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Psychological tool/scale development used in scientific quantitative research

Abstract

Employees policy implementation compliance scale (EPIC Scale) was developed after reading existing literature on Quality Assurance Policy, social and public policies and examining challenges of implementation. The researcher used expert penal review 33 pool items were reduced to 27 items which were tested during pilot study and finally 16 items remained for section B. The objectives of publishing this article are two; first to explain three major phases of developing a standardized questionnaire, and the second objective is to provide a basic tool to be used in testing policy compliance among employees in public organizations and communities. The Pearson correlation was used to establish the strength relationship between variables hence illumination of some variables (items) was possible. The one way ANOVA was used to establish pool items to be retained on the scale by considering mean square, f test and significance. However, some items with low f test value were retained depending on existing literature providing that they are significant. The items with *were reserves scored to avoid guess work and any other can still be reserve scored. The developed tool was applied in data collection after being tested and retested to establish reliability and validity. The major constructs were knowledge, negotiation, empowerment and perceived service delivery. The authors in this article analyzed PRES and OPTION scales that had constructs like decision making, negotiation and empowerment. The difference exist in the parties involved in the study where by patients and clinicians one provides service to the other while in EPIC Scale, employees take responsibility of the employer in providing service to the external clients.

Keywords: scale development, policy implementation and policy compliance, community level, employers, teaching staff, kitchen scale, business, handbook or drafts, private and public, protocol

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Abbreviations: IUCEA, inter university council of east Africa; NCHE, national council for higher education; CVI, content validity index

Introduction

Employees' policy implementation compliance remains a challenge in most developing countries since policy formulation process has been identified to be with gaps not well addressed. The reasons for failure to implement policies include among others domestic political realities, mismatches between the pattern of costs and benefits overtime or limited technical expertise or institutional capacity.[1] Stakeholders or policy implementers are never involved during policy formulation hence policy knowledge gaps affects implementation process.[2] Factors to be considered for knowledge are purpose of institutions, purpose of policy, theories, mission of organization, procedures of policy formulation, clear practices, and guidelines.[8] Participation or involvement of employees in decision-making has got two major purposes; to increase employees' motivation and commitment. The employees' knowledge and skills are channeled to increase productivity and efficiency in the organization or industry.[3] Each institution is expected to develop quality assurance policy which is publically available for purpose of acquaintance.[4] Unfortunately some institutions of higher learning have established quality assurance offices without formulating overall institutional policy on quality assurance which should be publically available to employees.[5] Policy formulation has to include all stakeholders' thoughts and it is most importantly taken at higher strategic level in the organization. Its implementation and benefits are seen evident at community level.[6]

The purpose of this article is to present procedures through which EPIC Scale was developed to measure employees' policy implementation compliance in universities of Uganda. Quality assurance policy has been adopted with assumption that each member state in East Africa Community where Inter University Council of East Africa (IUCEA) operates with mandate to implement international Quality Assurance Policy aiming at continuous improvement of university education globally will be effective. National council for Higher Education (NCHE) in Uganda is providing technical assistance to help universities in the country to implement the policy so as to establish institutional quality assurance system and policies that will aid a culture of continuous quality improvement.[4–7] This study has got a dual purpose to provide more literature on quality assurance policy implementation process and encouraging employees, university top management administrators to enhance team building in providing quality university education to the Global community.[8] The study has therefore provided major improvement tools for participating universities to mirror their compliance level in implementing Quality Assurance Policy. Employees interact directly with institutional clients more often than university administrators (employers) in top management positions hence employees (teaching staff) are the face of university quality assurance.[9]

