

EVALUATION OF SAFETY CULTURE MATURITY LEVELS OF THE UNIVERSITIES IN KENYA

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Abstract

Safety culture is shared and accepted attitudes, beliefs and practices supported by documented policies and procedures in an organization which influences employees' perceptions and behaviors within a workplace. Consequently, analysis of safety culture is vital in institutions in order to identify potential areas of improvement. The objective of this study was to evaluate safety culture maturity levels in universities in Kenya. Data was collected from seven universities where descriptive research design was utilized using simple and stratified random sampling methods. The tools used for data collection included questionnaires, observations and interviews. Similarly, secondary data was collected from universities strategic plans, policies and statutes. The data was subjected to statistical analysis using SPSS 16.0 and excel statistical packages. The results showed that six universities were in the emerging level (level 1) and one was in the managing level (level 2). The sampled universities recorded low average satisfaction levels ranging from 17.2% to 34.8%. The employees' perceptions were varied. The means of the key dimensions ranged from 1.90 to 3.68 with the average mean scores ranging from 2.42 to 3.49. Low safety perception on safety management in the universities was established. This was found to be as a result of the identified gaps in safety management systems which included invisible and weak top management commitment, unclear communication procedures, lack of adequate safety training and non-existence of safety rewarding systems. Based on these results, the study recommends an improvement on the identified weak safety management by the universities' management thus improving the employees' safety perception and satisfaction leading to an enhancement of safety culture maturity level. The role of universities top management and leadership in safety culture development in the universities in Kenya should be researched on to identify the weaknesses hampering their poor response.

Key words: Universities, safety culture, safety management systems, perception

1 Introduction

Universities are institutions of higher learning enacted by an Act of parliament and serve as centers of education excellence (GOK, 1989). They handle a large population of employees, students and customers on daily basis and occupational safety is of paramount importance in order to enhance achievement of their objectives. Occupational safety must be a concern of every employee in the workplace regardless of their job position (Pidgeon and O'Leary, 1994). In order to be able for the universities to provide a safe working environment they have a responsibility for ensuring that the work places are safe and risks are as low as reasonably possible (ALARP). Safety in a work place may greatly be influenced by the employees' perception and attitude towards safety management in the work place (Gledon *et al.*, 2006). Perceptions both personal and organizational as well as the environment in which people work in influence the development of safety culture in the organization [(Cox and Cox (1991), HSC (1993), Pidgeon (1991) and Schein (1992).

Safety culture encompasses a healthy and safe environment achieved through everyone understanding of their related responsibilities and compliance with all regulatory requirements and University safety policies. A safety and health program leads to an increase in morale, reductions in workplace near miss incidents, injuries and insurance costs and a positive safety culture. Other benefits of a safety culture include enhanced reputation with stakeholders such as students and parents/guardians, partners, sponsors, industry and community recognition for safe practices and improved business reputation to attract employees and students.

Safety culture commonly refers to values, perceptions, attitudes, norms, beliefs, practices, policies, and behaviors of personnel (Flin *et al.*, 1996). Employees in organizations with a positive safety culture are guided by an organization's wide commitment to safety in which each member upholds their own safety norms and those of their co-workers. Safety culture is increasingly recognized as an important strategy to improving the widespread deficits in safety in the work places (Mearns, *et al.*, 1998).

Previously several researches have been conducted on employees' perceptions and attitudes in various developed and developing countries in diversified fields such as construction industries, manufacturing industries, petroleum industries, aviation industries among other industries. However there are no researches conducted and documented for the Kenyan industries and especially in the learning institutions. Previous studies have shown that differences in industrial settings and different countries may influence the employees' perceptions and attitudes differently, thus the need for this study.

Safety culture was introduced by International Atomic Energy Agency (IAEA) in their report on the Chernobyl nuclear power plant disaster in 1986. The errors and violations of operating procedures which contributed to the Chernobyl disaster were seen by some as being evidence of a poor safety culture at the plant (Lee, 1998). The identification of a poor safety culture as a factor contributing to the accident led to a large number of studies investigating and attempting to measure safety culture in a variety of different high-risk, high-hazard industries for example in steel industries, air traffic industries, offshore industries among others.

