Status of Engineering Professional Practice in Nepal

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Abstract: Nepal Engineering Council, as engineering profession regulating body in Nepal, was established in 1999, which has completed a decade of its establishment. In this context, this paper has tried to understand the status of practice of engineering profession in one of the politically unstable developing country Nepal. A questionnaire survey of 125 engineers randomly selected was done. Paper discusses various aspects of practice of engineering profession in Nepal.

Keywords: Engineering, Profession, Ethics, Codes of conduct.

1. INTRODUCTION

As an engineering profession (in this paper engineering/engineer covers architecture/architect also) regulating body in Nepal, Nepal Engineering Council (NEC) was established under ***Nepal Engineering Council Act 2055*** on March 11, 1999 and in 2000 ***Nepal Engineering Council Regulation 2057*** was also came into force. This Act and the regulation provide the legal basis for regulation of engineering profession in Nepal.

There is a provision for registering engineers into following three categories:

a. **General registered engineer** – any engineer having bachelor's degree in engineering and desiring to practice engineering profession within the country should apply for registration under this category.
b. **Professional engineer** – any engineer having master's degree or postgraduate diploma in the approved engineering field may apply for registration under this category.
c. **Non-Nepali registered engineer** – Any non-Nepali engineer desiring to work in Nepal should apply for registration under this category. For registration under this category, the engineer should have at least bachelor's degree in engineering and minimum of 10 years experience in engineering field.

The engineers are required to take oath of maintaining honesty, loyalty, and to be dutiful towards the engineering profession before receiving registration certificate from the council, and as moral guidelines, the council has prepared and implemented code of ethics. Nepal Engineering Council has registered 19,066 engineers (including 18 non-Nepali engineers) in more than 40 engineering disciplines by the end of June 2012 and no engineer so far has been registered under professional engineer category. Establishment of NEC has crossed a decade, and in the above-mentioned background, an attempt has been made to understand the status of engineering professional practice in the country, which could help understanding the status of practice of engineering profession in one of the politically unstable developing country Nepal.

It is a fact that "there are differences in many aspects of life in different communities, including inequalities of economic and educational kinds, and the reflection of these in economic and political stratification to the point of the dependency of some nations on the support of others".[i] In this regard, this paper helps NEC in particular and similar institutions in other developing countries in framing their future strategic direction as well as to other persons/institutions having interest in engineering professional practice to understand what is happening in other part of the world. Most importantly, this

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study being the first in this area, this provides a baseline in future for monitoring progress of professional development in engineering profession in Nepal.

2. METHODOLOGY

A questionnaire was developed and 25 undergraduate engineering students were oriented and mobilized to administer the questionnaire (See annex-1). The students were asked to meet personally any engineer with the questionnaire and to collect their opinion. Special precaution was taken for avoidance of duplication. A target was of approaching 150 engineers but only 125 (84 % of the target) were approached. This paper is the outcome of the opinion of 125 engineers randomly surveyed. Survey was conducted in 2012. Weighted mean has been used where appropriate for ranking purpose.

3. RESULT AND DISCUSSIONS

This section presents the result and discussions.

3.1 On Registration and Use of Code of Ethics

After its establishment in 2001, NEC has issued a public notice in Kantipur national daily newspaper informing all the concerned engineers about the mandatory provision of registration with NEC before undertaking any assignment as an engineer.[ii] Furthermore, as provisioned in the Act if any one practices engineering profession without registration, he/she shall be subjected to fine up to Rs. 3000 or imprisonment of three months or both. Despite of such effort and provision, after a decade of establishment of NEC, 9% engineers (11 among 125) were still practicing without registering with NEC, which is against the law.

Among the NEC member engineers (i.e. 114 respondents) almost all 113 (90%) said that they knew about the NEC professional code of conduct but among the engineers who were aware of NEC code of conduct, only 35 % engineers have read them very often followed by 53 % partially and 12 % have just heard about it. The response is shown in figure 1.

