Screening Indicators for an Improved Faculty Accomplishment

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Abstract

This study determined the indicators for an improved faculty accomplishment based on selected profile (age, the number of years of teaching, performance rating, and salary), Common Criteria for Evaluation or CCE (educational qualification, professional achievements, and academic experience) and Qualitative Contribution Evaluation (QCE) ratings. One hundred percent (160) of faculty with ratings in the NBC- 461 6th cycle comprised the respondent which was evidently adequate as sample based on Kaiser–Meyer–Olkin (KMO) results. The Bartlett's test of sphericity indicates that variables are well-defined for Principal Component Analysis (PCA). The pre-defined indicators were categorized as indexes labeled as Input-Process-Output-Outcome. Results show that change in the Outcome of HE varies depending on the variables involved in the analysis. Considering full data, data with QCE and data of senior faculty, Inputs, Processes, and Outputs significantly contribute towards an improved (Outcome) faculty accomplishment (FA). The analysis on junior faculty (JF), showed that only Inputs and Outputs were significantly affecting change on Outcome of HE. Moreover, the most significantly affecting indicators towards faculty accomplishments are performance rating, age, and number of years of teaching. Then educational qualification followed, next are professional achievement and academic experience, and lastly the QCE.

Keywords: faculty accomplishment, screened indicators, improved accomplishment, pca on achievement, ipoo on faculty accomplishment

1.0 Introduction

Faculty members in State Universities and Colleges' (SUCs) compensation are based on accomplishment. This is articulated in the guidelines of National Budget Circular (NBC) 461. The accomplishment-based promotion system (ABPS) aims to give commensurable pay to quality teachers. The system considers the faculty performance in instruction, research, and extension. To extract more information, this study also considers selected faculty profile such as salary, age, teaching experience, and performance. Its primary purpose is to screen indicators significant on improving faculty accomplishment.

One of the management tools that academic administrators consider to meet external demands for faculty performance and institutional quality is faculty compensation (Bass, 2001). The university can use faculty compensation (which includes salary) as a means to achieve its mission. According to Reece, et. al (2008) accomplishment-based incentive compensation has repeatedly demonstrated effectiveness. Teaching effectiveness

is reasonably important and must attain balance with research and changes in management education (Tang, 1997). However, higher education performance indicators focused more on research and ignored the teaching function (Ramsden, 2006). But uncapped faculty salary reflecting research and education duties (Reece et.al, 2008) with consideration of age and teaching experience (Lackritz, 2004) are necessary to retain high-quality faculty. In fact Rise (2010) pointed out that teachers with more than 20 years (senior faculty) experience are more effective than those with less experience (junior faculty). In addition, Griffin, et. al (2015) said that new teacher's accomplishment and problems are influenced by classroom and school contexts. Al-Hussami, et.al (2011) found that age is significantly related to faculty members' commitment. By consequential effect, this positively associates faculty accomplishment.

The indicators of faculty accomplishment in SUCs are found to be varied like compensation, balancing research and TE, salary, age, teaching and academic experience, professional achievements, and educational qualification, QCE, and CCE. These indicators are not surfaced as to unravel patterns. The patterns may lead to reducing dimensions of indicators without much loss of information. In this case, the role of PCA is crucial in identifying vital indicators. More direct and substantial inputs can be available for accomplishment and compensation plan of SUCs. In order to find patterns among the aforementioned indicators, they were grouped according to dominance and strength (called index) in terms of contribution towards FA. Similarly, more detailed patterns among more experienced faculty and other patterns for the less experienced were investigated. Improved FA paved the way for better compensation. This paper intends to determine new indexes which are linear combinations of selected indicators. Indexes that consider all faculty, more experienced (senior) faculty and less experienced (junior) faculty are considered separately.

2.0 Methodology

This study employs exploratory data analysis utilizing archived data on faculty profile such as salary (S), age (A), performance rating (PR), and a number of years in teaching (YT) at the office of the Human Resource Management Office (HRMO) of SLSU. In addition, NBC 461 6th CCE ratings based on the printout from the NBC 461 Zonal Center (NBC 461 ZC) with detailed results on educational qualification (EQ), academic experience (AE), and professional achievement (PA) of 160 (100%) faculty were included. These faculty members are from the College of Engineering and Technology (CET), College of Teacher Education (CTE), College of Business and Management (CBM), College of Aquatic and Applied Life Sciences (CAALS), College of Agriculture and Environmental Sciences (CAES), Institute of Arts and Sciences (IAS) and College of Criminal Justice (CCJ). The QCE component ratings of the same evaluation period (6th cycle) were also taken. The sampling adequacy was acceptable (Kaiser–Meyer–Olkin (KMO) measure of = 0.755). Therefore, the sample size at n = 160 was highly satisfactory for PCA and that correlation matrix is applicable. Bartlett's test of sphericity X^2= 922.3195, df=21; p=0.000 also indicates that correlation between variables was well-defined for a PCA.