Background of the EPIC-16 item scale

Employees face a challenge in policy compliance where knowledge gaps existence about policy formulation and implementation procedure.[2] The more positive attitudes are perceived about policy implementation the more likelihood employees' compliance will be observed.[10] Perception influence attitude change hence new behaviour development is due to perceived knowledge.[11,12] Measurement of policy compliance can depend on constructs like knowledge level or understanding the policy, negotiation among parties involved in decision-making, empowerment of actors or implementers and compliance can be observed through perceived service delivery to the clients.[13] The EPIC scale was developed underscoring the four major constructs; knowledge level of the policy, negotiation on employees' involvement, empowerment in decision making and perceived service delivery. These major constructs had latent constructs that made the 16 items in section B of the scale. Involvement and participation are used synonymously to explain employees' active engagement in performing duty that promotes productivity within a firm. Employees' involvement or participation in decision making is evidence of management recognizing employees' ability to perform and increase returns to the firm. Employees' participation is the most important factor of success in modern companies and organizations.[13] Employees' empowerment is yet another construct that shows that employees are more engaged in running business, employees and management recognize that many obstacles can be avoided by jointly serving clients with quality products and service.[9–13]

The scales of Booker and Kitchen developed in 2006 and 2010 investigated "Employees Intentions to Comply with policy" and Kielstra investigates policy implementation in companied.[10–14] The Booker & Kitchen scale investigated the intention of employees' compliance on security policy in industry type of organization in United States while Kielstra investigated using online survey challenges of companies' efficient policy implementation. Booker & Kitchen 2010 scale was capturing individual's intentions to comply with security policy during their employment period while EPIC scale targeted individuals' compliance to a policy implementation at institutional level to cause education or community reform in improving quality of service. The question of how effective the policy was investigated in this study as human participants or respondents attempted item 04 in section B and section C of the tool to provide their personal view on the policy implementation item iii as it requires employees to identify values added in institution due to introduction of quality assurance policy. Quality Assurance policy is both a system and a policy.[7–15] Internal Quality assurance evaluation reports and external quality assurance evaluation reports provides a platform for improvement as they are reviewed by the teaching staff and administration. The challenge of staff (employees') complaints that they do not understand university policy formulation procedure is bottleneck in the implementation process as pointed out by Kielstra[13] that poor implementation is a widespread and damaging to a large majority of companies in the world today. Hence competiveness is impossible.[2–14] EPIC 16 Item scale tries to capture item 07 in section A, item 02 & 03 in section B and item i in section C to establish employees knowledge of policy formulation and hindering factors implementation since it has been identified to be Global problem in organizations both private and public.[14] The knowledge gap was identified by 81.1% where employees do not access the policy handbook or drafts.

Comparing Kielstra[13] with Kibalirwandi[10]; EPIC- 16 item scale, Kielstra[13] was considering means of efficient policy implementation in private and public companies while EPIC- 16 item scale is targeting employees' policy implementation compliance in institutions to provide continuous improved quality services. The scale of Kielstra looks mostly on administration of policy makers who in this case are top management officers in organization both private and public. Respondents were pinning down top management and the process of policy implementation in organizations all over the world. Kibalirwandi 2017- EPIC -16 item scale directly considers users of the policy in implementation process who at a large extend are lecturers (teaching staff) and some of the top administrators who are actively teaching staff despite management positions in organizations. The EPIC scale is used to test compliance of individuals who directly benefit from its implementation as proposed at international, national and institutional levels. The methodology used during data collection differ because the two scales (PRES and OPTION) used online interviewing and respondents did not see the researcher or research assistants hence most of the respondents ideally declined from the study without completing the survey.[10–14] The EPIC scale has both quantitative and qualitative sections and can be administered directly using hard copies or electronic online approach. The researchers used informed consent during recruitment of participants who were direct beneficiaries of the policy and implementers.[11] The EPIC scale was further supported by section C which allowed individual participants to write down their opinion which provided support evidence for policy implementation.[23–24] This study aimed at policy compliance as a major outcome basing on the four major constructs; knowledge level or cognitive level, negotiation on involvement, empowerment in decision-making and perceived service delivery as a holistic indicator for policy compliance since policy aims at quality service delivery.[15]

