Claim of Higher Engineering institutions regarding the Qualities They Instill in Their Students versus the Expectations of Stakeholders in Pakistan

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Abstract
The study was designed to explore the claim of higher education institutes concerning qualities and fulfillment of demands of stakeholders. For this qualitative research, the Grounded theory technique was adopted to investigate the problem in depth. All engineering universities of the Punjab and their stakeholders were the population of the research. To select the sample of this study theoretical sampling technique was used. A total of thirteen interviews were conducted by the participants among them six were teachers, seven stakeholders, twenty students who recorded their response on an open-ended questionnaire. To collect the data from participants, an intensive interview protocol and open-ended questionnaire were designed. Interviews and open-ended questions were analyzed and coding was made. Higher Education Institutions claim that they are producing productive graduates to meet the demand of the market. However, there is a difference of opinion between the stakeholders, students, and HEIs concerning their claims and the demands of stakeholders. Their views show the theory-practice gap exists which disturbs the whole system and more students to suffer in the form of unemployment .The result of the study showed that a link between academia and industry is needed to produce market-oriented graduates.
Keywords: Higher Education institutes (HEIs), Stakeholders, Vision, Mission and Claims

I INTRODUCTION

The educational system of a nation is so designed that prepare the learners to gain confidence, develop positive personalities, character building, and ensure an economically bright future (Bhardwaj, 2016). Higher educational institutions introduce such knowledge and skills in their graduates that can help them acquire jobs (King, Saxena, Pak, Lam, & Cai, 2021).

According to the instructions of Higher Education Commission (HEC) of Pakistan, universities have to set their directions to enhance their student's competencies and academic excellence. Under the leadership of HEC, the statistical indicators reflect that higher education in Pakistan has been routed to new dimensions of progress. The universities' leadership show their promises through their vision and policy to achieve the prescribed objectives of the institutions under the guidance of HEC (Kettunen, 2014).

Like all other organizations, the universities also have stakeholders from within and outside the universities. The internal stakeholders are students, academics and administrative staff and alumina. The faculty and the administrative staff are responsible for planning and improving the university's policies, their implementation and monitoring through various committees and bodies like Board of studies, Board of Faculties, Academic Council, Syndicates and the Senates. The external stakeholders i.e. Government, Employers, NGOs, are working for the establishment, development, and progression of any organization. The role of stakeholders is vital in the form of collaboration and sharing of mutual vision and expectations. Stakeholders of engineering universities have some expectations and demands like knowledgeable and skillful graduates from higher educational institutions. (Marić, 2013).

This study aimed to analyze the claim of HEIs about the qualities they inculcate in the students and examine the demands of stakeholders. The focus of this research was to explore the viewpoints of the higher education stakeholders to identify what they thought about the output (product) of higher education institutions and their impact on persons' lives and society.

II LITERATURE REVIEW

Pakistan Engineering Council (PEC), as a full signatory to the Washington Accord, has explicitly declared the application of the outcome-based education (OBE) system in engineering for certification. PEC has established twelve traits for graduates as learning goals that must be exhibited in an engineering graduate at the time of passing out. These twelve attributes are: (1) problem analysis; (2) investigation; (3) use of engineering tools; (5) design; (6) individual and teamwork; (7) communication skills; (8) professionalism; (9) impact on society and the environment; (10) ethics and equity; (11) economy and program delivery; and (12) lifelong learning. These characteristics must be cultivated in engineering graduates before graduation (Shaheen, 2019). All engineering programs in Pakistan are accredited by PEC under the Washington Accord, and all engineering technology programs are accredited by the National Technology Council (NTC) under the Sydney Accord (Kamran, Nisa, Fazal, Abid, & Abid, 2020).

III OBJECTIVE OF THE STUDY

1) To explore the claim of higher engineering institutes concerning qualities they inculcate in students.
2) To Explore the demands of stakeholders regarding the qualities of engineering graduates
3) To investigate the connection between the claims of HEIs and demands of stakeholders about the qualities of graduates

IV DELIMITATION OF THE STUDY

The present research was sealed off to the Higher education institutes of engineering in Punjab.

V RESEARCH METHODOLOGY

The current qualitative research was conducted using Grounded theory. Charmaz elaborates on grounded theory as "Grounded theory methods consist of systematic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories grounded in the data themselves"(Charmaz, 2006).