Culture of an organization is believed to impact on the organizations safety either positively or negatively (Hopkins, 2006). Over the years several models have been developed to assess safety culture in organizations. The models include IAEA safety culture model, total safety culture model, reciprocal model of safety culture, system model of safety culture, business excellence model of safety culture, safety culture maturity model, and the safety culture ladder models (Fleming, 2001) along with their key dimensions that define safety culture. This study adopted the safety culture maturity model (SCMM) since it's the most appropriate to measure the maturity levels in the universities. The key dimensions in SCMM can easily be compared with the universities activities and

have widely been used previously [(Kao, 2007), (Cox, *et al*, 1997), (Havold, 2007)] to study safety culture maturity in institutions and organizations elsewhere in the world. The SCMM has five interactive stages starting from emerging level (level 1) to continually improving level (level 5) (Figure 1). As an organization progresses from one level to the next, consistency on safety management is also enhanced. If the organization doesn't work on the weaknesses identified in the previous level, it is likely to slide backwards to the lower levels. This therefore calls for consistency in safety management systems being implemented in each level.

The maturity level can be determined from the satisfaction levels of the employees in each key dimension. The key dimensions adopted were management commitment and involvement, safety perception and attitude, safety communication and involvement, safety training and competence, safety supervision and audit, accident/incidence reporting and analysis, safety reward and benefits program (HSE 2001).

2 Materials and Methods

2.1 Research Design

A descriptive research design was employed for this study.

2.2 Sampling Procedure

The current research employed a two level sampling procedure with each level representing institutional category and respondent level respectively.

2.2.1 Institution's Level

The sample was drawn from employees working in seven (7) public and nineteen (19) private universities accredited by Kenya's Commission for Higher Education (CHE) by March 2010. The universities sampled were Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kabarak University, Egerton University, Daystar University, Maseno University, Mount Kenya University (MKU) and Great Lakes University of Kisumu (GLUK).

As highlighted by Mugenda and Mugenda (2003) when determining a sample size in the descriptive studies a 10% of the accessible population was found to be adequate. In this study, a sample size of 40% for the public universities and 20% for private universities of the target population as shown in Table 1 to get a representative sample. The public universities employ more employees than their private counterparts, thus the discrepancies in the sampling proportions.

2.2.2 Respondents' Level

Using the Bartlett, *et al.*, (2001) method of sample size determination of disproportionate nature, total population of the institutions was established to be approximately 5793 employees where a sample size of 598 respondents at 95% confidence level was determined. The sample was distributed proportionately across the universities as shown in Table 2. For confidentiality purposes the sampled universities were coded as PPU001 to PPU007.

The identified sample was further divided proportionately into three strata; senior managers, middle level management and general workers. The senior management was represented by the vice chancellor, deputy vice chancellors and principals in campuses while the middle level management was represented by the Registrars, directors, deputy directors, Deans and heads of departments. The general workers covered all other employees both teaching and technical staff working either permanently, temporary and on contractual basis.

2.3 Research Instruments

Structured questionnaire, observations and interviews were used to obtain data from various respondents. The questionnaires developed were on a five point Likert scale (0-strongly disagree to

5=strongly agree). They were designed to capture the employees' perceptions and attitudes on the current safety culture in the institutions at the time of the study. Secondary data was obtained from safety operation procedures, statutes, strategic plans, general registers and institutions' safety and health policies where available.

2.4 Data Analysis

The data collected was presented in suitable and appropriate analytical methods. Graphs, pie charts and frequency tables were used in the presentation of the bio data of the respondents. The standard deviations and mean scores of responses were used to determine the employees' perceptions towards safety in the universities while the chi squares were used to test the significance of the key elements under this study. The percentages of the satisfaction levels were used in determining the safety culture level of the institutions.