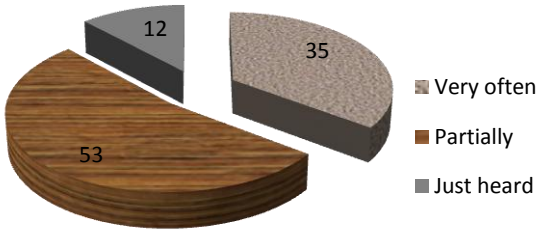

Figure 1: Engineers on Code of Ethics

Nepal Engineering Council has printed and distributed professional code of conduct to put in openly accessible place of every engineering college and in other concerned institutions but only 44 % engineers said that their organizations have put the NEC code of conduct at accessible place. Only 10 % and 29 % have read or used NEC Act and Regulation very often and often respectively but 51 % engineers have rarely and 10 % have not read or used the NEC Act and Regulation. Similar situation is also reported in Pakistan also. A survey showed that 65 % did not know about the existence of code of ethics and code of conduct of Pakistan Engineering Council (PEC) and among 35 % who knew about it, about 50 % had never read them.[iii]

3.2 On Professional Integrity

In developing country like Nepal, salary and fee of the professionals, social value, rules and regulations, morale of the self, and the professional society are the factors affecting morale of a professional.[iv] "Technology in general, and engineering in particular, is part of the culture of the society in which it is practiced, its standards necessarily reflects not only the technological but also the economic and social characteristics of that culture".[v] In Nepal, the salary or the fee the professionals receive, as compared to market price are low. Similarly, the societal value is also defective because it gives importance to "money" irrespective of the sources of it. On the other hand, being a politically unstable there is lacking effective implementation of rules and regulations forcing lowering the ***self-morale*** of the professionals. Because of the environment as mentioned, the professional society has also not been able to function effectively demonstrating its strong existence.

The result presented in item no 3.1 above proved that NEC has not been effective in exercising its authority. In this context, it was tried to know the status of professional integrity in engineering profession in Nepal. Professional engineers are expected to override their professional interest over national and organizational interest. Among the surveyed engineers, 8 %, 29.6 % and 37.6 % said that they have noticed (ranging from very often to rare) sacrificing the national or organizational interest for personal gain. The responses are shown in figure 2.

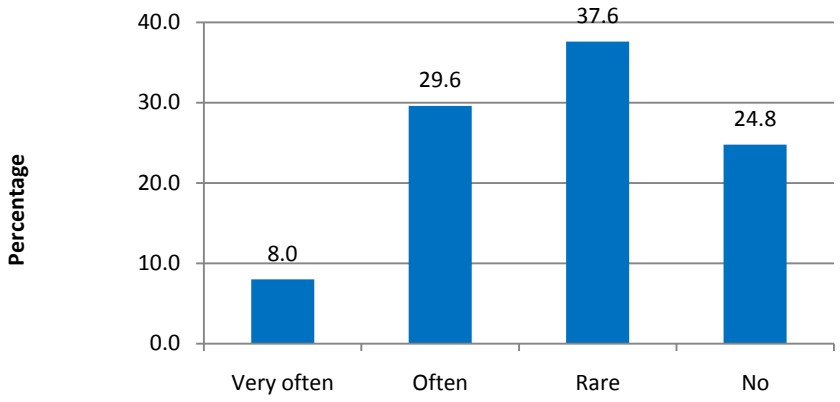

Figure 2: Overriding National or Organizational Interest for Personal Gain

This shows that in Nepal, among engineering professionals, overriding national or organizational interest for personal gain is prevailing, which is a "dangerous" symptom in maintaining sound professional environment. The professional society – NEC and engineering community and societies like Nepal Engineers Association (NEA), Society of Consulting Architectural and Engineering Firms Nepal (SCAEF) as well as Federation of Contractors Associations (FCAN) need to work in coordinated manner to discourage such behavior.

Only 18 % respondent said that they were not aware of any case of employers attempting to force their employees to commit unethical action. It means that rest 82 % are found aware in this regard indicating that at greater or lower extent but the employers in Nepal attempt forcing their employees for committing unethical action. The responses are shown in figure 3. It is also revealed that the engineers often witness unethical conduct.

