more I undertake students' industrial attachment the better it enhances my chances of acquiring job	**0.637**	0.157	0.225	0.038
Taking part in students' industrial attachment will make me more responsive in my career	**0.524**	0.198	0.294	0.225
Doing students' industrial attachment will help me assess economic benefit of career and hence maintain or change it	**0.528**	-0.017	0.484	0.127
Many employers consider work experience next to qualification. Hence doing industrial attachment will give me advantage of acquiring a job	0.441	0.168	0.293	0.203
Students' industrial attachment programme serves as one of the avenues for many companies to do recruitment	0.485	0.102	0.418	0.169
Students' industrial attachment serves a platform to prove the worth of my qualification and competence	0.221	0.126	**0.685**	0.210
Embarking on students' industrial attachment will improve my researching skills	0.074	0.188	**0.777**	-0.018

The features of the correlation matrix suggest that extracting beyond four factors may lead to over-dimensionalisation. In this case, we may not be able to determine a parsimonious number of factors that would give a plausible factor solution.

In order to assign labels to the factors, we would use a cut-off value of 0.5. In Table 5, the indicators with high loadings have been highlighted. On the first factor, it can be observed that seven indicators have high loadings. All of these influential indicators are related to benefit that makes one efficient in the practice of one's profession and leads to competitive

advantage over peers. The first factor may therefore be labelled as an ‘‘efficiency factor’’. The second factor loads highly on five indicators. These indicators are those that would enable the student to broaden their outlook in their field of learning. The second factor may therefore be labelled as ‘‘enhanced outlook’’. The third factor loads highly on two variables. They are indicators of what students perceive as opportunity to put to test what one has learnt. The third factor may therefore be labelled as ‘‘test of competency’’. The fourth factor also loads highly on two indicators. These are indicators of coping with new environment and skills. Thus, the fourth factor is a benefit that reflect ‘‘improved adaptability’’.

3.3 ANALYSIS OF CHALLENGES OF INDUSTRIAL ATTACHMENT

Table 6 shows a portion of the result on the eigen-values of the components. We notice that as many as the first eight of the components have eigen-values greater than one. This suggests that eight factors may adequately underlie the correlation matrix. The first component alone would account for almost one-fifth of the variation in the data. The first factor would clearly not be a dominant one, even though it is expected to be a kind of general challenge restricted to few dimensions. We notice that each of the remaining seven provides progressively much smaller information. It appears therefore that the challenges associated with industrial attachment may be varied. This is reflected in the scree plot in Figure A2, which does not suggest a clear ‘‘elbow’’ point. We would therefore consider as many factors as could be plausibly interpretable.

Table 6: Eigen-Analysis of Challenges Data

	Initial Eigenvalues		
Component	Total	Percent of Variance	Cumulative Percentage
1	5.290	18.892	18.892
2	2.041	7.291	26.183
3	1.716	6.129	32.312
4	1.483	5.295	37.607
5	1.219	4.355	41.962
6	1.206	4.307	46.269
7	1.123	4.010	50.279
8	1.010	3.606	53.885
9	0.938	3.349	57.233
10	0.911	3.255	60.488

3.3.1 Factor Solution of Perceived Challenges

The initial solution (see Table B1) shows that the first factor loads highly on seven indicators which are a mixture of indicators of three main dimensions. The dimensions cover issues of lack of suitability of training programmes, poor supervision, problems associated with long distance from attachment centre for both the student and supervisors. Clearly, this factor represents a general factor in some restricted sense as it covers only a few of the dimensions. The composition of the second and subsequent factors suggests a need for a rotation of the solution. Guided by results in Table 4, we consider a rotation of initial eight-factor solution in Table 7.