3 Results and Discussion

The study dealt with seven key dimension namely 'Top Management Commitment to Safety' (KD 1), 'Safety Perception and Attitude' (KD 2), 'Incidence/Accident Analysis and Reporting' (KD 3), 'Safety Communication and Involvement' (KD 4), 'Safety Training and Competence' (KD 5), 'Safety Supervision and Audit' (KD 6) and 'Rewards and Benefits programs' (KD 7). The mean scores and standard deviations of the key dimensions were analyzed to determine the employees' perception towards safety in the universities. The percentages scores of the key dimensions were used to measure respondents' satisfaction on safety management which was used to determine safety culture maturity level. The mean is the sum of scores of all the Likert items in question divided by the total number of items. The standard deviation is a standard measure of spread of the responses from the average mean within a variable. A low standard deviation indicates low variation of the data points to the mean while large standard deviation indicates large variation among the responses.

3.1 Employee Perception towards Safety

The means, standard deviations and variances of the key dimensions were analyzed and used to evaluate the employees' perceptions and attitudes towards safety. The mean scores equivalent to 0.1 to 2.50 represented perceptions that were regarded as least acceptable (LA), an implication of non existence of management systems on continuous Likert Scale ($0.1 \leq LA \leq 2.50$). The mean scores equivalent to 2.51 to 3.50 represented perceptions that were regarded as moderately acceptable (MA) implying presence of weak safety management systems on a Likert scale ($2.51 \leq MA \leq 3.50$) while those scores equivalent to 3.51 to 5.0 were regarded as highly acceptable (HA) and represented perceptions that were highly applicable or presence of visible management systems on a Likert Scale ($3.51 \leq HA \leq 5.0$).

The mean scores from the seven institutions were varied across the key dimensions as indicated in Table 3. Key dimension 2 (KD 2), had the highest score of 3.43 in the moderately acceptable ($2.51 \leq MA \leq 3.50$) category on likert scale. The other key dimensions in this category were KD1, KD 3, KD 4, KD 5 and KD 6. This implies presence of weak safety management systems in the universities. The lowest scoring key dimension was KD 7 (2.31) in the least acceptable category ($0.1 \leq LA \leq 2.50$). This was an indication of non-existence of the safety reward and benefit program/scheme in the universities. Of importance to note is that most of the universities had the mean scores in this category except two universities (PPU005 and PPU006).

PPU006 had the best average mean scores of 3.17 which was in the moderately acceptable category implying that the employees perceive presence of weak safety management systems in the university. PPU001 (3.05), PPU002 (2.65) and PPU005 (2.95) were also in this category while the others were in the least acceptable category. In these universities, the employees perceived that there were no safety management systems in place which include safety training, safety supervision, accidents and incidents reporting and analysis procedures among others. Close monitoring of the

implementation of safety management systems in these universities and adherence to set standards would lead to an enhancement of employees' perception towards safety management and would ultimately lead to higher safety perceptions. Similarly, these perceptions and attitudes towards safety management in the institution can be represented in a radar plot as indicated in Figure 2.

The plots of the radar provide a visual representation of employees' perception and attitudes towards safety in the institutions. Each of the dimensions represented on the radar plot was scored on a standardized mean scale of 0 (centre) to 5 (outermost point of the spike). The seven spokes on the radar represent the seven key dimensions of the study. The connecting lines represent the standardized mean scores. A low standardized mean score represents low perception and safety satisfaction while high standardized mean score represents high perception and safety satisfaction. The study revealed the institutions strengths and weaknesses in the seven key dimensions of safety culture. The scores were moderately low giving an indication of low perception of the overall safety management systems in the universities. The highest scored key dimension was key dimension 2 (safety perception and attitude) in all the institutions but with varied mean scores. Similarly there was no statistical difference between university category and employee safety perception and attitudes towards the universities safety management systems ($\chi^2=5.366$, $df=4$, $p<0.05$). This could have been high because it depicted the willingness of the employees to observe safety in their work stations and willingness to enforce safety operation procedures in an effort to make the work place safer. Key dimension 5 (safety training and competency) and key dimension 7 (rewards and benefits) were the lowest scored in almost all the institutions. The low scores in these key dimensions were due to low levels of employees' safety training and awareness and lack of a rewarding and/or punishment system for safe and/or unsafe behaviors. There was a statistical difference between the university categories and safety training and competency ($\chi^2=48.010$, $df=4$, $p<0.05$) giving an indication of the existing gap in safety training between private and public universities. Similarly there was no statistical difference between the university category and rewards and benefits programs in the universities ($\chi^2=11.315$, $df=3$, $p<0.05$), an implication of non-existence of rewards and benefits for unsafe and safe acts within the universities. Lack of such programs leads to lack of motivation and incentives for the employees safety performance which in turn leads to low safety perception thus low safety culture maturity levels.