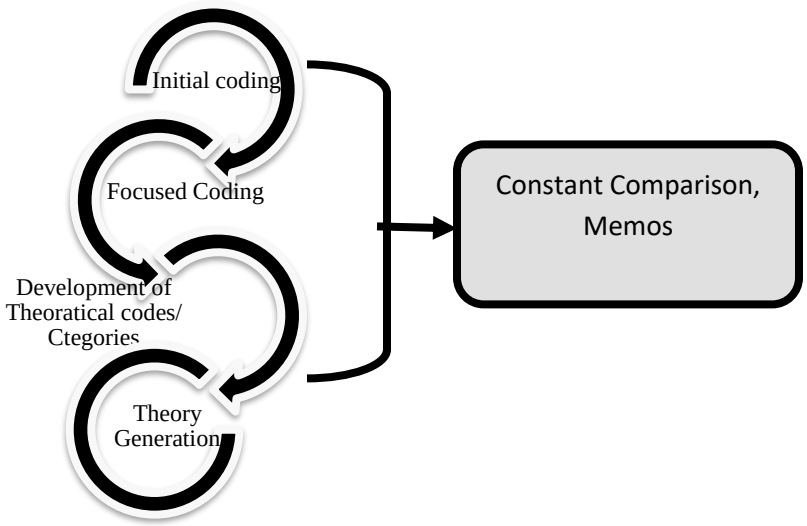
All academic staff and students of engineering universities of the Punjab and their stakeholders were the population of the study. A theoretical sampling technique was used to select the sample. The sample of the study was limited to two universities in Punjab. First were The Islamia University of Bahawalpur and its electrical and electronics department and second were the University of Engineering and Technology Lahore and its electrical and civil department. One dean, five chairmen, and twenty students were selected from these departments. Seven stakeholders were selected from the industry. The researcher stoped data collection after conducting interviews with them when saturation occurred. Saturation is a point in grounded theory where the researcher stops to collect further data because further data collection does not teach you more about your topic, new data are not coming and concepts repeat (Glaser, Strauss, & Strutzel, 1968).

For the collection of data from Students, an open-ended questionnaire was developed. From Teachers and stakeholders, data was assembled through semi-structured in-depth interviews. During the interview, the researcher not only wrote the answers of the participants but also takes notes by reading their facial expressions and wrote memos. The major goal was to compare higher education institution's claims and mission to the needs of stakeholders. Understanding was required to carry out the research and fulfill the qualitative paradigm.

VI DATA ANALYSIS

Analysis of data is a systematic procedure that collects facts, organizes them, and then interprets them according to study goals (Creswell & Poth, 2016). Grounded theory technique was adopted to analyze the qualitative data. Interview transcripts were prepared by the researcher after conducting each interview. The researcher assigned codes to the collected data. Data were classified into initial coding, focused coding, and finally constructed a grounded theory (Charmaz, 2006). The major results of the research were included in the discussion section. Each question was analyzed by analyzing and observing the interviewee's expressions, and narration, and summarizing the interview.

VII PROCEDURE OF ANALYSIS



VIII RESULTS AND DISCUSSION

Teachers' opinion about the Claim of HEIs

Table 1: Qualities/attributes, which HEIs claims to produce in their engineering Students

Initial code	Focused Code	Theoretical Code/ Category
1. Engineering knowledge 2. Problem analysis 3. Design/development of solutions 4. Investigation 5. Modern tool usage 6. Engineer and society 7. Environment and sustainability 8. Ethics 9. Individual and teamwork 10. Communication 11. Project management 12. Lifelong learning	12 attributes of engineering presented by (PEC)	Engineering institutes are bound to produce 12 attributes of engineering in their students.
• Alignment of PLOs and CLOs, with market	Alignment of PLO's and CLO's	Curriculum and learning outcomes are aligned with market-demanded skills.

Initial codes:

Interviews were conducted with teachers and asked about the claim of HEIs**,** which Qualities/attributes HEIs are producing in engineering Student and the two initial codes from their answers emerged here. **1A)** 12 attributes of engineering directed by (PEC), **2A)**Alignment of PLOs and CLOs with market. First code stressed on the attributes those are claimed by HEIs. Engineering institutes are bound to produce 12 attributes directed by the Pakistan Engineering Council in students before passing out.