In Table 7, the indicators with high loadings have been highlighted. On the first factor, it can be observed that three indicators have high loadings, all of which are related to challenges of lack of monitoring and evaluation of the performance of the student on the programme. The first factor may therefore be labelled as ‘‘lack of monitoring and evaluation’’. The second factor loads highly on four indicators. These are indicators of challenges that does not provide for adequate training on the programme as a result of lack of machine or exposure to them and insufficient or proper assignment. The second factor may therefore be labelled as ‘‘inadequate training’’. The third factor loads highly on two variables. They are indicators of what inhibits progress of work schedules as a result of long distance that must be covered by the student to access the institution of attachment. The third factor may therefore be labelled as ‘‘unfulfilled schedules due to distance’’. The fourth factor also loads highly on two indicators, which are concerned with a lack of support and welfare package for the student. Thus, the fourth factor is a challenge that reflect ‘‘lack of support’’. The fifth and sixth factors may similarly be labelled as ‘‘late turn up for attachment’’ and ‘‘lack of sensitization’’. The interpretations of the remaining two factors are unsuitable.

Table 7: Rotated Component Matrix of Perceived Challenges

Indicators	Component							
	1	2	3	4	5	6	7	8
I am unable to acquire enough exposure because supervisors send me on errands	-0.151	**0.557**	0.211	0.070	0.012	0.110	0.039	-0.037
Industries training programmes are inadequate	0.112	**0.636**	-0.013	0.031	0.070	-0.034	0.176	0.098
I am unable to have access to machines and equipment at workplace to enhance learning	0.006	**0.752**	-0.017	-0.025	0.083	0.062	0.065	-0.007
Students spend a lot of time in getting placement	0.085	0.263	-0.169	0.384	0.481	-0.114	0.161	-0.064
Workplace supervisors allowing students to do independent work does not promote learning	0.165	0.151	0.074	0.030	0.120	-0.019	0.187	0.055
Eight weeks duration for attachment is not enough	0.082	-0.021	-0.002	-0.013	-0.043	0.025	-0.018	**0.868**
Students are often not placed in their rightful areas	0.015	0.348	0.108	0.227	0.063	0.123	0.208	0.253
Industry work schedules are not suitable to equip students with problem-solving and employable skills	-0.025	0.084	0.109	0.160	0.103	0.051	**0.734**	0.162
Attachment supervisors do not adequately discuss feedback from industry with students	0.302	0.139	0.031	0.081	0.073	-0.029	**0.609**	-0.056
The months of June to August are inconvenient for the students' industrial attachment programme	0.094	0.172	0.267	-0.110	0.103	0.201	0.342	0.484
Workplace supervisors do not give practical assignment	0.264	**0.512**	0.228	0.218	-0.055	0.143	0.085	0.012
Weak supervision from workplace supervisors adversely affect students' industrial attachment	0.426	0.244	-0.135	-0.112	0.280	0.100	0.048	0.156
Supervisors do not visit regularly to monitor progress	**0.759**	0.032	0.119	0.194	0.032	-0.122	0.028	0.102
Supervisors follow up late to make their inputs on students' industrial attachment	**0.764**	0.057	0.042	0.139	-0.004	0.033	0.024	0.018
Post attachment seminar for all stakeholders are not usually held to discuss problems students encounter	**0.584**	-0.066	-0.103	-0.020	0.104	0.144	0.188	-0.038
Workplace supervisors are not conversant with students' industrial attachment programme	0.074	0.160	0.082	-0.182	0.035	**0.560**	0.512	-0.139
Attachment openings are not declared to students on time to enable them prepare ahead of time	-0.061	0.111	0.134	0.208	0.168	**0.617**	0.088	0.101
Orientation for students are organized rather late	0.108	0.039	0.029	0.278	0.105	**0.685**	-0.047	0.095
Welfare issues concerning students are not addressed properly before the start of the programme	0.084	0.071	-0.038	**0.674**	0.131	0.341	-0.046	0.066
Students' travel longer distances in search of new places whenever their intended places of attachment fail	0.086	0.046	-0.062	**0.710**	0.239	0.006	0.097	-0.068
Some supervisors do not supervise regularly because they travel longer distances	0.389	-0.016	0.301	0.477	-0.065	0.201	0.127	0.000
Students get distracted by undertaking different exercise	0.112	0.050	0.451	0.400	-0.038	0.116	0.188	-0.152
I close before the official time since I stay far-off	-0.020	0.068	**0.785**	-0.028	0.086	-0.043	0.115	0.084
Supervision from workplace supervisors is poor	0.152	0.384	0.491	-0.064	0.028	0.371	-0.039	-0.037
I am unable to honour all my schedules because I stay quite far from the place of attachment	-0.106	0.050	**0.616**	0.006	0.455	0.156	0.049	0.120
Students are not supervised by competent professionals	0.292	0.201	0.388	-0.138	0.334	0.269	-0.128	-0.034
Difficulty in getting placement close to my location eventually reduces the time for attachment	0.075	0.065	0.099	0.153	**0.782**	0.103	0.071	-0.036
Reporting in good time each day for attachment is a challenge due to the distance	0.077	-0.082	0.275	0.135	**0.639**	0.192	0.074	0.045