3.2 Safety Culture Maturity

The universities safety culture maturity level was measured using the percentages of the employees' level of satisfaction in the seven key dimensions. Based on previous studies by Kao (2007), the level of satisfaction of the respondents was used to compute the level of the institutions safety maturity. The emerging level ranges from 0-28.5 scores on satisfaction levels, managing from 28.6 – 45.5 % scores on satisfaction levels, involving from 45.6-55.5% scores on satisfaction levels, cooperating from 55.6- 65.5% satisfaction levels scores and continually improving from 65.6 – 100% scores on satisfaction levels. Low satisfaction score depicts low safety culture maturity level while high satisfaction score depicts high level of safety culture maturity.

The satisfaction levels were computed from the Likert scale scores in each of the key dimensions where strongly agree (SA) and Agree (A) were summed up and percentages calculated for each key dimension for all the universities as indicated in Table 4.

From the analysis, key dimension 2 (safety perception and attitude) had the highest satisfaction level in all the universities and was the only key element which was above maturity level 3 (Involving). This depicts the desire of the employees to be involved and consulted in development of safety management systems in the universities. However, the best scoring university was PPU006, which had at least four key elements above level 1. This was also evidenced by the fact that this is the only university which has safety drills and safety briefings and also conducts self safety risk assessments.

Key dimension 1 (top management commitment), was in the emerging level, all scores in the universities below 28.5%. This was an implication of poor top management commitment towards safety management. It was coupled with lack of budget allocation towards safety issues in almost all universities. This creates the need for budget allocation and visible top management commitment in the universities.

Key dimension 3 (Incidence/accident analysis and reporting) had all its scores in the emerging level. This is characterized by non existence and or unclear accidents/incidences analysis and reporting systems and lack of documentation. The study also revealed that none of the universities had a general register where accidents and incidents are recorded. A general register can be obtained from DOSHS after the universities are registered as workplaces. For effective reporting of the accidents and incidences, a shift to workforce involvement in accidents/incidences investigation is encouraged and ensuring timely feedback to the employees. Peer safety tours across departments and maintaining good practice data base can play a great role in encouraging timely accidents/incidents reporting.

Key dimension 4 (Safety communication and involvement) had its scores in the emerging level (level 1) except in PPU006. This was the only university which had safety marshal (representatives) who conducts safety briefings once every week and when there are safety issues. In this university, safety communication is through memos and departmental/section briefings by safety marshals. The other universities didn't have safety communication methods or techniques and if they are there, the respondents were not aware of them. However, PPU002 and PPU001, some of the respondents indicated that safety was communicated through memos. Safety communication and employee involvement in safety management can be improved by improving employee participation in safety management in order to reveal the barriers (deficiencies in SMS) that inhibit or frustrates safe behavior and then address them. Increment in employee participation will improve on management-employee relationship which will lead to mutual trust development which of course translates to improved communication.

All the universities had key dimension 5 (safety training and competency) in safety culture maturity level 1 (emerging). Though some responses indicated that they had received training in safety issues, the training received was not sufficient. From the analysis where only 36.2% of the respondents had received some form of safety with majority of them (23.1%), trained on fire safety. General safety training which gives the trainees an overview of occupational safety and its management had 5.3% of the respondents trained on it.