These attributes are:

1) Engineering knowledge: Knowledge related to engineering which includes mathematics, numerical solutions, analysis, etc. ***2) Problem analysis:*** The skill of solving complex engineering problems and reaching the solution (Memo Table: 1 and Memo #1). ***3) Design/development of solutions:*** Design systems, or processes that see needs with solutions. ***4) Investigation:*** The skill to examine complex engineering problems including literature (Memo Table: 1 and Memo# 1). ***5) Modern tool usage:*** The ability to use the latest instruments of engineering (Memo Table: 1 and Memo# ***6) Engineer and society:*** Useful application of engineering knowledge for society's benefits. ***7) Environment and sustainability:*** Ability to realize knowledge of engineering and sustain the environment. ***8)***

Ethics: The ability to apply professional ethics. ***9) Individual and team work:*** Ability to work in both situations i.e. individually and in team work. ***10) Communication:*** The ability to communicate effectively in both oral and written form. ***11) Project management:*** The ability to manage their work and effectively demonstrate their management skills. ***12) Life-long learning:*** The ability to innovate things and abilities that are necessary to pursue their life in the future (The Islamia University of Bahawalpur, n.d.) (Memo Table: 1 and Memo# 3).

Memo Table 1

Memo 1: Participant claim that their graduates are using Modern tools in labs and they are well aware about the usage these modern tools but at the same time they complaint that their labs were not upgraded since 1990.

Memo 2: They were confused while explaining problem analysis and investigation, they explained both as same.

Memo 3: Interviewee claims the attribute lifelong learning but when they were asked to explain thev were confused.

2A) Alignment of PLOs and CLOs with market demands**.** PLO's means prolong learning outcomes and CLOs course learning outcomes this is mandatory for the class teacher that he/she discuss the scope that particular subject with students and also assess this through group discussion, assignments or through paper pencil test. HEIs design their curriculum and learning outcomes are aligned with market-demanded skills.

Table 2: Criteria to check prescribed qualities which are trying to inculcate in engineering students by HEIs

Initial Code	Focused Code	Theoretical code
• Job/scholarship ratio describes the successful inclusive of targeted qualities • Job in developed countries • Graduates join the job market • Internship opportunity	Graduates job scholarship ratio	Students' job scholarship ratio and positive feedback from employers.
• Employers give feedback that our graduates are working efficiently • alumni's feedback	Positive employers and alumni feedback	
• Assessment Criteria followed by HECs • followed by our HECs	Feedback through assessment and evaluation	Evaluation through examination
• Few CEO as member of our industrial advisory board • Few CEOs are our alumni	CEO are their alumni and member	Professionals feedback

Initial Codes:

Teachers were asked about Criteria to check prescribed qualities which are trying to Inculcate in engineering students and the three initial codes from their answers emerged here 1A) Job/ scholarship ratio, 2A) Employers and Alumni Feedback and 3A) Assessment Criteria 4A) CEO are their alumni and member

1A) describes Students' job/ scholarship ratio and they claimed that their students are working in higher positions at different organizations i.e. few of them are working as CEOs.

2A) and 3A) explains about direct assessment like examination, final year project evaluation inducts that how much these attributes successfully inculcating in graduates. In indirect assessment, both employer and Alumni provide feedback that how much graduate has learned. Through all this process we assess how much our PLO's achieved.

Table 3: After completion of the degree attributes engineering graduates Possess

Initial code	Focused Code	Theoretical Code/ Category
• Communication skills Of graduates	Communication skills	Students will have qualities according to PEOs, i.e., communication and engineering skills.
• Soft skills • Analytical skills • Problem-solving • Critical Thinking Skills	Soft skills of graduates	
• PEO-1. Ability to use knowledge, skills, and personality traits, • PEO-2: Solutions to daily life problems; • PEO-3:Professional ethics, leadership qualities, effective communication skills	Program Education Objectives (PEO) inculcated	

Initial Codes:

The response of the respondents regarding attributes of engineering graduates possess after degree completion are divided into three major initial codes; 1A) Cognitive skills, 2A) soft skills and 3A) psycho-motor Skills. All three codes describe that their students will have the abilities of Program Educational Objectives (PEO) 1: Graduates will exhibit an ability to exercise knowledge, abilities, and personality characteristics to investigate and analyze complex engineering issues for designing advanced solutions by research, and modern tools. PEO-2: Graduates will be involved in attaining the socio-economic development goals of Pakistan through sustainable, environment-friendly, socially and ethically acceptable strategies. PEO-3: Graduates will demonstrate leadership, organizing, planning effective communication skills to follow entrepreneur culture and higher education to handle the challenges of the swiftly changing engineering field.