The PCA translates or rotates the axes of multivariate data to fit into their orientation in order to come up with the desired linear transformation (Richards, 1986). To add more

detailed information, cohort characteristics are provided. Using the Minitab, the following were done: (1) Eigen analysis of correlation matrix using the input data sets; (2) running for Scree plot to visually assess which components or indicators explain most of the variability in the data and (3) identifying the dominant components or indicators and creating indexes based on the resulting Principal Components and (4) comparison of the indexes of junior and senior faculty; (5) regression analysis using the created indexes to determine the significantly contributing index towards faculty accomplishment. These analyses consider full model (all faculty), a model for junior faculty and another model for senior

Variables	Details	Measurements
Profile of Faculty	Described in terms of: 1. Age 2. Number of years of teaching experience 3. Performance Rating 4. Salary	 1. Number of years a faculty has lived 2. Number of years faculty has taught a tertiary level institution 3. Average rating of a faculty in the two rating periods in 2016 4. Periodic basic payment per month to a faculty based on the current plantilla position
Common Criteria for Evaluation (CCE)	CCE includes: 1. educational qualification 2. professional achievements 3. academic experience	 1. Points corresponding to a level of education such as: 85-doctorate; 65-master's degree/LLB/MD/Diploma course above bachelor's degree; 45-Four years Bachelor's Degree & 5 points for every year above 4 years. 2. Total points earned from inventions, discoveries, creative works, research results and innovations, published books, published research outputs, instructional materials developed, expert services, membership in professional organizations, academic honors/awards, scholarships, community outreach and professional examinations/ skills certification passed. 3. Total points earned for every rating period (3 years) with the following details: 1-for every year of experience in a tertiary institution and 0.75 for service in public or private research institution; 3-for every year of service as President; 2.5-Vice President, 2-Dean, 1.5-Program Chair/Department Head/Unit Head, etc.
Qualitative Contribution	QCE is a validating factor of CCE which includes: 1. Commitment	QCE rating is the weighted rating across these different raters: Supervisor-30, Peer-20, Students-30 and Self-20. Evaluation is done every semester and average of the 6

3.0 Results and Discussion

Table 1 presents the cohort characteristics of the faculty respondents. These are presented as frequency and percentages, or using descriptive statistics (mean ± SD).

Table 1. *Cohort Characteristics*

Cohort Characteristics	Junior Faculty		Senior Faculty	
	f	Percentage	f	Percentage
Educational Qualification				
Doctorate Degree	16	12.90	2	5.56
Master's Degree	85	68.55	17	47.22
Baccalaureate Degree	23	18.55	17	47.22
Total	124	100.00	36	100.00
Academic Experience	11.5 ± 5.74		23.56 ± 1.71	
Professional Achievement	32.52 ± 18.93		47.37 ±16.27	
CCE	114.03 ± 36.16		145.76 ± 23.65	
QCE	94.89 ± 5.42		97.15 ± 2.76	
Salary (In pesos)	39,789.18 ± 20,072.30		54,321.92 ± 22,962.26	
Performance Rating	4.18 ± 0.62		4.31 ± 0.22	

The respondents of this study are composed of junior and senior faculty wherein the former are mostly master's degree holders (68.55%) while the latter are either master's or baccalaureate degree (47.22% for each). Generally, the senior faculty has lower EQ than the junior faculty. In terms of academic experience, senior faculty obviously had a higher average score (12.06 disparity) than the junior faculty. For professional achievements, the senior faculty is higher than junior faculty. However, the rate per unit change of academic experience is higher for JF (2.83) than SF (2.01). According to Smock and Stephenson (n.d.), one assistance that SF can provide to JF is the information on the process on to become promoted and tenured in the service. This may be one of the reasons why JF have a higher increasing rate in their professional achievements than SF. In terms of CCE, the same trend was observed with SF (average=114.03 is Associate Professor IV) and JF (average=145.76 is Assistant Professor III). Nevertheless, SD for JF is higher than SF which indicates that if the distribution of points is assumed to be normal, there is a 95% chance that JF will only be one

rank lower than SF (Professor V: μ+2SD=186.35; Professor VI: μ+2SD =193.06). The QCE points have 2.26 disparity in the average in favor of SF. However, JF has higher SD (5.42 vs. 2.76) than SF making the former to possibly reach μ+1SD=100.31 while the later is only μ+1SD=99.91. The average salary per month favors much to SF with a difference of P14,532.74. Lastly, the performance ratings are very satisfactory, both the JF and SF.

Eigenanalysis of Correlation Matrix

The eigen analysis of the correlation matrix (Table 2) shows the eigen values, proportion of variation of the rotated data based on the original data and the cumulative proportions according to the number of principal components. Note that the eigen values represent the amount of variance assigned to each eigen vector.