Safety training is one of the key pillars in effective safety management systems. Training and competency of can be strengthened by simply focusing on risk taking behaviors and behavioral safety with a strong emphasis on safety education, setting safety standards and procedures and reinforcing them. Safety induction and safety open days can go a long way in the training aspects. Key dimension 6(Safety supervision and audits), only PPU006 had the element above the emerging level while all the other universities were in the emerging levels. This was an implication of lack of safety supervision and audits in the Universities.

Key dimension 7(safety rewards and benefits), all universities were below the emerging levels with PPU007 having the highest satisfaction score of 28%.This indicates lack of safety reward and benefit program in the institutions. This is a very important aspect in safety culture and safety management because it acts as a motivation to the employees to observe safety in their workplaces. The averages of the satisfaction levels were used to get the universities safety culture maturity level represented by the colored horizontal lines in Figure 3.

As indicated in Figure 3, the institutions safety culture maturity levels were in the L1(Emerging level) except PPU006 placed in L2 (Managing) and had average satisfaction scores of 34.8%. All the universities in this level were characterized by weak and invisible management commitment in safety, poor communication/unclear communication procedures, lack of adequate training of employees, poor accidents and incidences reporting, analysis and documentation, inexistence of safety rewarding system.

PPU006 was the only university in the managing level though its scores were relatively low and almost at the lower border. The strengths of PPU006 would be accounted for by the presence of safety marshals who are tasked with safety management in the institution. The marshals conducts safety surveillane, conducts risk assessment which is task based thus reduction of accident occurrences. The institution also has a safety committee with a safety representative in the management who is the head of the safety marshals group.

The weaknesses noted in PPU006 were poor accidents and incidences reporting system, weak management commitment, low safety training levels, poor safety supervision and inexistence of safety reward/benefit schemes and programs. For improvement to the next maturity level, the universities must work on the weaknesses identified by the study.

4 Conclusions

The findings in this study have shown that the univesrities employee safety perception and safety satisfaction towards safety management was poor. This has been identified as the main causes to low safety culture maturity levels of the universities in Kenya. The levels was foound to be level 1 and 2(the emerging and managing) characterized by poor safety management systems. The weaknesses noted include poor management commitment in safety, unclear communication/distorted communication procedures, lack of adequate training of employees, poor accidents and incidences reporting, analysis and documentation and non-existence of safety rewarding system. This study recommends close monitoring of the performance and implementation of safety management systems in the universities in Kenya by the Directorate of Occupational Safety and Health Services as well as the adherence to the set standards by the employees. All these will work towards provision of a safe working and learning environment.

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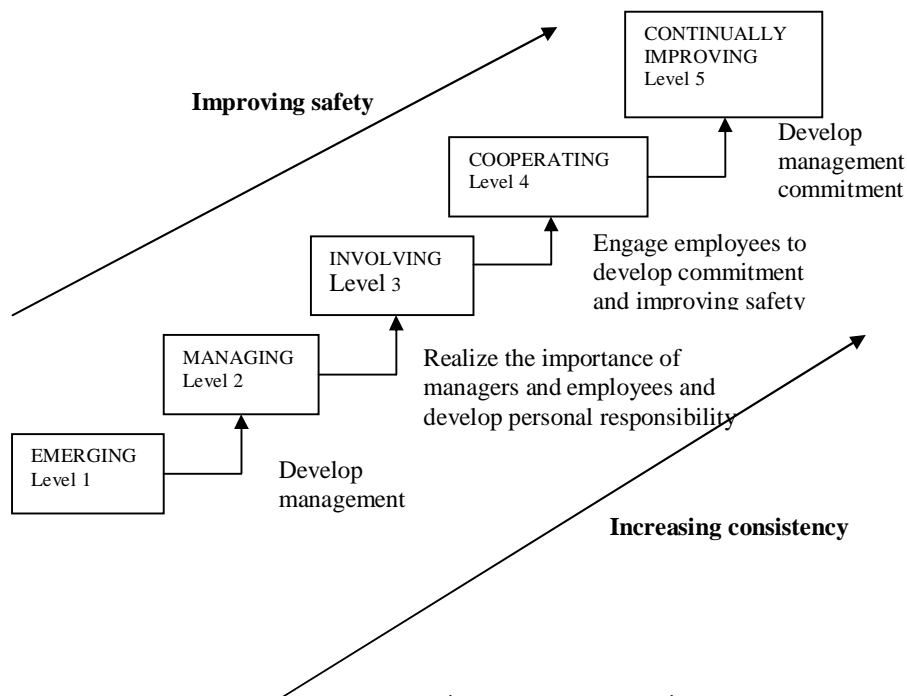