Table 4: Discipline's stakeholders and students job market

Initial code	Focused Code	Theoretical Code/ Category
• Power distribution companies (LESCO, MEPCO, and FESCO etc.) • Kot Addu Power Plant	Power Distribution	Candidates will join the job industries according to their fields of study.
• PTCL • Ufone Pakistan • Pakistan Broadcasting Corporation Bahawalpur	Pakistan Telecommunication	
• Quaid-e-Azam Solar Park Bahawalpur	Solar energy	
• SNGPL • Asia Industries Bahawalpur • Ashraf Sugar Mills, Bahawalpur • Fuji Fertilizer Company Sadiqabad • PEL • SUPARCO		

Initial Codes:

Responses of respondents regarding job market of engineering graduates are categorized into three initial codes;1A) Power Distribution Sector 2A) Telecommunication sector and 3A) Chemical Industries. All three codes indicating that according to administrators their students are working in many well-known industries according to their subject expertise. They will serve in power distribution companies, SNGPL, PTCL, Ufone Pakistan, Pakistan Broadcasting Corporation Bahawalpur, Quaid-e-Azam Solar Park Bahawalpur, Fuji Fertilizer Company Sadiqabad, SUPARCO, Ashraf Sugar Mills, Bahawalpur, Asia Industries Bahawalpur, Kot Addu Power Plant, and PEL.

Table 5: Qualities of graduates which fulfill stakeholders' demand

Initial code	Focused Code	Theoretical Code/ Category
• In-depth subject knowledge • Field Exposure • Practical skills • Good communication • Confidence • Independently solve site issues and teamwork ability • Leadership behavior • Good manager • Grip on modern technology • Entrepreneurship skill	Qualities of graduates demanded by stakeholders	To fulfill the stakeholders' demands subject knowledge and its practical application, communication, leadership, management, and modern technology are needed.
• Lack of R&D setups in Pakistan • Minimum research opportunities are provided to graduates to show their talent. • Graduates have abilities to work in R&D but lack of opportunities create hurdle.	R&D setup at small scale	There is a lack of R&D setup in engineering HEIs; if it is available then students can learn Research and development skills.

Initial Codes:

Qualities of graduates which fulfill stakeholders' demand responses were categorized into three initial codes; 1A) Professional qualities, 2A) Research skills, 3A) Cognitive skills

1A) revealed professional skills as; In-depth subject knowledge, field Exposure, practical skills, good communication, confidence, independently solve site issues and teamwork ability, leadership behavior, good manager, grip on modern technology, international standards education, curriculum aligned with global trends, revision of curriculum and deficiency and change curriculum. 2A)stressed on research skills that are problem identification, data analysis, design/development of solutions, Investigation of issues and patent of research project. Responses show that HEIs fulfill the demands of their stakeholders as they are producing job-oriented and skillful graduates. Sometimes, stakeholders suggest that HEIs produce such graduates who can develop their organization and work independently. Engineering institutes are fulfilling the demands of stakeholders. Our graduates can compete internationally. There is a lack of Research and Development setup in the engineering field; if it were available then students could learn and be part of Research and development setup

Students' Opinion regarding HEIs claims

Table 6: Qualities Developed after completion of degree

Initial code	Focused code	Theoretical code/ category
• Communication skills • Management Skills • Problem handling abilities • Challenges acceptance	After completion of the degree, students will groom themselves with skills.	After completion of the degree, students will develop communication, management, and situation-handling skills.
• Career development	Developing career	
• Personality Grooming • Discipline	Grooming the personality	
• C++ programming • Office Automation • Grip on computer modern technology	Computer related skills	They will enhance their computer-related skills

Initial Codes:

Reponses of the participants regarding qualities developed after completion of degree are divided in four initial codes; 1A) Soft Skills 2A) Employability Skills 3A) IT skills 4A) leadership and management skills.

1A) soft skills related to communication skills, personality grooming, discipline, and punctuality 2A) employability skills related to career development, career counseling, job relevant qualification, interview skills and job hunting

skills, 3A) IT skills deals with computer operator, use of modern technology and virtual media 4A) Leadership and management skills deals with project management, time management, resources management, team work, collaboration and social work.

The researcher collected data from final-semester students through an open-ended questionnaire. According to their responses, after degree completion some qualities developed in students such as communication, management, and computer-related skills and a disciplined personality. Only one student responded that he wanted to develop automation skills.

