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# Vuca in Engineering Education: Enhancement of Faculty Competency For Capacity Building

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## Abstract

The world is changing at a very fast pace- in terms of culture, education, complexities of societal needs and demands. The educator with his past learning cannot match the expectations of the millennials. The VUCA (volatility, uncertainty, complexity and ambiguity) in Engineering Education has to be observed, studied, analysed and reformed and that too very soon. Higher Education is unable to evolve in pace with the technological developments, global economics, and digital transformations. Global networking has shrunk the world and established inter-connectedness breaking barriers of language, geography, societal cultures, and perceptions. However such rapid changes have not impacted Engineering Education much. Academicians prophecies about attributes that an engineer should possess are turning volatile. This uncertainty leads to unemployed engineers. The chaos has emerged with various levels of complexities. With under-skilled employees, the future of the Engineers and Engineering Education looks bleak and ambiguous. Jack of all trades will have more employable possibilities than the Master of a particular skill. The faculty who teach the 21st Century Learner therefore must make a conscious, intentional choice to enhance his competencies to prepare students for the future.

This study emphasizes the need to reawaken our educational policies and teaching-learning pedagogy. Certain learning strategies like flipped learning, project-based learning, problem-based learning will adapt the andragogic method. The teaching trends will be metamorphosed and establish good networking for inter/transdisciplinary research. Case studies and scenario building will churn in opportunities for the students to communicate, collaborate, critically think, and be creative. The empowered faculty will have his multi-skilled students placed well, the student will be industry ready and the industry will have the employee come along with his 21st Century skill set. The beneficiaries: the school, university, teacher now a facilitator, the student and the community at large will build not only a sustainable future but a thriving one too!

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## 1. INTRODUCTION:

Education especially Higher Education is undergoing a rapid transformation from what it was a decade ago. The curriculum, the design of instructional objectives, the pedagogy and the strategies to meet the outcomes are evolving. Disruptions in the digital transformation has aided in significant participatory social learning forums and increased prosperity in different domains.

Education is now accessible from anywhere and at any time, all that one needs is the right attitude to study and learn. The trend of the old elite educational institutes with the 20<sup>th</sup> century teachers and curriculum will not hold good for the 21<sup>st</sup> century learners. This opening up of interconnectedness and easy access has introduced a volatile, uncertain, complex and ambiguous world called VUCA. The students of 2030 and 2040 will have to be groomed on specific skill sets for the future.

The Educational system be it at the primary, secondary or the tertiary level is not designed for creativity and innovation. Rote learning and the lower levels of Blooms are tested and evaluated. The higher order thinking skills are penned down on paper and it is taking time to gain foot into the curriculum. Some institutions have taken a leap and have bio-marked HOTS into their curriculum, but the number of such institutions is less. The component called Institute- Industry interaction, inter phasing and integration will engage the students and shape them to become industry ready from day one. However, not many institutions have time for all these processes in their academic calendar.

### *1.1 Engineering Education:*

Students spend about 20 years of their life in educating themselves on the curriculum designed by the academicians. They work to meet all the expectations to master the learning outcomes so that they qualify engineering degree with good grades. Families and universities celebrate their success. However, the transition from the portals of the university to the gates of the career is very hard. The engineering graduates are hit by the fact that their learning does not fetch them a job, leave alone creating a career for themselves. Academicians and the curricula nudge the engineer towards a career curve and not for the essential knowledge curve. The nudging force is not sufficient to create rigor or aspirations in the minds of the engineering students and they hit hard on the reality that they are not ready for the job despite their grades. Now, who is to shoulder this responsibility of getting job readiness: is it the curriculum, the academia, the individual, the industry or the society at large?

### *1.2 The Missing Basics:*

David E. Goldberg [1] in his TEDxTalks titled “7 Missing basics of engineering,” talks of the seven essential skills that go to make a productive and responsive engineer. He enlists them as the ability to: question, label patterns, model conceptually, decompose, experiment, visualize or ideate and communicate effectively. This, he feels are the missing basics of engineering.

Students are perplexed right from the time of joining the engineering program. They take up engineering not because they want to, but due to peer pressure, society and family prestige. They lack the necessary rigour and are caught unaware even in choosing their domain. New course titles, computer skills, communication requisites, ability to mingle with socio-hetero groups of different cultures and nations add more uncertainty. The knowledge component volatilizes to cause ambiguity and ends in complexity. From a spoon-fed school environment, they are thrown into a free, self-directed, uncertain ecosystem that threatens them with its vastness, volatility and openness.