From the foregoing interpretations, it appears that all factors extracted are concerned with issues of supervision, problems associated with distance and suitability of the programmes

received at the attachment centre. These are in line with the first factor of the initial solution. We would therefore adopt the first factor of the initial solution as the final factor solution for the challenge data. Table 8 shows a summary of the extracted solutions for the two datasets.

Table 8: Summary of Extracted Factor Solutions

Dataset	Extracted Factor	Main Dimensions
Benefit	General Benefits	General acceptance of programme
Challenge	General Challenge	Lack of effective supervision
		Challenges associated with distance
		Lack of suitability of training programmes

3.4 EXTENT OF INFLUENCE OF EXTRACTED FACTORS ON BACKGROUND CHARACTERISTICS

Using the factor scores, we define three main levels of influence of a factor by specifying three ranges of factor scores. In Table 9, we have the definitions of the scores for Benefit and Challenge factors. The interpretation of the ranges shows the extent of influence of the factor on the particular background of the respondent.

Table 9: Interpretation of Factor Scores on Benefit Factor

Factor	Factor Score	Interpretation
General Benefit Factor	–0.5 and below	Least Influenced
	–0.49 to 0.49	Moderately Influenced
	0.5 and above	Highly Influenced
General Challenge Factor	–0.8 and below	Least Influenced
	–0.79 to 0.79	Moderately Influenced
	0.8 and above	Highly Influenced

The ranges of scores are determined such that the condition on test of independence is met for the two datasets. In this paper, we examine the influence of the factors on two background characteristics, namely, the gender and programme of study of the respondent.

Table 10 shows the test of independence of the level of influence of the extracted factors on the two identified backgrounds of students. It is observed that both factors appear to be independent of the sex and the programme of the respondent. This suggests that the extent of

benefits and the challenges associated with industrial attachment are almost equally experienced by the students irrespective of sex and programme of study.

Table 10: Test of dependence of level of influence of factors on two background characteristics

Background	Benefit Factor		Challenge Factor	
	Chi-sq value	*p*-value	Chi-sq value	*p*-value
Gender	1.060	0.588	0.045	0.978
Programme	9.213	0.162	4.112	0.662

4 DISCUSSION

General factors under initial solutions for both aspects of the paper are found more in line with the background of the data and help to avoid problem of over-dimensionalisation, as acknowledged earlier. However, we have proceeded to show specific factors under rotation. These factors are those that have two or more indicators and are plausibly interpretable. These measures also help to achieve a parsimonious solution.

One of the main components of the general challenge factor is the the lack of suitability of training programmes during attachment. A study of the distributions on the indicators (see Table 3) shows that this component is rather controversial as respondents were divided on the issue. Nevertheless, this component is worth considering.

5 CONCLUSION

The paper examines the latent benefits as well as the challenges that are associated with industrial attachment exercise undertaken by tertiary institution students in Ghana. It makes use of exploratory factor analysis of high-dimensional datasets generated on likert scale using a total of forty-eight indicators of usefulness and challenges of the exercise along various dimensions.