Table 2. *Eigen analysis of the Correlation Matrix (Full data)*

Eigenvalue	4.2575	1.6147	0.8386	0.5479	0.3736	0.2183	0.1494	0.0000
Proportion	0.5320	0.2020	0.1050	0.0680	0.0470	0.0270	0.0190	0.0000
Cumulative	0.5320	0.7340	0.8390	0.9070	0.9540	0.9810	1.0000	1.0000

Variable	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
EQ	0.335	-0.300	-0.149	-0.791	-0.128	-0.092	-0.236	0.264
Acad Exp	0.405	0.288	0.091	0.134	0.149	-0.803	0.151	0.195
Prof Achvt	0.412	-0.200	-0.157	0.525	0.072	0.265	-0.403	0.501
CCE	0.467	-0.154	-0.126	0.101	0.039	-0.060	-0.294	-0.800
Salary	0.424	-0.247	-0.136	0.052	-0.147	0.244	0.811	0.000
Perf Rating	0.068	-0.440	0.890	0.052	-0.074	-0.033	-0.027	0.000
Age	0.301	0.452	0.283	-0.255	0.616	0.423	0.029	0.000
Years of Teaching	0.248	0.552	0.196	-0.007	-0.740	0.184	-0.118	0.000

The study considers eight variables which are presumed interrelated to each other. These variables are age, salary, performance rating, teaching experience, educational qualification, professional achievements, academic experience, and CCE. They are grouped into indexes according to their numerical strength in each phase of the principal component analysis. Jollifee (2002) reiterated that this analysis is a technique to reduce the dimensionality of a large multivariate dataset. Further, PCA of a data matrix extracts the dominant patterns in the matrix in terms of a complementary

set of variables. Grouping these dominant patterns forms the indexes.

The eigen value assigned to PC1 is 4.2575; four times the variance of the original variables. In terms of between-indicator contrasts, PC1 explains 53.2% of the variation in data rotation with respect to the original data, with the remaining 46.8 percent can be explained by other PCs. The variation of data in the second rotation is 1.6147, almost two times the variance of the original data. In this case, PC2 explains 73.4% of the variation while the remaining 26.6% can be explained by the remaining six PCs.

The Scree plot shown in Figure 1 appears to have an inflection point at component Number 4. This explains 95.4% of the variation of data in the fourth rotation. The dominant variables are CCE, YT, PR and EQ for PC1, PC2, PC3, and PC4, respectively.

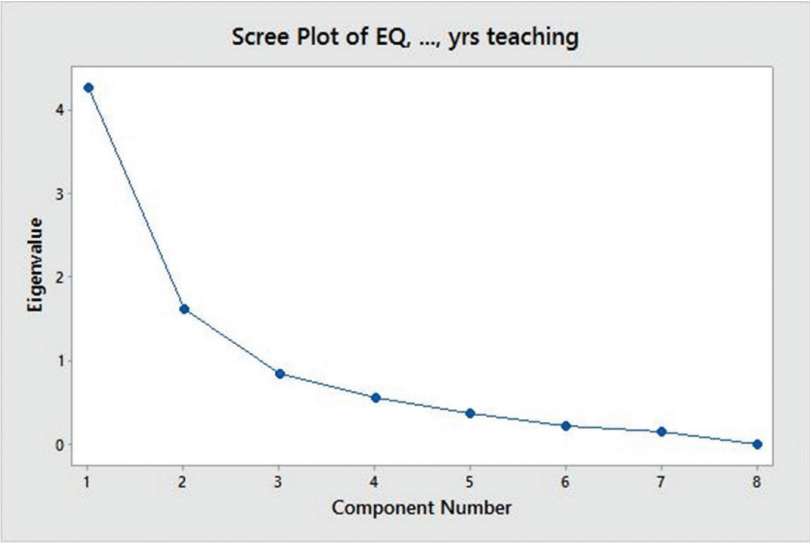

Figure 1. *The Scree Plot of the Full Data*

The Indexes of the Full Data

The loadings on the index of faculty experience and competence (FEC) which is considered as the Inputs in HE were taken from PC2. In this case age, number of years in teaching and performance rating with loadings 0.452, 0.552 and -0.440, respectively, are the included indicators. New teachers are found to be less effective than those experienced in their field of specialization (Harris & Sass 2007; Sass 2007; Kane, Rockoff, & Staiger 2006; Ladd 2008; Clotfelter, Ladd, & Vigdor 2007a, 2007b), although there are diminishing marginal returns to experience (Boyd, et al. 2007). Also, the performance rating is based on the targets that the university has at the beginning of the rating period. These targets served as the steering mechanism and inputs of the university's direction. However, the last variable has a negative contribution towards FEC, i.e, for every unit increase in PR, there is 0.440 unit

decrease in FEC.

Index of Faculty Experience and Competence (The **Inputs** in a Higher Education)

FEC = 0.452A + 0.552YT - 0.440PR

For the index of faculty performance and residency, performance rating, age, and a number of years of teaching were found to be dominant; hence, all the three were considered to constitute the ***Process*** in an HE. It is observed that PR is the most dominant with the highest loading of 0.890. As defined in the Strategic Performance Management System (SPMS) of the university, PR is based on the major final outputs which include instruction, research, extension and support functions. These all project the different practices and process are done in these areas. Thus, the components of PR define the processes in HE added to the age and years of teaching experience which are both propelling mechanisms towards the execution of the processes.

Index of Faculty Performance and Residency (The **Process** in a Higher Education)

FPR = 0.890PR + 0.283A + 0.196YT

The ***Outputs*** of an HE were based on the index of professional and academic achievements. The PA is composed of the outputs in the areas of instruction, research, and extension to mention a few. While academic achievements include EQ and AE which were obtained either before or during employment in the university. As part of the requirement of CMO 52, s. of 2007 and CMO 30 s. of 2004 is the support from the university towards faculty development, thus, may also be considered as the output of HE.