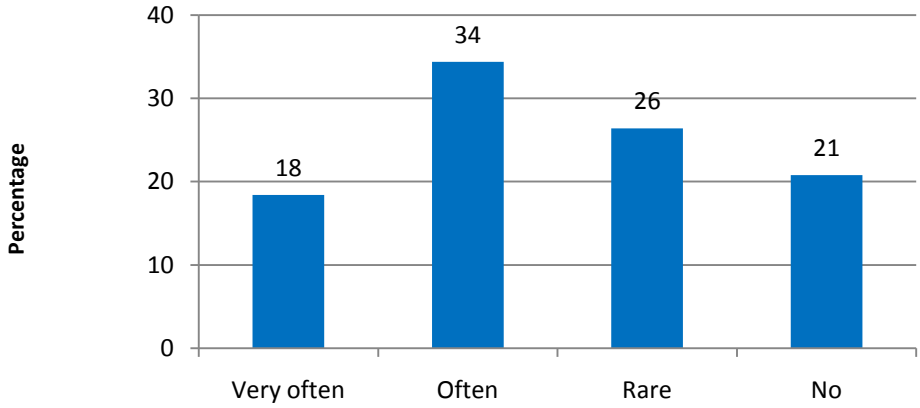

Figure 3: Employers Forcing to Commit Unethical Action

The forms of such unethical conduct are ranked and are presented along with their weighted mean in table 1.

Table 1: Forms of Unethical Conduct

S. No.	Form of Unethical Conduct (In descending order)	Weighted Mean Weighted Mean (Max. Value=3)	Rank
1	Favoritism	1.63	I
2	Yes Boss culture	1.62	II
3	Gifts, meals, services, or entertainment	1.44	III
4	Compromise on quality	1.39	IV
5	Conflict of interest	1.29	V
6	Bribery	1.22	VI
7	Unfair conduct/ decision	1.14	VII
8	Fraud	1.11	VIII

Table 1 shows that ***favoritism*** is the major unethical conduct in Nepal followed by ***yes boss culture*** and accepting ***gifts, meals, services or entertainment.*** In a question, whether the respondents have noticed anyone accepting "commission" directly or indirectly from contractors/suppliers, 15 % said they have noticed very often, 37 % have noticed often and 29 % have noticed rare. This also showed the prevalence of accepting "commission" by the engineers from contractors/suppliers. Figure 4 shows the responses. This is also supported by one of the recommendations made at the government level by SCAEF, which was based on the SWOT analysis, was to "take serious actions to prevent corruption"[vi]. Accepting commissions by a professional in any form needs to be prevented by devising a strong mechanism because this practice will have impact on morale of the professionals as well as on quality of construction, products or services.

The professionals are not supposed to work with other organization/institution (even a part-time) without the consent of the prime or main employer. In this matter, 58 % are of opinion that few engineers work with other organization/institution without the consent of the main employer and 33 % said that majority of engineers in Nepal does it. The responses are presented in figure 5.