Methodology in psychology tool development

The EPIC scale development took three phases as recommended when developing PRES (Pregnancy- related empowerment scale).[16] Three major phases of developing the scale were used and constructs were identified as in this study. Hinkin also gives the guidelines on how to develop measurement scales for survey.[17] Option scale for shared decision making between clinicians and patients was developed taking similarly procedures as what PRES and EPIC has taken.[2–18] Clinicians were consulted and patients were involved in discussion and development of the OPTION scale. Testing variables Booker & Kitchen used means and standard deviation which this EPIC scale also has used in its discussion part while Hinkin recommended the use of correlation coefficient which this study used in scale development as relationship between factors was taken.[2–19] Finally, this EPIC scale has been used for evaluating staff participation in quality assurance policy implementation in institutions of higher learning in Uganda. Reliability of the tool increases with increasing number of participants in the study however, validity was observed at once during scale development to be 98%. The researcher used five raters in the testing for Content Validity Index (CVI) and raters' percentages were (100+88+96+96+92) while the 16 items in section gave 100% alone and because raters were considering background information items and qualitative question in section C then overall CVI was got to be 0.944 which stands at 94.4%. The scale has so far 0.737 cronbach's alpha where a sample of 42 human participants in partial analysis was consulted and participated in the study.[2] Three significant phases were used in the development of EPIC-16 item scale as detailed

below.[10–17] However, other authors detail these phases into seven.[20] The theoretical basis of establishing items, designing individual items and eliminating poor items process begins as shown in phase 1. In phase II assessment of reliability and validity was done, determining validity of variables, and determining convergent validity is further done and determining divergent validity. Finally in phase III a tool is retested, put to use and finally used as a standardized scale to establish or measure what it purports to measure. These steps are placed into three phases.[10–17]

Phase I: Pool items identification by expert panel

The researcher after chapter one and two of protocol # 160104 approved by MUST-REC, consulted experts who were lecturers at Kasese branch (satellite center) of Bugema University. These suggested pool items that rose to 33 items covering the five objectives, 13 items in the background information of respondents and three qualitative questions to capture in-depth opinion of respondents. These items made the questionnaire to be bulk to 09 pages which was tested and response was good because it had reliability of 0.854 Cronbach's alpha. The constructs were then grouped after consecutive trainings under Mbarara University Research Training Initiative (MURTI) in January 2017 course Instructor was Dr. Akena. The tool was subjected to rigorous screening and major constructs were identified, underlying constructs were also identified and retested to generate the 16-item scale in phase II. As Hinkin, argue that items in the scale should address single issues not double barreled, precisely stated to achieve objectives of the study and some reserve scored items may reduce biasness in avoiding guess work.[17]

Phase II pool item development

The constructed pool items became 27 these were printed on two (2) pages with 07 background items and one qualitative open-ended question. 17 experts were given this tool to respond and gave their opinion on how based it could test staff participation (involvement) in policy implementation. Pool items were accepted to remain 27 as they were, and qualitative questions were to be increased to four (4) while background information items to be 07 but increased options. The statistics were made using the SPSS version 22 and reliability for the 27 items dropped to 0.49 hence some of the items were dropped as their seemed poor in rating. The factor loading and inter- item correction contributed to elimination of 11 items and maintained 16 items for the section B that has 5-point likert scale ranging from strongly agree, agree, moderately, disagree and strong disagree in phase III. As Hinkin,[17] arguably say that rigorous testing of content validity should be done to see if the tool is comprehensive to test what is meant to test. The cognitive value, negotiation, empowerment and perceived service delivery as major construct were tested with latent constructs that that gave 16 major variables. Sections C provided qualitative part of the tool to confirm the argument by providing participant opinion on the policy being evaluated.

Phase III pool item pre-test

The pool items were pre-tested using research community members from Mbarara University of Science and Technology (MUST), and Bugema University (BU) whereby the two institutions made an appropriate sample of the targeted six universities that represents the 22 universities in Uganda that existed ten (10) years before the onset of this study. The recruitment of the experts from research communities depended on employment experience being more than 3 years of teaching service in the university. The researcher presented the tool with research title "An Evaluation of Staff Participation in Quality Assurance Implementation in Institutions of Higher Learning in Uganda". The tested tool maintained 07 items in section A Background information for human participants, 16 items in section B testing policy compliance, and four open-ended questions in section C. The reliability of the questionnaire for section A & B became 0.77 where section B alone had reliability of 0.728 and section C was added for qualitative purpose since experts suggested that some items in section C would help to describe and explain the statistics in Section B. These items in section B sometimes may not follow mathematical expression hence section C has a capacity of giving proper explanations based on participants' opinions. There are some other hidden issues that administration may not be willing to handle in implementing the policy. The reliability dropped compared to the pool items when they were 33 as shown in phase I the reason were of low factor loading of some items were maintained because of their significance. During the pre-testing of the EPIC scale, university dons were suspected to be busy hence they could be attempted to guess and mark everything without reading so the researcher made reverse–scoring in the scale items after running the statistics so that he can avoid guess work by the respondents. Reverse-scoring items were marked with *so that the statistician may be alerted to make adjustment as he/she runs the statistics. This reverse scoring helped in establishing factor loading, and inter-item correlation rating of items.[10]