Index of Professional and Academic Achievements (The **Outputs** of a Higher Education)

PAA = 0.525PA + 0.791EQ +0.134AE

The ***Outcome*** of an HE is found to include CCE and salary (both are in PC1). Although this PC contributes 45.5% of the variance of the rotated data compared to the original, this has the highest eigenvalue. According to Dill and Van Vught (2010), HE plays a critical role towards innovation and human capital development. These are necessary to attain success and sustainability of the knowledge economy both in the national and global arena. In this case, CCE which encompasses all the accomplishments of a faculty on patents, discoveries, publications, and awards to mention a few, are contributory to innovation and human capital development. PA is part of CCE and that the salary follows the pattern of CCE.

Index of Faculty Accomplishment (The **Outcome** of a Higher Education)

FAC= 0.467CCE + 0.424S + 0.412PA

The above results imply that faculty members in HE institutions (HEI) tend to use CCE, salary and professional achievement as a basis of their accomplishments. It is worthy to note that CCE components encompass all the accomplishments of faculty. Hence, as Outcome in HE, this calls for the continued support from CHED and even from the Philippine government so that CCE shall be part of faculty promotion in the SUCs.

Regression Analysis of the Full Data Indexes

In this section of the paper, regression analysis of the full data (all respondents) indexes was done

with the Outcome of HE index which is the index of Faculty Accomplishment (FA) as the dependent variable. The independent variables are the other indexes such as Index of Faculty Experience and Competence (Input), Index of Faculty Performance and Residency (Process) and Index of Professional and Academic Achievements (Output). Results of this regression analysis are shown in Table 3.

The regression equation is

$$\frac{\sqrt{FAC}}{11} = -28.657+2.447PAA+126.665\frac{\sqrt{PAA}}{7} +0.011PAA^2 - 0.006\ FEC^2 + 0.011\ FPR^2 + 1.366\frac{FEC}{5};\ r^2 = 32.3\%.$$

The results (Table 3) show that every unit change in PAA contributes positive change in $\frac{\sqrt{FAC}}{11}$, either in the first degree, second degree or a square root of PAA. For FEC2, a unit of its change affects -0.006 change in $\frac{1}{5}$ however; for every $\frac{1}{5}$ change $\frac{\sqrt{FAC}}{11}$, there is a 1.366 change in $\frac{\sqrt{FAC}}{11}$. Also, a unit change in the square of FPR can cause a 0.011 change in $\frac{\sqrt{FAC}}{11}$. Note that both PAA and FPR contain performance or achievement-related factors. The r2 = 32.3% is less than 50%. However, this is the highest among all other r2, especially when each of the predictors was taken one by one or taken any two of them, the maximum r2 is only15.71%. The results show that process and outputs are making significantly positive changes towards the outcome. The input also does, but it tends to lower the effect when it gets higher. It is important to note that both the process and outputs indexes include an A (age) as one of the components, the rest are EQ, YT, PR, and PA.

Eigenanalysis of Correlation Matrix with QCE Results

Faculty members who submitted for NBC 461 evaluation for the first time do not have QCE. In this section, only the data of 133 out of 160 (with QCE) were analyzed to find the dominant variables or patterns. The results of this analysis are reflected in Table 3.

Again the indexes formed were based until PC4 of the PCA results which account 91.6% (cumulative proportion) of the 0.5724 variations of the fourth rotation of data with respect to the original data. The Scree plot shown in Figure 3 appears to suggest to include component Number 4.

Table 3. *Results of the regression analysis of the full data Indexes*

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-27621	3860.0	-7.16	0.000	
PAA	590.2	55.9	10.57	0.000	1.33
FEC	1271	587.0	2.16	0.032	1.33

Table 3. *Eigenanalysis of the Correlation Matrix (with QCE)*

Eigenvalue	3.9636	2.0549	0.9781	0.6750	0.5724	0.3716	0.2333	0.1511	0.0000
Proportion	0.4400	0.2280	0.1090	0.0750	0.0640	0.0410	0.0260	0.0170	0.0000
Cumulative	0.4400	0.6690	0.7770	0.8520	0.9160	0.9570	0.9830	1.0000	1.0000

Variable	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
EQ	0.343	-0.240	-0.053	-0.388	-0.723	-0.005	0.049	0.254	0.284
Acad Exp	0.395	0.275	0.091	0.220	0.086	0.405	0.712	-0.003	0.180
Prof Achvt	0.412	-0.225	0.118	0.039	0.538	-0.096	-0.308	0.331	0.511
CCE	0.480	-0.169	0.078	-0.064	0.107	0.029	-0.019	0.305	-0.791
QCE	0.106	0.355	-0.669	-0.552	0.260	0.191	-0.080	-0.030	0.000
Salary	0.440	-0.222	0.018	-0.093	0.040	-0.230	-0.009	-0.833	0.000
Perf Rating	0.069	-0.338	-0.717	0.592	-0.098	-0.051	0.043	0.054	0.000
Age	0.283	0.450	0.068	0.343	-0.287	0.353	-0.613	-0.112	0.000
Years of Teaching	0.190	0.544	-0.055	0.119	-0.084	-0.780	0.109	0.151	0.000