Memo Table 2

Memo: All students emphasized that communication skills developed among them during academic session but their filled forms of open ended questionnaires were unable to read without their guidance. Researcher also makes her notes by asking them questions.

Table 7: Qualities (attributes) employers wish to see in their employee and demanded qualities are found in Graduates after completion of degree

Initial code	Focused Code	Theoretical Code/ Category
• Management skills • Soft Skills	Management skills of students	Employees want to see communication, management, and some other skills in their students.
• Communication skills • Problem Solving	Communication skills of students	
• Confidence • Intelligent • Professionalism • CGPA	Other personal skills of students	
• Honest • Punctual • Trustworthy • Strong Work Ethic	Honesty of students	Stakeholders want their employees to be honest punctual and hardworking employees.
• Hardworking	Working with hardships	
• No I don't have all qualities • To some extent.	I do not have all qualities but I have a few qualities according to stakeholders demands	They do not have all the qualities demanded by the stakeholders. But possess some qualities.

Initial Codes:

The response of the students regarding qualities (attributes) employers wish to see in their employee and demanded qualities are found in Graduates after completion of degree are divided into three initial codes; 1A) Management skills 2A) Soft Skills 3A) Professionalism.

First code 1A) describes different qualities which are the demands of the stakeholders such as human resource management, time management, conflict management etc. second code 2A) consists on soft skill, Honest, Punctual, Trustworthy, Strong Work Ethic, Hardworking, Intelligent, Confidence, Problem Solving. Third code 3A) related to professionalism which is related to competency and excellence of work.

When it was asked from the students whether they had all those qualities which are demanded by the stakeholders, they answered that yes they have "management skills, communication and soft skills along with engineering knowledge and its practical application". They have the quality of being honest and hard-working. Some of the respondents answered that they do not have all the qualities demanded by the stakeholders but to some extent demanded qualities are found in them. One different answer from others was that "I have no quality to claim the job of electrical".

Stakeholder's Opinion regarding HEIs Graduates

Table 8: Job-related Qualities Demanded by Stakeholders

Initial code	Focused Code	Theoretical Code/ Category
• Management skills of employees	Management skills	Respondents should have good communication, management, and soft skills to perform job duties. Must grip on modern technologies.
• Modern technologies • Training opportunities to learn technologies	The grip on the latest technologies	
• Critical thinking skills • Soft skills of candidates	Soft skills, critical thinking	
• Good knowledge of subjects and their practical application	Knowledge and its application	
• Communication skills of candidates	Communication skills	
• Decision-making power	Decision power	Decision-making power and confidence demanded. However, there is variation in candidates' abilities.
• Confidence needed	Confidence	
• Qualities vary from person to person • Expertise of every person is different	Variation in candidates' abilities	
• Work load management	Work Pressure	Work load management

Initial Codes:

The responses of the interviewees regarding Job-related Qualities Demanded by Stakeholders classified into three initial codes;1A) Cognitive Skills, 2A) Management skills 3A) Soft skills.

First initial code 1A) disclosed about cognitive skills such as knowledge of subject, field expertise, critical thinking. 2A) revealed about management skills like work load management, technology management, human resource management, time management, conflict management and training management. 3A) described about soft skills like communication, Confidence and Decision-making power. Stakeholders revealed that they required in-depth knowledge of the subject, decision-making power, skills of report writing, good communication, management and soft skills, and practical application of knowledge. They must grasp modern technologies. However, findings indicate that graduates qualities vary from person to person. Expertise of every person is different.

Table 9: Demanded Qualities founded in Graduates and lack areas of Graduates where they need improvement

Initial code	Focused Code	Theoretical Code/ Category
• Everyone is not perfect • Qualities vary from person to person	Not all demanded qualities found	HEIs have to work on candidate's subject knowledge, communication skill, decision power and confidence. However, there is variation in candidates' abilities.
• Not all demanded qualities found • Maybe to some extent demanded qualities found		
• Don't have in-depth knowledge	Poor subject knowledge	
• Weak communication skills of candidates	Soft skills needed to polish	
• Decision-making power needed to work on it		
• Confidence needed		
• Graduates are not fully equipped with demanded qualities. • Partially these attributes are found in them.	Not fully equipped with demanded qualities	However, graduates are not fully equipped with these qualities. Partially these attributes are found in them.
• Can't bear the Pressure of work		
• Institutional impact on graduates performance • UET, NUST, GIKI graduates are better than other public sector university	Good Perception about well-known HEIs	Institutional impact on graduates

Initial Codes:

The responses of the interviewees regarding demanded qualities founded in graduates and lack areas of graduates where they need improvement classified into three initial codes;1A) Cognitive Skills, 2A) Management skills 3A) Soft skills.