Presentation of results for the scale development

The data was collected from three Universities where lecturers responded to the questionnaire developed. The total sample for the partial results was 42 participants for the survey. The participants (lecturers or Dons) that were in their middle age between 31-50 years were 81.00% of the lecturers. This age is a productive and stable age group that can concentrate at work once given morale and supported by administrators within the university. The researcher was gender sensitive where 28.6% were females and 71.4% were males this was observed normal since female access to education is being emphasized globally.[11] The factor that adolescent school drop out for girls was previously identified to be high as 91.6%, getting 28.6% female respondents in this study was incredible. The sensitization level was reported to be below 25% by (21.4%) of respondents, almost 50% level of sensitization was acknowledge by (26.2%) while 75% sensitization level was acknowledged by (28.6%) and 100% was acknowledge by (11.9%) and (11.9%) disputed that there is no sensitization among employees. The researcher concluded that 88.1% of the respondents acknowledge Quality assurance policy awareness in Uganda. The 16 items were analyzed to determine the strength of the relationship between variables.[19] Correlation coefficient of all items ranged between -1 to +1 where some had strong and others weak relationship because of QA policy implementation challenges. Knowledge of the policy was not clear to the participant as it was revealed in section C which the researcher used to provide confirmatory evidence to the statistics analyzed in section B. The scale was measuring major constructs; knowledge, negotiation, empowerment and perception (attitudes) of participants towards policy implementation and the magnitude of policy implementation within national institution of higher learning. The expected outcome was to determine the level of policy compliance. The major study was evaluating the staff participation in policy implementation

compliance which was observed from both attitudes of implementers and magnitude as observed basing on the EPIC and checklist provided in the protocol as appendix 4. The use of one-way ANOVA technique determines if there is a significant difference among three or more means.[19] The items in section B were considered significant for EPIC basing on the level of sensitization among implementers of the policy.[1] The difference in means signifies that if within group mean is almost equal to between group means then null hypothesis will not be rejected. In this study the between group mean was greater than the value of within group hence in every construct null hypothesis was being reject and accepting the alternative hypothesis.[19]

ANOVA 1 Factor variance

Total Variance Explained

	Initial eigen values			**Extraction sums of squared loadings**		
Component	**Total**	**% of Variance**	**Cumulative%**	**Total**	**% of Variance**	**Cumulative %**
1	6.272	39.198	39.198	6.272	39.198	39.198
2	4.481	28.006	67.204	4.481	28.006	67.204
3	2.748	17.173	84.377	2.748	17.173	84.377
4	2.500	15.623	100.000	2.500	15.623	100
5	1.050E-15	6.56E-15	100.000			
6	8.13E-16	5.08E-15	100.000			
7	5.82E-16	3.64E-15	100.000			
8	2.65E-16	1.65E-15	100.000			
9	2.23E-16	1.40E-15	100.000			
10	1.59E-16	9.92E-16	100.000			
11	7.68E-18	4.80E-17	100.000			
12	-1.36E-16	-8.47E-16	100.000			
13	-2.55E-16	-1.59E-15	100.000			
14	-3.06E-16	-1.91E-15	100.000			
15	-5.16E-16	-3.23E-15	100.000			
16	-5.89E-16	-3.68E-15	100.000			

Extraction Method: Principal Component Analysis.

Only cases for which level of sensitization on QA = almost 50% are used in the analysis phase.