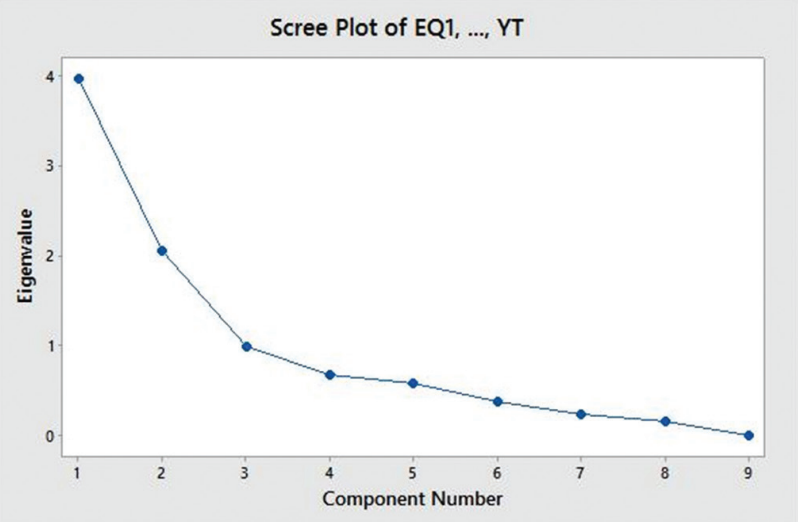

Figure 2. *The Scree Plot of Data with QCE Results*

Indexes of the Data with QCE

The indexes formed in this data set also follows the IPOO Model. As noted, the ***Inputs*** are the academic experience, age, number of years in teaching and educational qualification. Although inputs in HE is heterogeneous according to the National Academies Press, but the mentioned variables can be considered as vectors of capital and labor as inputs. Note that the most dominant factor in this index is the number of years of teaching experience. These indicators are found in PC2 which account 66.9% of the variance of the second rotation with reference to the original data. This variation is two times the variance of the original data.

Index of Faculty Experience and Residency (The **Inputs** in a Higher Education)

FER = 0.355QCE + 0.450A + 0.544YT

Similar to the full data model, the ***Process*** in HE also includes PR (more dominant) and this time with the QCE component. Note that the QCE component includes the faculty performance in the four areas namely Knowledge of Subject Matter, Commitment, Teaching for Independent Learning and Management of Learning, which is all part of the processes in HE. Hence, this is called the index of Qualitative Contribution and Performance (QCP). These dominant variables are found in PC3 which accounts 77.7% of the variation as compared to the original data.

Index of Qualitative Contribution and Performance (The **Process** in a Higher Education)

QCP = 0.669QCE + 0.717PR

The index of Professional and Educational Achievement (PEA) is more dominated by EQ and PA, than the other variables. As stipulated in the guidelines on NBC 461 evaluation, PA reflects the professional developments, achievements, and honors. These form part of the faculty's daily activities in the different areas leading towards discoveries, innovations, patents, IMs development, membership in professional organizations, and professional examinations passed.

Index of Professional and Educational Achievement (The **Outputs** in a Higher Educ.)

PEA = 0.538PA - 0.723EQ

Analogous to the index of FAC for the full data model, the dominant variables are CCE and salary. Both belong to the Outcomes of an HE with a variation of 3.9636, almost four times the variation of the original data. Located in PC1, this records 44% of the variation.

Index of Faculty Accomplishment (The **Outcome** in a Higher Education)

FA = 0.480CCE + 0.440S

Regression Analysis of the Data with QCE Indexes

Data of all faculty with QCE indexes were also subjected to regression analysis. The results are shown in Table 4.

Table 4. *Results of the regression analysis of the data with QCE indexes*

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-17544	11386	-1.54	0.13	
FER	57.1	31.8	1.80	0.08	1.31
QCP	-2.0	173	-0.01	0.99	1.16
PEA	462.4	23.9	19.37	0.00	1.14

Similar to the full data model, the regression analysis of the data with QCE considers the Outcome of HE as the dependent variable. The independent variables are the other indexes such as Index of Faculty Experience and Residency (FER), Index of Qualitative Contribution and Performance (QCP), and Index of Professional and Educational Achievement (PEA). All the three indexes are significantly contributing to the variation in $\sqrt{FA}$ at about 37.40% (Table 4). Hence, the regression equation becomes

$$\sqrt{FA} = 535.825 + 21.747\text{FER} + 4.776\text{PEA} + 0.187\frac{PEA^2}{3} - 0.082\text{FER}^2 - 8.159\sqrt{QCP} - 17.57\frac{\sqrt{FER}^3}{5};\ r^2 = 37.4\%$$