Figure 1: The safety culture maturity model (Fleming et al., 2001)

Table 1: University Category and the number being sampled

S/NO	University category	No. of Universities	No. of universities being sampled
1	Public Universities	7	3
2	Private Universities	19	4
	Total	27	7

Table 2: Sample distribution per University

S/NO	University	Total Population	% of the Total Pop.	Sample size
1	PPU001	180	3.1	19
2	PPU002	1854	32.0	191
3	PPU003	1195	20.6	123
4	PPU004	150	2.6	16
5	PPU005	250	4.3	26
6	PPU006	300	5.2	31
7	PPU007	1864	32.2	192
		5793	100.0	598

Table 3: Mean scores key elements in Universities (n=542)

Description	PPU001 Mean	PPU002 Mean	PPU003 Mean	PPU004 Mean	PPU005 Mean	PPU006 Mean	PPU007 Mean	Average mean scores
KD 1	3.19	2.61	2.27	2.08	2.94	3.26	2.11	2.64
KD 2	3.68	3.21	3.34	3.24	3.32	3.64	3.61	3.43
KD 3	3.29	2.88	2.31	2.56	2.82	3.08	2.45	2.77
KD 4	2.98	2.8	2.25	2.45	2.9	3.11	2.44	2.7
KD 5	2.52	2.27	2.15	2.24	3.06	3.1	2.2	2.51
KD 6	3.18	2.64	2.28	2.1	2.7	3.08	2.43	2.63
KD 7	2.48	2.24	1.9	1.6	2.89	2.9	2.16	2.31
Average mean scores	3.05	2.66	2.36	2.32	2.95	3.17	2.49	