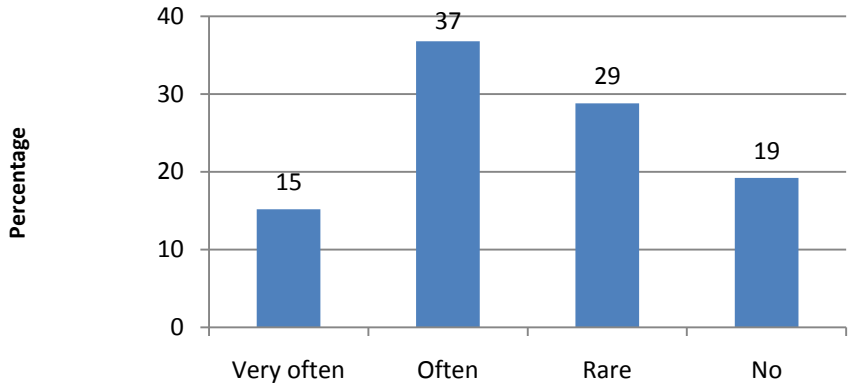

Figure 4: Accepting Commissions from Contractors/Suppliers

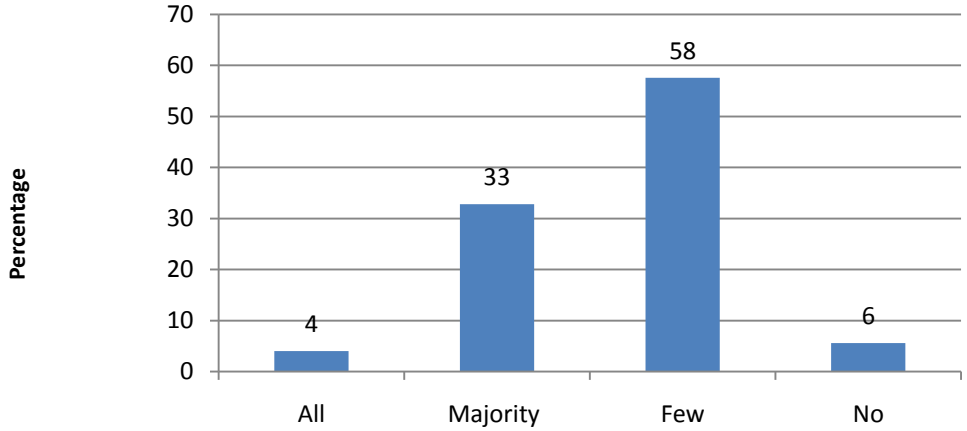

Figure 5: Working in Other Organizations

If engineers undertake assignments from two different employers at same time without the consent of the prime employer, there may be situation of conflict of interest. In many instances, the engineers working full time in public institutions undertake part time assignments from even contractors. The engineers are required to be capable of distinguishing the situation creating conflict of interest and should refrain from accepting such assignments.

3.3 On Qualification and Experience Requirement

As per NEC professional code of conduct, a professional shall have to do "professional works or submit recommendation or suggestions only within the area of subject of study or obtained knowledge or skills. With regard to the works not falling within the subject of one's profession, recommendation of the works shall be made to an expert of the subject matter". Education and experience are among the basic features of any profession. In this matter, 13 % have very often and 39 % have often noticed undertaking engineering assignments without having adequate qualification, experience or training. Though rare but further 33 % has also noticed it and only 15 % said that they have not noticed such activities. It is shown as figure 6.

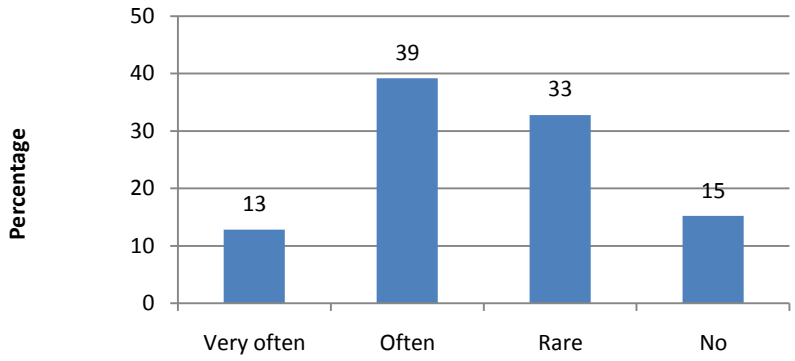

Figure 6: Undertaking Engineering Works

Practicing profession without adequate qualification and experience should not be allowed in any circumstance. Prevalence of such practice prevents from uplifting the image of profession and on the other hand displaces the qualified and competent engineers from their jobs. However, there is not an authentic data related to demand and supply status of engineering professionals in the country, but the fresh engineering graduates are facing difficulty in getting employment in the country.

3.4 On Health, Environment, and Safety

One of the codes of ethics of Association of Professional Engineers, Geologists and Geophysicists (APEGGA) Alberta of Canada delineates that professional engineers, geologists, and geophysicists shall, in their areas of practice, hold paramount the health, safety, and welfare of the public and have regard for the environment (APEGGA, 2008). It is found that 23.2 % and 30.40 % engineers consider these factors very often and often respectively. Only 3.20 % are of opinion that engineers in Nepal do not consider these factors. The responses are shown as figure 7.