The coefficients tell that $\frac{PEA^2}{3}$ very unit change in PEA, there is a 4.776 change in $\sqrt{FA}$, while 0.187 change for a unit change in $\frac{PEA^2}{3}$. Similarly, a unit change in FER effects 21.747 change in $\frac{\sqrt{FER}^3}{5}$ while negative changes, -17.57 and -0.082, if $\frac{\sqrt{FER}^3}{5}$ and FER2, respectively. Lastly, QCP effected also a negative change (-8.159) in $\sqrt{FA}$. Note that FER (composed of QCE, A and YT) is the Input while PEA (composed of PA and EQ) is the output. For faculty with QCE, results suggest that only inputs and outputs are significantly affecting positive change in FA. These further advocate that an HE may give attention to improving the professional achievements and educational qualifications of faculty. In fact the Civil Service Commission (CSC) and the Commission on Higher Education (CHED) signed a Memorandum of Agreement (MOA) dated August 15, 2013 (MC No. 17, s. of 2013) which aims to strengthen cooperation and coordination in the establishment of an improved qualification standards for all faculty positions in SUCs. Therefore, the process which includes EQ in addition to professional achievements is vital. Besides, support on improving the different areas of instruction such as knowledge of subject matter, commitment, teaching for independent learning and management of learning is also worthy to consider for these compose the QCE. Also, age and years of experience are needed to improve FA.

There is consistency of the regression analyses results of full data and data with QCE only. Both affirm that inputs, process, and outputs are all contributing to the outcomes in HE, beyond 1% level of

significance.

Experience matters as it is gained overtime. It enhances knowledge, skills and work productivity (Sass, 2010). To have a deeper analysis, a t-test was done to compare the index of FA of the junior and senior faculty. Results show a highly significant difference in favor of the senior faculty (μ=22854.1757; SD=9727.45767 vs. μ=14442.9650; SD=4974.71542; t=-5.064; p=0.000). Thus; indexes for each group was determined to identify significantly contributing index towards FAC.

Indexes of Data for Junior Faculty

Results of the eigenanalysis correlations are presented in Table 5. Similar to other eigenanalysis, this contains eigenvalue, proportion of variation of the rotated data based on the original data and the cumulative proportions according to the number of principal components.

Table 5. *Eigenanalysis of the Correlation Matrix for Junior Faculty*

Eigenvalue	3.8612	1.6561	0.8884	0.6545	0.4809	0.3099	0.1489	0.0000
Proportion	0.4830	0.2070	0.1110	0.0820	0.0600	0.0390	0.0190	0.0000
Cumulative	0.4830	0.6900	0.8010	0.8830	0.9430	0.9810	1.0000	1.0000
Variable	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
EQ	0.331	-0.274	0.119	0.807	-0.042	-0.103	0.245	0.278
Acad Exp	0.388	0.328	-0.069	-0.190	0.180	-0.798	-0.005	0.176
Prof Achvt	0.431	-0.180	0.117	-0.493	0.029	0.362	0.344	0.524
CCE	0.492	-0.144	0.105	-0.086	0.045	0.026	0.316	-0.785
Salary	0.448	-0.244	0.101	-0.023	-0.140	0.087	-0.838	0.000
Perf Rating	0.050	-0.396	-0.897	-0.057	-0.153	-0.081	0.052	0.000
Age	0.252	0.486	-0.357	0.231	0.570	0.428	-0.107	0.000
Years of Teaching	0.213	0.558	-0.117	0.074	-0.772	0.150	0.079	0.000

The created indexes consider until PC4 of the results as also supported by the Scree plot (Figure 3). Just like the other analysis in creating indexes, academic experience, age and number of years in teaching are considered ***Inputs*** to HE for junior faculty. These are located in PC2 which explains 69% (cumulative proportion) of the variation of FAC with the remaining 31% can be explained by the other PCs. The eigenvector value (1.6561) suggests that the variation of data in the second rotation is almost twice the variation in the original data.

Index of Faculty Experience and Residency (The **Inputs** in a Higher Education)

FER = 0.328AE + 0.486A + 0.558YT

Meanwhile, the index of FPR is solely focused on the performance rating (Process). Again PR measures how far the junior faculty implemented the different academic and non-academic processes measured in terms of the MFO 1 in the SPMS. As presented, for every unit change in PR, there is a corresponding 0.897 unit change in FPR. This is found in PC3 which justifies 80.1% of the variation with eigenvector value of 0.8884. For the junior faculty, PR appears to be a necessary indicator of the process in HE. This is somewhat a different view as compared to the indexes of the full data (which includes age and years of teaching in addition to PR) and data with QCE (which includes QCE in addition to PR), both include the junior and senior faculty members.

Index of Faculty Performance Rating (The **Process** in a Higher Education)

FPR = 0.897PR

In terms of Outputs, the junior faculty members have similar dominant variables namely PA and EQ, with the other faculty in the full data model and data with QCE (located in PC4).

Index of Professional and Educational Achievement (The **Outputs** of a Higher Educ.)

PEA = 0.493PA + 0.807EQ

Finally, the Outcomes of an HE is described by the similar index components (FAC) with the addition of PA. These are found in PC 1 which account 48.30% of the variation as compared to the original data with an eigenvalue of 3.8612. In other Outcome indexes, only CCE and S are dominant. But for junior faculty data, PA is also an important component.