A one-factor initial solution is extracted for each of the benefits and challenges of the programme. The extracted solutions show a general acceptance of the usefulness of the industrial attachment exercise. However, there is equally a general acceptance of challenges. Specific dimensions of these challenges are issues related to distance that students and

supervisors have to cover to access attachment centres; lack of monitoring and supervision; and lack of suitability of training programmes. Using factor scores which are categorized into three levels of influence of the factors, the results further show that the extent of usefulness and challenges associated with industrial attachment appear to be independent of the sex and the programme of the student.

The results imply that students could gain fully from the programme if attachment centres could be accessed within the vicinity of their residence. In addition, institutional and workplace supervisors need to be resourced to show more commitment to the exercise by ensuring regular and professional assessment of the performance of the students. The scale on which the data were obtained could influence the correlation coefficient between the indicators. Future studies on the subject will consider a transformation of the correlation matrix. In addition, responses will extend to institutional and workplace supervisors who are involved in the industrial attachment exercise.

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APPENDIX

APPENDIX A

SCREE PLOTS OF LATENT BENEFITS AND CHALLENGES OF INDUSTRIAL ATTACHMENT

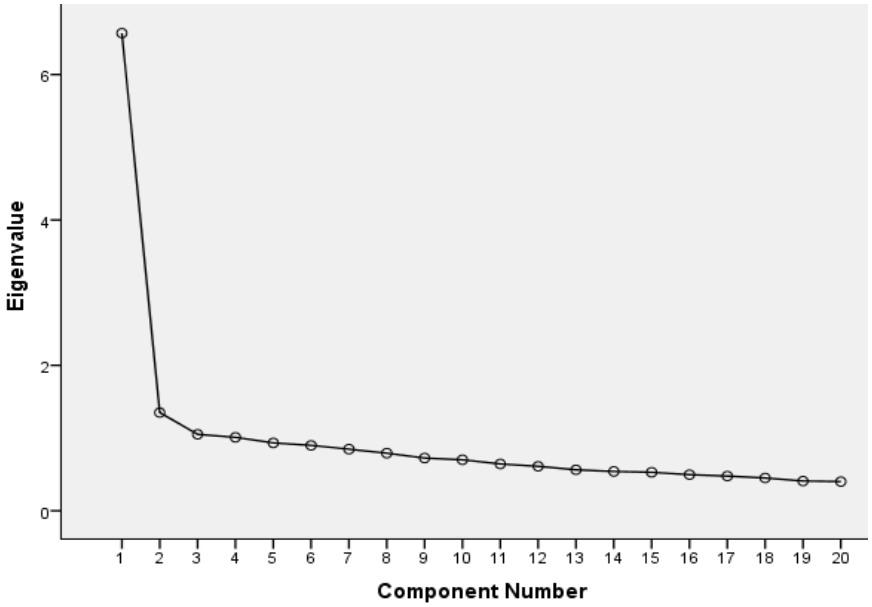

Figure A1: Scree Plot of Perceived Benefit of Industrial Attachment

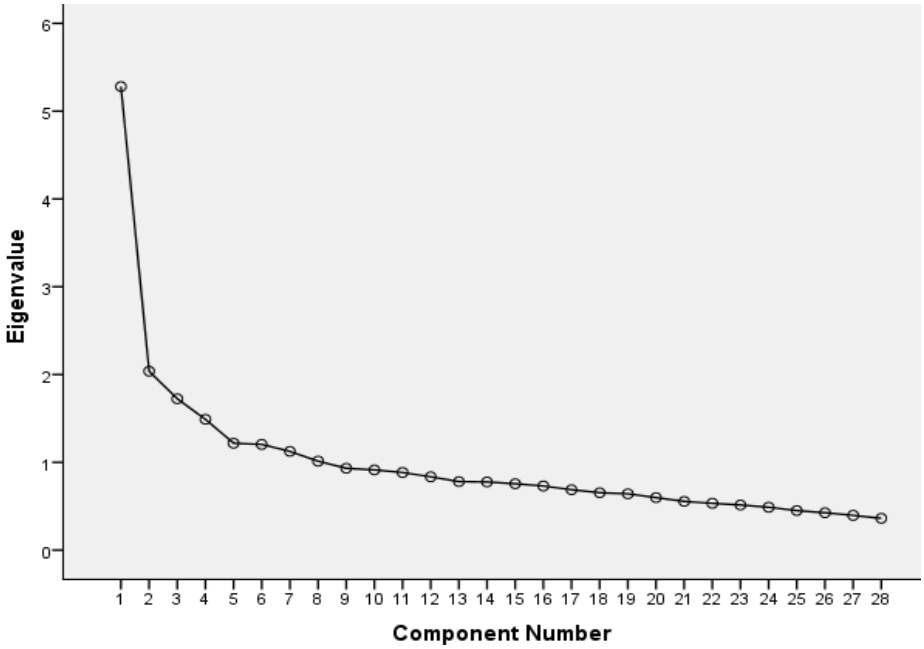

Figure A2: Scree Plot of Perceived Challenges of Industrial Attachment

APPENDIX B

INITIAL FACTOR SOLUTIONS OF LATENT BENEFITS AND CHALLENGES OF INDUSTRIAL ATTACHMENT

Table B1: Initial Component Matrix for Benefits

	Component			
	1	2	3	4
Students' industrial attachment gives much exposure to students about the job market	**0.512**	0.450	0.321	-0.163
I am of the view that students' attachment helps students develop their competencies in their areas of study	**0.542**	0.380	0.332	-0.086