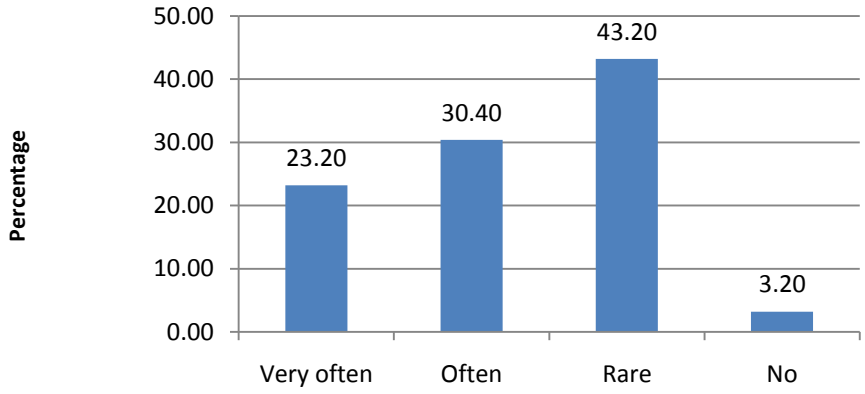

Figure 7: Engineers Considering Health, Safety, and Environment

3.5 On Following Code of Conducts

Among 125 engineers surveyed, 63 % said that it is difficult to follow the code of conduct/ethics in engineering profession in Nepal and only 37 % engineers found with opinion that following the code of conduct is not difficult. The study also tried to know the reasons why the professional engineers feel difficult to follow the codes of conduct. As revealed, the major cause making difficult in following codes of conduct is the ***corrupt politics/politicians in the country*** followed by ***weak system*** (Muscle power and money being more powerful than the system). Ranking of probable causes is given in

table 2. A national daily reported that most controversial decisions are made in the ministries that are looked after by the Prime Minister – Energy, Urban Development, Commerce and Supply, Defense, Agriculture Development, Youth and Sports, and Law ministries,[vii] which can be cited as one of the examples. This news supports the ranking of the causes making difficult to follow the code of conduct in Nepal.

Table 2: Reasons Making Difficult to Follow Codes of Conduct

S. No.	Causes Making Difficult to Follow Codes of Conduct (In descending order)	Weighted Mean (Max. Value=3)	Rank
1	Corrupt politics/politicians in the country	2.42	I
2	Weak system (Muscle power and money being more powerful than the system) in the country	2.27	II
3	Low morale of the engineers	1.44	III
4	Very strict code of conduct	0.58	IV

"Today's major concern has been" writes Badan Lal Nyachhyon, Past President of SCAEF "the overall deterioration of general environment of Public Procurement and National Economy particularly induced by the **loss of Moral Values, Ethical Behavior and Integrity.**"[viii] According to him, this has caused in the rise of corruption, thus negatively affecting the development process.

Until and unless the registered engineers strictly follow the code of conduct/ethics, image of the profession in the society will not be prestigious. Furthermore, one of the duties of NEC is also to implement effectively the code of conduct. The result also revealed that ***the codes are not difficult to follow*** but ***the corrupt politics/politicians*** and ***the weak system*** have made it difficult to follow.

It was necessary, here to know about whether the respondents have experienced unrealistic political pressure or any compulsion in impartial execution of any assignment/task or a project. In this, only 15.20 % engineers said that they have not experienced such pressure or compulsion, but rests of all have experienced such pressure or compulsion from very often to rare. The results are presented as figure 8. This result demands effective role of NEC in regulating engineering professional practice and raising its image in the society.

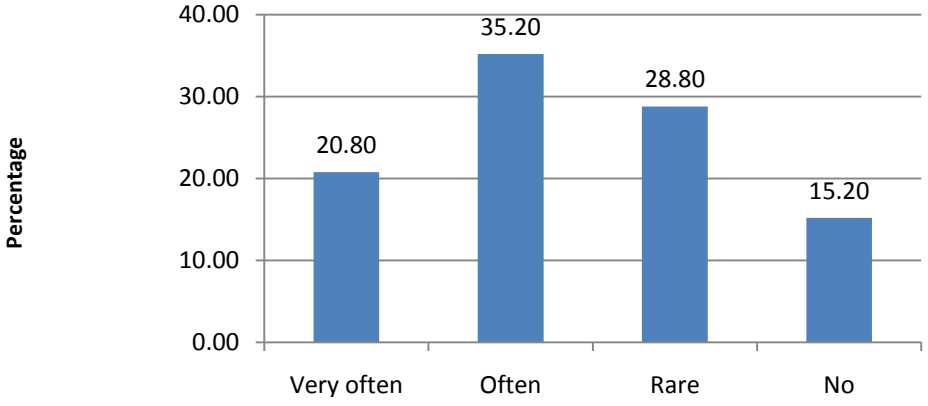

Figure 8: Political Pressure or Compulsion

3.6 On NEC's Effectiveness

Role and activity of professional society plays very important role in regulating the concerned profession. In this regard only nine percent engineers strongly supported the role and activity of NEC as adequate in regulating engineering profession in the country followed by 18 % who simply agreed with this statement but majority of engineers (i.e 40 %) moderately agreed and 34 % did not agree with this statement. This supported the result obtained in item no 3.5 above. The results are shown as figure 9.