Index of Faculty Achievements and Compensation (The **Outcomes** of a Higher Education)

FA = 0.431PA + 0.492CCE + 0.448S

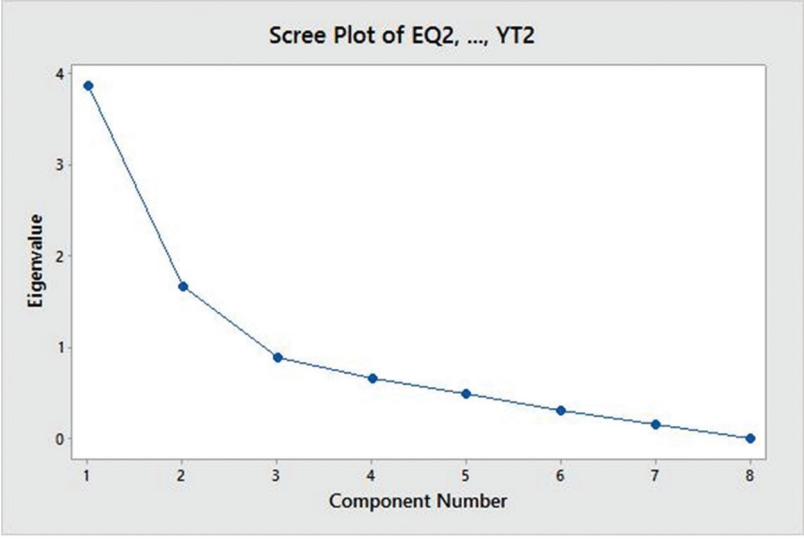

Figure 3. *The Scree Plot of the Data for Junior Faculty*

Regression Analysis of the Data with Indexes for Junior Faculty

The regression analysis for data with indexes for junior faculty considered Outcome as the dependent variable. Results are presented in Table 6.

Table 6. *Results of the regression analysis of the data with indexes for Junior faculty*

Term	Coef	SE Coef	T-Value	P-Value
Constant	219255.208	16672.947	13.150	0.000
FER	94.047	16.552	5.682	0.000
FPR	3634.260	224.555	16.184	0.000
√PEA	-55345.748	3897.274	-14.201	0.000

Again, the regression analysis results considering the index of FAC as the dependent variable are shown in Table 6. Among the three indexes, FER and PEA are significantly contributing beyond 1% (p=0.000) to the variation in FAC at about 90.5%. The regression equation excludes the index of FPR. Results reveal that only the inputs and outputs have direct change effect towards an outcome in HE. According to Garvin (1998), processes encompass different tasks and activities which transform inputs into outputs when all are taken and worked together. Thus, results may further suggest that the processes in HE necessitate revisiting to make them aligned with the inputs and intended outputs.

$$FA = 219255.208 + 94.047FER + 3634.260PEA - 55345.748\sqrt{PEA};\ r^2 = 90.5\%$$

Indexes of Data for Senior Faculty

The indexes created for senior faculty are based on the results reflected in Table 7 which considers up to PC 4 as based on the Scree plot shown in Figure 4.

Table 7. *Eigenanalysis of the Correlation Matrix for Senior Faculty*

Eigenvalue	4.1257	1.7653	1.2367	0.7178	0.5591	0.2828	0.2389	0.0737	0.0000
Proportion	0.4580	0.1960	0.1370	0.0800	0.0620	0.0310	0.0270	0.0080	0.0000
Cumulative	0.4580	0.6550	0.7920	0.8720	0.9340	0.9650	0.9920	1.0000	1.0000
Variable	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
EQ	0.381	-0.123	0.294	-0.018	0.596	0.474	0.069	-0.235	0.336
Acad Exp	0.122	-0.611	-0.163	-0.454	-0.185	0.170	-0.541	0.142	0.056
Prof Achvt	0.442	-0.014	-0.060	0.287	-0.356	-0.396	-0.148	-0.359	0.533
CCE	0.478	-0.108	0.074	0.157	0.000	-0.055	-0.111	-0.338	-0.775
QCE	-0.242	-0.001	0.716	0.164	0.153	-0.303	-0.524	0.112	0.000
Salary	0.443	-0.132	0.133	0.330	-0.114	0.043	0.189	0.781	0.000
Perf Rating	0.219	0.219	0.512	-0.633	-0.391	-0.028	0.295	-0.033	0.000
Age	-0.136	-0.655	0.091	-0.073	0.209	-0.494	0.495	-0.080	0.000
Years of Teaching	-0.309	-0.324	0.279	0.381	-0.501	0.498	0.161	-0.228	0.000

The ***Inputs*** in an HE for senior faculty is similar to junior faculty. These inputs include AE, A and YT. The most dominant are age followed by academic experience and the number of years in teaching. These are located in PC2 which explains 65.5% (cumulative proportion) of the variation of FAC with the remaining 34.5% ought to be explained by the other PCs. The eigenvector value of 1.7653 means that the variation of data in the second rotation is almost twice the variation in the original data. Note that all the loadings have negative signs which indicate that when the values of the AE, A, and YT become bigger, FER goes down. However, the negative sign does not change the variance in this particular component.

Index of Faculty Experience and Residency (The **Inputs** in a Higher Education)

FER = - (0.611AE + 0.655A + 0.324YT)

For the Process in an HE, the senior faculty considered QCE, PR, and EQ to be dominant. There are more indicators found for senior faculty than junior faculty. The QCE which measures the teaching competence and EQ are considered important processes. These are located in PC3 which accounts 79.2% of the variation in the third rotation with an eigenvalue of 1.236.