Students' industrial attachment will eventually enable me acquire my profession	**0.581**	0.074	-0.141	-0.367
If I undertake students' attachment, it will enhance my personality	**0.558**	0.003	0.096	-0.460
Students' industrial attachment will enable me develop self-confidence in the pursuit of my profession	**0.635**	0.306	0.025	-0.182
Students' industrial attachment will up-date me on modern technology being applied in industries	**0.570**	0.379	0.050	0.070
Undergoing students' industrial attachment will serve as a motivation for industries to employ polytechnic graduates	**0.592**	-0.018	-0.189	0.186
Students' industrial attachment bridges the gap between practical and theoretical knowledge	0.488	0.338	-0.069	0.518
Students' industrial attachment will equip me with the skills to acquire a job	**0.608**	0.150	-0.252	0.132
Taking part in students' industrial attachment will enable me adjust to challenging working environment	**0.521**	0.087	0.051	0.428
Embarking on students' industrial attachment will nurture me to become a good entrepreneur	**0.599**	-0.266	-0.247	-0.030
The practical skills acquired during students' attachment will make me more competitive over other graduates	**0.584**	-0.012	-0.218	-0.009
Part taking in students' industrial attachment will make me more innovative in my profession	**0.642**	0.017	-0.291	-0.100
The more I undertake students' industrial attachment the better it enhances my chances of acquiring job	**0.617**	-0.224	-0.143	-0.173
Taking part in students' industrial attachment will make me more responsible in my career	**0.657**	-0.131	-0.042	0.011
Doing students' industrial attachment will help me assess economic benefit of career and hence maintain or change it	**0.594**	-0.417	0.019	0.058
Many employers consider work experience next to qualification. Hence doing industrial attachment will give me advantage of acquiring a job	**0.577**	-0.130	-0.005	0.029
Students' industrial attachment programme serves as one of the avenues for many companies to do recruitment	**0.610**	-0.272	0.037	0.041
Students' industrial attachment serves a platform to prove the worth of my qualification and competence	**0.553**	-0.303	0.379	0.191
Embarking on students' industrial attachment will improve my researching skills	0.426	-0.346	**0.586**	0.034