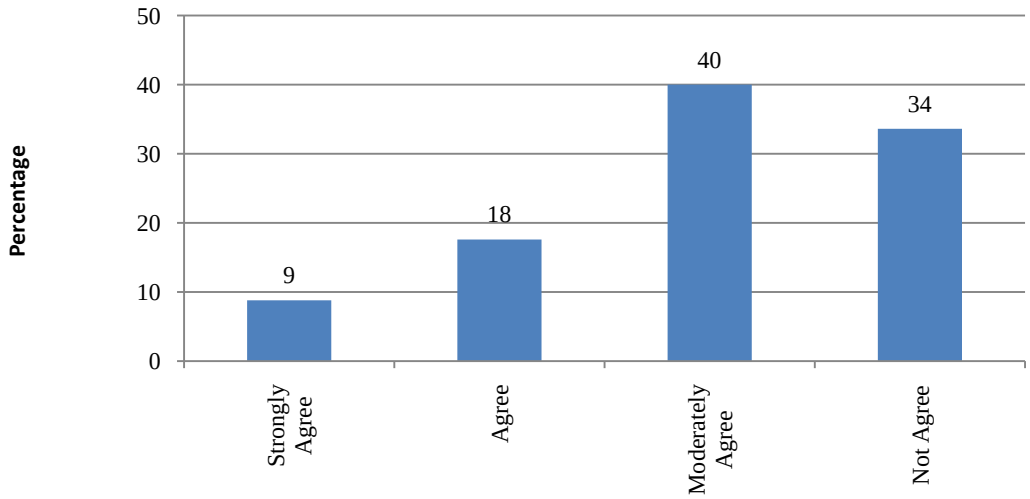

Figure 9: Effectiveness of NEC

3.7 On Teaching of Ethics and Responsibility

Teaching of ethics in engineering in Nepal was started in 1998 with the introduction of ***Engineering Professional Practice*** course in undergraduate engineering programs (civil, electrical, and electronics) in Institute of Engineering of Tribhuvan University. The engineers surveyed were asked about their opinion on importance of teaching ethics to engineering students. Among the engineers surveyed, 74 % strongly agreed and further 22 % said that teaching of ethics to engineering students is important. The result is presented as figure 10.

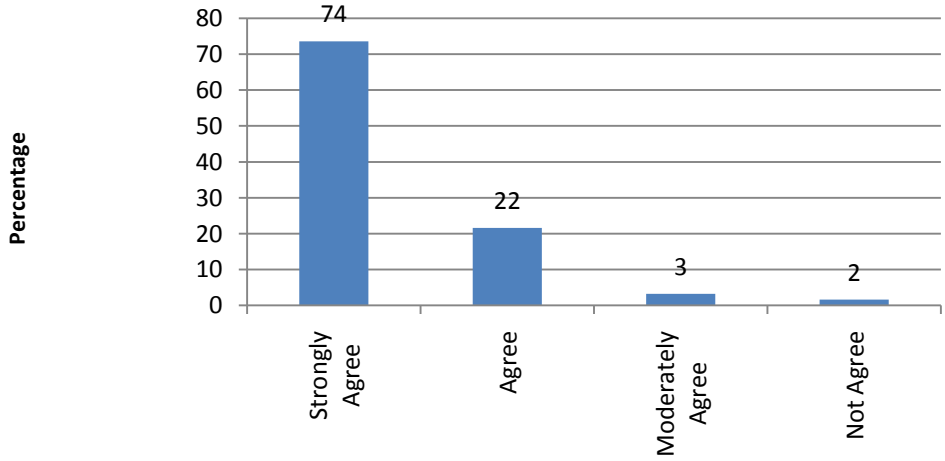

Figure 10: Importance of Teaching Ethics

It showed that teaching of ethics to engineering students is important. "A little ethics knowledge is certainly better than none because it introduces the commonly overly engineering student to a new realm of professional reality. Some ethics knowledge can alert an engineering practitioner to an issue that can be investigated further and about which he can obtain help"[ix]. Furthermore, teaching ethics "can increase student sensitivity to ethical issues simply by making students aware that they, as engineers, will have to resolve certain ethical problems."[x]

The professional integrity and image can be maintained only through the individual professional. The consequence of the professional decision-making should be borne by individual professional and a well-established and well functioning system will only assist the individual professional by withholding the professional from any circumstances where he/she is likely to commit unethical decision or action.