Index of Qualitative Performance and Education (The **Process** in a Higher Education)

QPE = 0.716QCE + 0.512PR + 0.294EQ

The index of AEP which describes the Outputs of an HE includes AE and PR. These are different from the components in data for junior faculty which is composed of PA and EQ. These are found in PC4 which explains 87.2% (cumulative proportion) variation. In this index, PR is more dominant than AE. However, it is observed that among the data set being analyzed, only the senior faculty results differ on Output. The others contain PA and EQ, plus AE for the full data.

Index of Academic Experience and Performance (The **Outputs** of a Higher Education)

AEP = -0.454AE + 0.633PR

In terms of Outcomes of an HE, the index of FA is composed of PA, CCE, and S. This a bit different from the other results being added by PA, which is not found in the other Outcome index. These loadings are found in PC1 which explains 45.8% of the variation.

Index of Faculty Accomplishment (The **Outcomes** of a Higher Education)

FA = 0.442PA + 0.478CCE + 0.443S

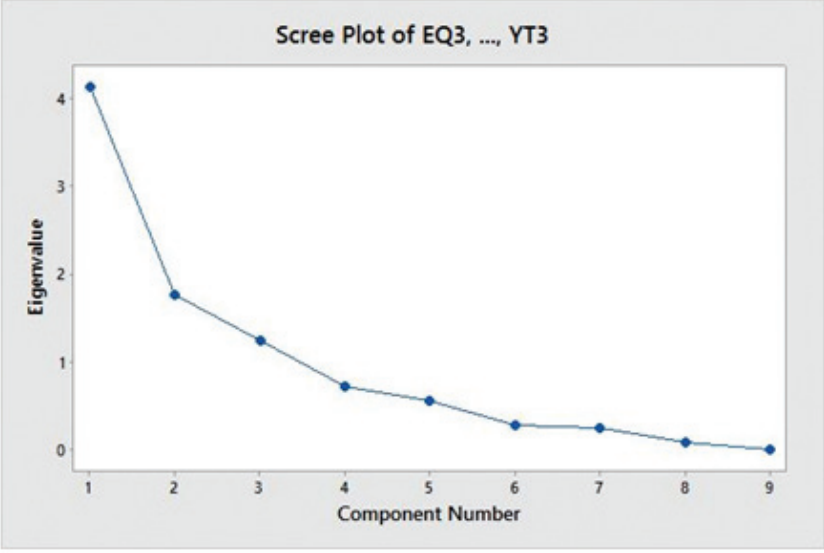

Figure 3. *Figure 4. The Scree Plot of the Data for Senior Faculty*

Regression Analysis of the Data with Indexes for Senior Faculty

Similar to the regression analysis for data with indexes for junior faculty, data for senior faculty considered Outcome as the dependent variable as reflected in Table 8.

Table 8. *Results of the regression analysis of the data with indexes for Senior faculty*

Term	Coef	SE Coef	T-Value	P-Value
Constant	318.022	88.020	3.613	0.000
QPE	9.007	1.424	6.324	0.000
FER	4.886	1.445	3.380	0.001
√FER	57.641	18.386	3.135	0.002
√QPE	-124.539	20.139	-6.184	0.000
AEP2	0.664	0.096	6.926	0.000

Results reveal that all indexes significantly contributed to the variation in $\sqrt{FA}$ (Outcome). For every unit change in FER (input), QPE (process) and AEP2 (output), there is an expected respective increase of 4.886, 9.007 and 0.644 in the outcome.However, including a unit change in $\sqrt{QPE}$(Process) can decrease the outcome by 124.539. All of them are significantly contributing ($p<0.01$) to the variation in $\sqrt{FA}$ at about 57.3%. The regression equation is

$$\sqrt{FA} = 318.022 + 9.007\text{QPE} + 4.886\text{FER} + 57.641\sqrt{FER} - 124.539\sqrt{QPE} + 0.664\text{APE}^2,\ r^2=57.3\%$$

It should be noted that the outputs and process are positively contributing to the outcome but not the input. Although all the three are significantly affecting change to the outcome but one-fifth of the last indicator is of opposite change effect (negative).

4.0 Conclusion

Within the limits of this study, effecting change towards the Outcome of HE varies depending on the variables involved in the analysis and on the teaching experience of the faculty. However, three out of the four categories (full data, with QCE and senior faculty) were found to have Inputs, Processes, and Outputs to effect change on the outcome. Meanwhile, the analysis of data with junior faculty surfaced inputs and outputs only to effect change on outcomes. This means that the process component which takes care and monitors the process implementation and potential procedural barriers was not found to affect change in junior faculty accomplishment. There may be a need for adjustments or revisions of both the academic and non-academic processes of the university. A more focused concern is on the processes directly related to PR (the only variable involved in the Processes in HE for junior faculty) variable like SPMS. The actual data fits into the theoretically modified model particularly for full data, with QCE and senior faculty. However; Processes do not significantly contribute to a change in the faculty accomplishment for junior faculty. Moreover, the indicators which most significantly affect change towards faculty accomplishments are performance rating, age, and number of years of teaching. Then educational qualification, followed by professional achievement and academic experience, and lastly the QCE.

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