First initial code 1A) disclosed about cognitive skills such as knowledge of subject, field expertise, critical thinking. Second initial code 2A) revealed about management skills like work load management, technology management, human resource management, time management, conflict management and training management. Third initial code 3A) described about soft skills like communication, Confidence and Decision-making power.

However, graduates are not fully equipped with these qualities. Partially these attributes are found in them. Students are lacking in engineering knowledge, which leads to a deficiency of practicability of knowledge. Respondent said every institute has its impact and value in the market. Graduates from UET, NUST, and GIKI are better than other engineering institutes. Institutes need a proper assessment system and set of plans for betterment.

Table: 10 Reasons behind demanded qualities are not inculcated in graduates

Initial code	Focused Code	Theoretical Code/ Category
• Communication gap between HEIs and job market • HEIs didn't invite the industrial person to show them their graduate's abilities	The gap between HEIs and the job market.	HEIs and the job market are not on the same page. They are working independently. No alignment between them.
• Need for Teacher assessment • Lack of teachers training programs • Teachers are not interested in their continues development • Recruitment criteria needs up-gradation • Professional qualification ignored at recruitment time • Modern methods of teaching neglected	Teacher assessment and training programs and reset recruitment criteria on an urgent basis	Institutes need proper assessment and training plans for in-service teachers and upgrade recruitment criteria.

Initial Codes:

The responses of the interviewees regarding reasons behind demanded qualities are not inculcated in graduates classified into three initial codes. 1A) lack of linkage between HEIs and job market, 2A) poor recruitment criteria and 3A) lack of professionalism.

Reasons were asked from the stakeholders behind demanded qualities that are not inculcated in graduates. They responded that HEIs and job markets are not on the same page. They are working independently and have no alignment between them. There exists lazy behavior of teachers. There is need for teacher assessment, there is a lack of teacher training programs, teachers are not interested in their continues development, recruitment criteria need up-gradation, and professional skill ignored at recruitment time. Modern methods of teaching are also neglected. Institutes need proper assessment and training plans for in-service teachers.

Focused Codes:

The second stage of the coding process involves choosing focused codes out of the initial codes. A constant process of comparing properties of initial codes with each other in the first stage yields focused codes. Charmaz (2006) reminds her readers that "Focused coding requires significant and/ or frequent earlier codes to sift through large amounts of data".

The significant and frequent focused codes emerged from initial codes are 1b) 12 attributes of engineering directed by (PEC), 2b) Alignment of PLOs and CLOs with market and Curriculum alignment with Syllabus in the semester, 3b) Assessment Criteria, 4b) Professionalism, 5b) Relevant job market, 6b) lack of linkage between HEIs and job market and 7b) poor Recruitment criteria. These focused codes emerged from teachers, students and stakeholders combined responses.

RISING FOCUSED CODES TO CATEGORIES:

The third stage of the coding process involves generating Categories from focused codes. A constant process of comparing properties of initial codes with each other in the first stage yields focused codes at second stage and then development of theoretical codes at third stage (category). Charmaz (2006) explains the role of categories in the following way: "Categories explicate ideas, events, or processes in your data and do so in telling words. A category may subsume common themes and patterns in several codes". Two categories which generated from focused codes are "curriculum and assessment criteria" and "Linkage between HEIs and job market". Results show that in our HEIs curriculum and assessment criteria are not up to the mark and needed up-gradation according

to international standards. Our HEIs are not completely aligned with stakeholders; there exist a gap between HEIs graduate's qualities and demands of stakeholders.

THEORY GENERATION:

From the results of the research the substantive theory that I propose that there exist egoistic approaches of HEIs they are less fulfilling their prime responsibilities. Higher Education Institutions claim that they are producing competent graduates who are meeting the demands of the job market. However, there is a mismatch between the opinions of stakeholders, students, and HEIs concerning their claims and the demands of stakeholders. There should be a link between academia and industry needed to produce market-oriented graduates. Theory-practice gap exists which disturbs the whole system and more students to suffer in the form of unemployment.

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