In the above-mentioned context, the study also tried to know the feeling of the engineers on who should start building up engineers/engineering profession's image in the country. The study revealed that the role of Nepal Engineering Council is of paramount importance followed by the role of individual engineer and the senior engineers of the country. The finding is presented in table 3.

Table 3: Role to Build Up Engineers/ Engineering Profession's Image

S. No.	Causes Making Difficult to Follow Codes of Conduct (In descending order)	Weighted Mean (Max. Value=3)	Rank
1	Nepal Engineering Council (NEC)	2.61	I
2	Individual engineer	2.48	II
3	Senior engineers of the country	2.41	III
4	Nepal Engineers Association (NEA)	2.34	IV
5	Political leaders of the country	2.14	V

4. Conclusion and Recommendations

Engineering is a profession because to practice engineering one needs to acquire an engineering degree (of 4-5 years duration) and may be some years of experience and in these modern days this profession is regulated by the council established through the Act of the parliament. "In the aftermath of World War II we see the emergence of organizations and journals that would specifically address the responsibilities of scientists and engineers for the consequence of their professional work."[xi] Practice of a profession requires knowledge and skill. In Nepal NEC is the engineering profession regulating council, which has already completed a decade of its establishment on the one hand and implementation of rules and regulation is becoming weak day by day in the country weakening the effective operation of the NEC as well as professional integrity of the engineers in the country on the other. In this context, this paper has revealed the status of practice of engineering profession in Nepal and come up with recommendations for strengthening professional practice and enhancing image of engineers in the country.

Recommendations

Based on the analysis and discussions made above following recommendations are made for uplifting engineering profession of the country:

i. NEC should strictly implement the existing rule and increase its effectiveness in monitoring the practice of engineering profession.

ii. NEC is strongly recommended to start taking ***Professional Licensing Examination (ProfiLE)*** for registration of engineers as its members and renewal of membership at certain time interval (3-5 years).
iii. NEC is recommended to form a task force to develop and recommend syllabus and modality for ***ProfiLE*** and renewal of the license.
iv. Ministry of Physical Planning, Works, and Transport Management (MOPPWTM), as a functional ministry, is recommended to conduct a study to explore the hindrances that are impeding effective functioning of NEC.
v. An independent mechanism is essential to monitor and control the engineers from accepting assignments that are likely to create ***conflict of interest*** and for this ***Construction Business Development Council (CBDC)*** is recommended to take a lead role. If required a joint open commitment of SCAEF and FCAN may also be sought.
vi. Universities in the country is recommended to review its existing syllabus of engineering ethics and teaching methodology so that teaching of ethics in engineering should not be only a formality but it could be a meaningful and important subject for students. The point to be mentioned here is that senior professors having adequate practical experience should be encouraged to teach engineering ethics.

Acknowledgement

B.E. Geomatics Engineering students (2008 batch) of Kathmandu University for their support in data collection.

Annex-1

Questionnaire for Study of Status of Engineering Professional Practice

Please TICK the appropriate answers in the box.

S. No.	Question	3	2	1	0
1	Are you a member of Nepal Engineering Council (NEC)?	Yes			No
2	Do you know about NEC Code of Conduct/Ethics?	Yes			No
3	If yes in above question, have you ever read them?	Very often	Partially	Just heard	No
4	Does your organization have put NEC Code of Conduct/Ethics at the accessible place?	Yes			No
5	How frequent you read (or use) the NEC Act & Regulations?	Very often	Often	Rare	No
6	Have you ever noticed anyone in engineering profession scarifying the national/organizational interest for any personal gain?	Very often	Often	Rare	No
7	Have you ever noticed undertaking engineering assignments without adequate qualification, experience or training?	Very often	Often	Rare	No
8	Are you aware of any case of employers attempting to force their employees to do unethical conduct?	Very often	Often	Rare	No
9	Have you ever witnessed unethical conduct in form of:			Rare	
	a. Compromise on quality	Very often	Often	Rare	No
	b. Unfair conduct/ decision	Very often	Often	Rare	No
	c. Conflict of interest	Very often	Often	Rare	No
	d. Fraud	Very often	Often	Rare	No
	e. Favoritism	Very often	Often	Rare	No
	f. Gifts, meals, services, and entertainment	Very often	Often	Rare	No
	g. Bribery	Very often	Often	Rare	No
	h. Yes Boss culture	Very often	Often	Rare	No
10	Have you noticed anyone accepting commission directly or indirectly from contractors/suppliers or other parties for doing a favor to such contractors/suppliers?	Very often	Often	Rare	No
11	Do you think the engineers work with other organizations/institutions also (part-time) without the consent of the prime or main employer?	All engineers	Majority of engineers	Few engineers	No
12	Do the engineers recognize or consider the Health, Environment and Safety of public giving high importance while planning or implementing their task/ assignment?	Very often	Often	Rare	No
13	Have you experienced unrealistic political pressure or any compulsion in impartial execution/completion of any assignment/task or a project?	Very often	Often	Rare	No
14	Do you consider it is difficult to follow the Code of Conduct/Ethics in engineering profession in Nepal?	Yes			No
15	If the answer of question no. 14 is Yes, then why? Because of :-				
	a. Very strict code of conduct/ethics	Strongly agree	Agree	Moderately agree	Not agree
	b. Weak System (Muscle power and Money being more powerful than system) in the country	Strongly agree	Agree	Moderately agree	Not agree