Table B2: Initial Component Matrix for Challenges

	Component							
	1	2	3	4	5	6	7	8
I am unable to acquire enough exposure because supervisors send me on errands	0.391	-0.329	0.167	-0.318	-0.195	-0.142	-0.004	0.118
Industry training programmes are inadequate for students	0.312	-0.075	0.361	-0.314	0.096	0.053	0.275	0.095
I am unable to have access to machines and equipment at workplace to enhance learning	0.397	-0.199	0.377	-0.432	-0.055	-0.152	0.215	0.046
Students spend a lot of time before getting placement	0.387	0.251	-0.158	-0.397	0.287	-0.191	0.058	0.084
Work place supervisors allowing students to do independent work does not promote learning	0.408	0.059	0.179	-0.033	0.041	-0.231	-0.269	0.041
Eight weeks duration for attachment is not enough	0.125	-0.021	0.214	0.263	0.302	0.506	0.132	0.417
Students are often not placed in their rightful areas	**0.503**	-0.074	0.134	-0.196	0.015	0.104	-0.110	0.184
Industries work schedules are not suitable to equip students with problem-solving and employable skills	0.454	-0.045	0.114	-0.144	0.306	0.219	-0.492	-0.064
Attachment supervisors do not adequately discuss feedback from industries with students	0.438	0.201	0.262	-0.073	0.175	-0.026	-0.366	-0.167
The months of June to August are inconvenient for the students' industrial attachment programme	0.415	-0.251	0.222	0.202	0.277	0.358	0.027	0.056
Workplace supervisors do not give practical assignment	**0.543**	0.003	0.236	-0.132	-0.258	-0.018	0.080	0.125
Weak supervision from workplace supervisors adversely affect students' industrial attachment	0.353	0.198	0.248	0.056	0.219	-0.066	0.298	-0.110
Supervisors do not visit regularly to monitor progress	0.384	**0.539**	0.207	0.332	-0.037	-0.086	0.084	0.155
Supervisors follow up late to make their inputs on students' industrial attachment	0.393	**0.529**	0.224	0.290	-0.119	-0.064	0.123	-0.013
Post attachment seminar for all stakeholders are not usually held to discuss problems students encounter	0.335	0.426	0.171	0.216	0.046	-0.065	-0.021	-0.272
Workplace supervisors are not conversant with programme	0.438	-0.211	0.148	-0.030	-0.020	0.194	-0.136	-0.587
Attachment openings are not declared to students on time to enable them prepare ahead of time	0.454	-0.190	-0.268	-0.051	-0.083	0.354	0.172	-0.201
Orientation for students are organized late for students	0.486	0.019	-0.269	0.001	-0.223	0.321	0.185	-0.214
Welfare issues concerning students are not addressed properly before start of the programme	0.442	0.268	-0.401	-0.228	-0.178	0.266	0.104	0.116
Students' travel longer distances in search for new places whenever their intended places of attachment fail	0.379	0.380	-0.387	-0.317	-0.005	0.033	-0.081	0.190
Some supervisors do not supervise regularly as they travel longer distances	**0.501**	0.283	-0.136	0.159	-0.279	0.147	-0.125	0.102
Students are distracted by undertaking different exercises	0.494	0.009	-0.163	0.037	-0.309	-0.079	-0.358	0.116
I close before the official time since I stay far-off	0.392	-0.433	-0.028	0.356	-0.066	-0.169	-0.242	0.265
Supervision from workplace supervisors is poor	**0.532**	-0.339	0.112	0.143	-0.314	-0.080	0.149	-0.049
I am unable to honour all my schedules because I stay quite far from the place of attachment	0.456	-0.452	-0.294	0.257	0.171	-0.103	0.040	0.115
Students are not supervised by competent professionals	**0.529**	-0.169	0.002	0.277	-0.075	-0.304	0.207	-0.091
Difficulty in getting placement close to my location eventually reduces the time for attachment	**0.495**	0.001	-0.378	-0.045	0.414	-0.275	0.173	-0.077
Reporting in good time each day is a challenge due to distance	**0.505**	-0.074	-0.399	0.159	0.298	-0.166	0.050	-0.050