ANOVA 2 Iteration history for the two dimensional when variables are divided into parts of 8 items each. (ALSCO)

Iteration history for the 2 dimensional solutions (in squared distances)

Young's S-stress formula 1 is used.

Iteration	S-stress	Improvement
1	0.40029	
2	0.37971	0.02058
3	0.37754	0.00217
4	0.37711	0.00043

Iterations stopped because S-stress improvement is less than .001000

Stress and squared correlation (RSQ) in distances

RSQ values are the proportion of variance of the scaled data (disparities) in the partition (row, matrix, or entire data) which is accounted for by their corresponding distances.

Stress values are Kruskal's stress formula 1. For matrix, Stress = .30132 RSQ = .46148

Configuration derived in 2 dimensions

Stimulus Coordinates Dimension

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Table Continued...

Stimulus Number	Stimulus Name	1	2
1	item01	0.8151	1.9093
2	item02	0.7456	-0.564
3	item03	1.2603	-0.5656
4	item04	0.9271	1.0938
5	item05	0.8897	-0.8989
6	item06	-0.6137	0.9887
7	item07	-1.5802	-0.7447
8	item08	-1.3993	-0.922
9	item09	0.2231	-1.5008
10	item10	0.737	-0.9263
11	item11	-0.9574	1.2383
12	item12	1.281	0.7082
13	item13	-1.2808	-0.2513
14	item14	0.6454	-0.8577
15	item15	-1.4022	0.6376
16	item16	-0.2907	0.6553

Discussion and recommendation

The 16 items were analyzed considering level of employees' sensitization on quality assurance policy. While 88.1% of the human participants accepted to be aware of the QA policy, implementation was not appropriately done as items 2, 3, 6 and 9 suggested rejection of hypotheses. This made the researcher to involve in-depth interviews to establish the cause why. Item 01 was accepted to be significant at 0.991 yet the difference in means was great but not due to the policy sensitization because means square between groups was too small than mean square within groups and F test was 0.069 which too was small than 1. The cause was each institution is having good mission, vision and purpose for its establishment. The same idea or interpretation of all items that appear with high significance yet the participants are showing that quality assurance policy compliance is institutionally accepted policy but procedures or system of implementation is lacking due to knowledge gaps, negotiation between policy makers, empowerment hence employees still feel not performing well because of hindering factors mentioned in section C of the tool. Item 02 was policy formulation process is clear to employees. This item had between group mean square greater than the within mean square signifying rejection of the hypothesis that is not significantly related to staff sensitization as shown in Table 1 above. The implication of mean square where between groups is greater than within groups and F test being greater than 1, then each null hypothesis of a variable is rejected and alternative is accepted. The level of staff sensitization variables and items 01, 04, 05, 11 and 12 accumulated less mean square between groups and F test value was less than 1 hence accepting null hypotheses for these factors where a claim that sensitization is ideally related to the institution mission, working environment, staff involvement in decision making, there is clear recruitment and feedback on policies given the similar circumstances respondents were in terms of age, gender, academic qualification, professional ranks, and existing salary scale. Some human participants argued that salary may not be enough to motivate employees but non-wage incentives like lunch meals, house rent, loan schemes, scholarships and promotions in ranks. Motivation of employees or morale is achieved through provision of non-wage incentives as mentioned by respondents in section C of the tool Table 2.

These five items were seen significant hence they were accepted to continue appearing among scale items because existing literature identifies item 01 as significant for institution to have mission and vision. It is within the purpose of Quality assurance policy to help institutions to improve working environment for quality services to students and staff. As the employees negotiate to be rewarded, employers ought to equip them with appropriate tools. Rewards are imperative for any computing institution of higher learning. Employees were regarded to be the first clients to each of the institutions in which the study conducted. The question of recruitment in item 11 was also pertinent according to the literature review yet during data analysis it proved that there was no significant relationship with sensitization or awareness. As this item 11 was analyzed, its' between groups mean square was 0.819 while within groups mean square was 1.238 and F test value was 0.622. Finally item 12 was observed to be less significant as between group mean square was 1.185 while 1.430 within group mean square was greater and f test was got to be 0.787 which is less than 1. This item was retained because feedback on policy issues is paramount in implementation process. Administratively communication gaps should be bridged so as to improve the working environment hence quality service to all stakeholders. Finally, scale was statistically tested and retested to achieve its standardized reliability and validity. The items mentioned to have low F test value or P-value above α were maintained because of their importance basing on the existing quality assurance policy literature[17] However, this tool can deeply explain policy compliance if correlations among items are well interpreted as these 16 items provides sufficient measurements to test policy compliance (Table 3 & Table 4).