	c. Low morale of the engineers	Strongly agree	Agree	Moderately agree	Not agree
	d. Corrupt politics/politicians in the country	Strongly agree	Agree	Moderately agree	Not agree
16	Do you think teaching of ethics is important for engineering students?	Strongly agree	Agree	Moderately agree	Not agree
17	Who do you think shall start to build up engineers/engineering profession's image in the country:				
	a. Individual engineer	Strongly agree	Agree	Moderately agree	Not agree
	b. Senior engineers of the country	Strongly agree	Agree	Moderately agree	Not agree
	c. Nepal Engineers Association (NEA)	Strongly agree	Agree	Moderately agree	Not agree
	d. Nepal Engineering Council (NEC)	Strongly agree	Agree	Moderately agree	Not agree
	e. Political leaders of the country	Strongly agree	Agree	Moderately agree	Not agree
18	Have you noticed (or heard) of any disciplinary action taken by the NEC for any unprofessional (unethical) activities of its members?	Very often	Often	Rare	No
19	Do you agree that the role/activity of NEC is adequate in regulating engineering profession of the country?	Strongly agree	Agree	Moderately agree	Not agree
20	Any comments/suggestions:				

Year of graduation (BE degree): ……

Discipline (e.g. Geomatics/Civil/Mechanical etc.): …….

Work experience: …….. Years

Work organization: ……

THANK YOU

References

[i] Donald S. Mansell, "Constraints on Engineering in Third World", **Engineering Issues**, ASCE October 1978 pp 281-292

[ii] **Kantipur**, national daily, 29 Chaitra, 2057 (April 11, 2011)

[iii] Nadeem Ehsan, Sohail Anwar, and Muhammad Talha, "Professional Ethics in Construction Industry of Pakistan", **Proceedings of the World Congress on Engineering,** WCE 2009, July 1-3, 2009, London

[iv] Rajendra P. Adhikari, **Engieering Professional Practice Nepalese and International Perspectives**, Pashupati Publishing House, Kathmandu, 2010

[v] Donald S. Mansell, "Engineering Standards in Developing Economies", **Engineering Issues**, ASCE October 1978 pp 271-279

[vi] Society of Consulting Architectural and Engineering Firms, Nepal, **Development of Consulting Industry in Nepal: An Outlook**, February 2007, pp. 9

[vii] **Kantipur,** national daily, 28 Magh, 2069 (February 10, 2013)

[viii] Badan Lal Nyachhyon, "Vision for Corruption Free Procurement", **Development of Consulting Industry in Nepal: An Outlook**, Society of Consulting Architectural and Engineering Firms, February 2007, pp. 69-80

[ix] John W. Lipscomb, Jr. and Eyler R. Coates, "Professional Ethics in Engineering and Engineering Technology, **ASEE Southeast Section Conference,** 2000

[x] Charles Edwin Harris, Jr., Michael Davis, Michael S. Pritchard, and Michael J. Rabins, "Engineering Ethics: What? Why? How? And When?" **Journal of Engineering Education**, April 1996

[xi] Mike W. Martin, Roland Schinzinger, **Ethics in Engineering**, The McGraw-Hill Companies, Inc., New York, 1996, pp. 12