Figure 2: Radar plot for employees' perception and attitudes

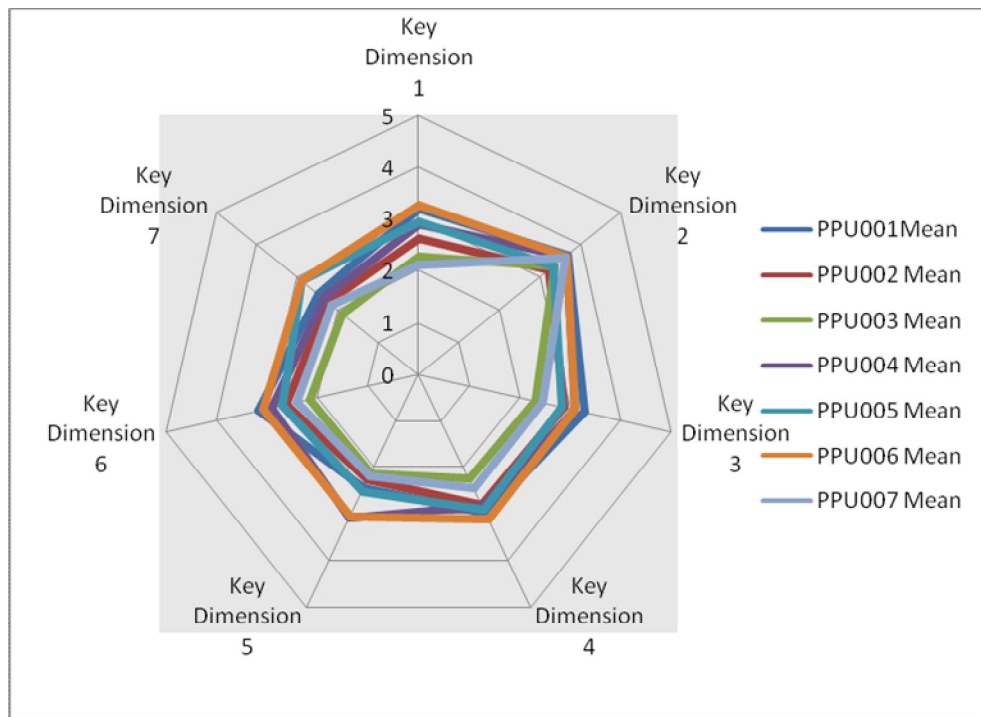


Table 4: Respondents Satisfaction Levels of the Key Dimensions

Key Dimensions	Percentage Satisfaction Levels (%)						
	PPU001	PPU002	PPU003	PPU004	PPU005	PPU006	PPU007
KD 1	22.4	18.9	13.9	6.4	9.6	32.4	22
KD 2	68.5	51.3	68.4	73.8	63.7	65.7	56.8
KD 3	32.7	21.5	12.4	16.8	14.4	22.5	25.7
KD 4	20.5	24.4	12.2	9.3	9.9	40.2	25.8
KD 5	12.9	6.6	2.9	1.8	8.1	27.8	3
KD 6	25.9	10.5	9.2	8.9	9	31.7	13.3
KD 7	15.5	2.7	7.5	3.5	7.5	23.4	28
Total	198.4	135.9	126.5	120.5	122.2	243.7	174.6
Average	28.3	19.4	18.1	17.2	17.5	34.8	24.9

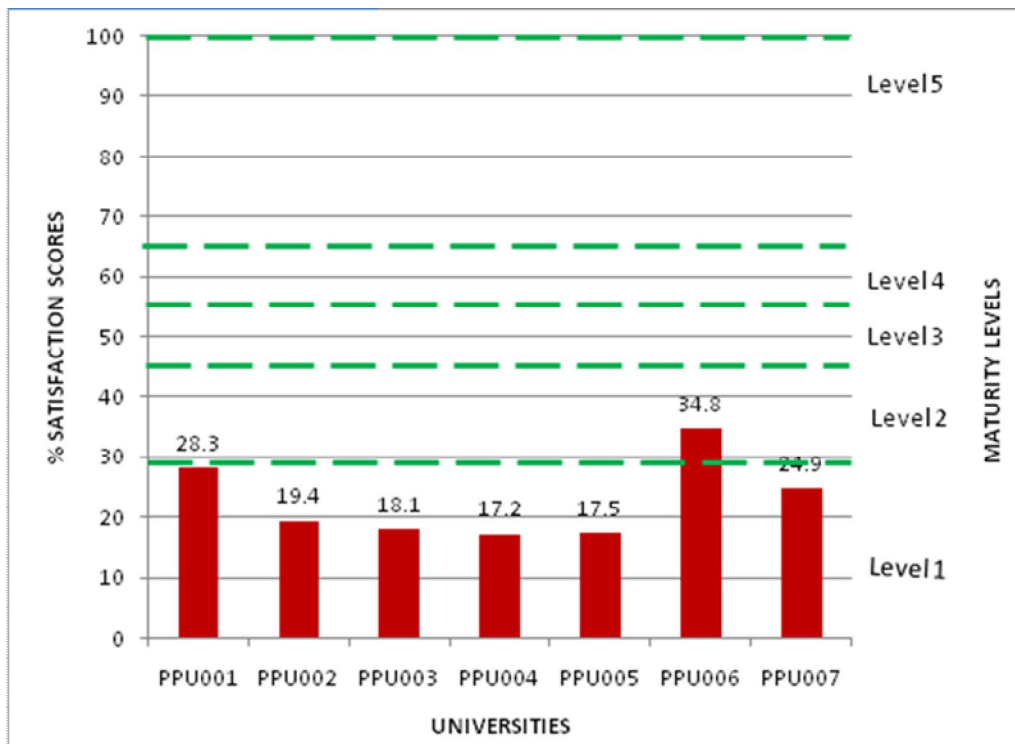


Figure 4: Universities safety culture maturity levels