Table 1 Knowledge of the policy as understood by the implementers

		Sum of Squares	df	Mean Square	F	Sig.
Institution mission and purpose makes me enjoy my participation	Between Groups	0.27	4	0.067	0.069	0.991
	Within Groups	36.016	37	0.973		
	Total	36.286	41			
policy formulation procedure is clear to employees in this University	Between Groups	10.824	4	2.706	2.339	0.073
	Within Groups	42.795	37	1.157		
	Total	53.619	41			
Employees participate in policy formulation in this University	Between Groups	15.007	4	3.752	2.638	0.049
	Within Groups	52.612	37	1.422		
	Total	67.619	41			

Table 2 Negotiation between employees and employer to allow participation

		Sum of squares	df	Mean square	F	Sig.
Working environment has improved, staff can execute their duties	Between Groups	1.141	4	0.285	0.25	0.908
	Within Groups	42.192	37	1.14		
	Total	43.333	41			
Staff involvement in decision making at all levels is highly encouraged	Between Groups	2.307	4	0.577	0.513	0.727
	Within Groups	41.598	37	1.124		
	Total	43.905	41			
Employee recognition by Management is highly satisfying	Between Groups	11.511	4	2.878	2.032	0.11
	Within Groups	52.394	37	1.416		
	Total	63.905	41			
promotion in professional ranks is well articulated in HR manual	Between Groups	7.777	4	1.944	1.215	0.321
	Within Groups	59.199	37	1.6		
	Total	66.976	41			
This institution ensures job security for employees	Between Groups	10.138	4	2.534	1.567	0.204
	Within Groups	59.862	37	1.618		
	Total	70	41			

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Table 3 Empowerment of employees in decision making so as to implement policies

		Sum of squares	df	Mean square	F	Sig.
Delegation has improved and leadership team is observed within	Between Groups	4.369	4	1.092	1.024	0.408
	Within Groups	39.465	37	1.067		
	Total	43.833	41			
At Department, faculty and Institution level team spirit exist	Between Groups	10.56	4	2.64	2.242	0.083
	Within Groups	43.559	37	1.177		
	Total	54.119	41			
There is clear recruitment procedure for employees in this university	Between Groups	3.668	4	0.917	0.626	0.647
	Within Groups	54.236	37	1.466		
	Total	57.905	41			

Table 4 Perceived service delivery by implementers of the policy to the clients

		Sum of squares	df	Mean square	F	Sig.
Feedback is given on quality assurance and other related policies	Between Groups	3.277	4	0.819	0.662	0.622
	Within Groups	45.794	37	1.238		
	Total	49.071	41			
Access to new technology is embraced and financed by this institution	Between Groups	5.217	4	1.304	0.86	0.497
	Within Groups	56.117	37	1.517		
	Total	61.333	41			
Staff morale in executing duty for productive work is high	Between Groups	4.243	4	1.061	0.997	0.422
	Within Groups	39.376	37	1.064		
	Total	43.619	41			
The progress on my duty is satisfying in this institution	Between Groups	4.742	4	1.185	0.829	0.515
	Within Groups	52.901	37	1.43		
	Total	57.643	41			
Employees use creative problem solving in handling clients problems	Between Groups	4.611	4	1.153	0.787	0.542
	Within Groups	51.289	35	1.465		
	Total	55.9	39			

Ethical consideration

The study was approved by Mbarara University of Science and Technology-Research Ethics committee (MUST-REC) references MUREC 1/7 and Uganda National Council of Science (UNCST) reference SS-4248 as by August 2016 and March 2017 respectively.

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Conflict of interest

The author declares there is no conflict of interest.

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