In the words of Stephan Athan [2] in his TED Talk (Re-Engineering Engineering Education: Stephan Athan at TEDxUF): Brands, competition, collaboration, innovation, tricks of the trade, problem solving skills, economics,

business development, network ethics, Intellectual Property, research and development, and budgeting as few of the rudiments that are to be infused into the making of the engineer. The list is long and mind-boggling: the students, the faculty and the society are caught in the whirlpool called VUCA.

## 2. The VUCA term:

**VUCA**, an acronym for Volatility, Uncertainty, Complexity and Ambiguity [3] is the buzzing word, much discussed about by top level strategists and adaptive leaders for driving their organizational values to the pinnacle. The term was first used in 1987, drawing on the leadership theories of Warren Bennis and Burt Nanus [4] to understand the general conditions and situations. The U.S. Army War College coined the concept of VUCA to understand the more volatile, uncertain, complex and ambiguous multilateral world viewed after the end of the Cold War. The word gained immense usage from 2002. This targets processes that involve strategic leadership, quick decision making, on the oven moves and achieving positive outcomes of the unpredictable. The turbulence caused in economic, social, digital, technical and technological realms enhance the entropic measures- from formed to free as the saying goes! Many organizations are way laid and their leaders are startled and unable to strategize their next move in this VUCA world.

### 2.1. VUCA: A better understanding in Academics.

VUCA emerged from a military planning, entered into business domain and gained ground into education for capacity building. VUCA understanding for enhancement of faculty competency for capacity building is tweaked to fit to an academic settings. Not all stakeholders in the academia have heard of it, though it is a trendy term of the era. “The particular meaning and relevance of VUCA,” in the lines of the Wikipedia is: “often relates to how people view the conditions under which they make decisions, plan forward, manage risks, foster change and solve problems. In general, the premises of VUCA tend to shape an organization's capacity to:

1. Anticipate the Issues that Shape Conditions
2. Understand the Consequences of Issues and Actions
3. Appreciate the Interdependence of Variables
4. Prepare for Alternative Realities and Challenges
5. Interpret and Address Relevant Opportunities”

These components need to be practiced hard and get better at by the educators. A close look at each of the VUCA components with the academic lens over the viewpoint opens up the Pandora’s box.

#### 2.1.1. Academic Volatility (AV)

One has to ponder on the influential impact (AV) has on the educational framework based on the disruptiveness in the pedagogy, teaching-learning practices and experiential academic experiences. The best today is thrown out of place the next day. Courses and programs sought after, few years earlier, are obsolete now. Exam patterns, score types, accreditation processes are on a roller coaster. The ecosystem on the engineering institute campus is becoming more diverse, students react and respond differently to the imbalance between academic institution and real life situations. Online courses, digital transformation, artificial intelligence, big data analytics and developing apps are gripping the educational domain, without a strong base in basic skills, the students’ life may become endangered.

#### 2.1.2. Academic Uncertainty (AU)

The academic change is so fast paced that uncertainty looms over it. Earlier it was a defined path, if one followed a particular school of thought, one’s future will architected as a template and the outcomes would be predictable. In the present scenario, with start-ups, new skills demand, new workplace culture, social expectations and acceptance are all a different ball game. Many start-ups fizzle, but a few go quickly to being worth billions [5] - financial

experts and economists are unable to share their intuition about which one will win and for how long. With constant debate and discussion, some light is thrown upon based on data. Big brands names are now lost and forgotten, new ones mushroom in the rains, whether they sustain or wilt will be their response to this volatile, uncertain and complex system.

### *2.1.3. Academic Complexity (AC)*

Technically, technologically, socially a whole network of complexity has set in with the academics relying on space, biotechnology, emotional intelligence, resilience, leadership and people management. The population of the world has exploded and is rising steadily in a short time. It is a gruelling challenge and one can be thrown off by it or play tactfully. Increased complexity leads to enhanced competition. Demographics now play a huge role.

### *2.1.4. Academic Ambiguity (AA)*

The lack of definitism and clarity entangles ambiguity profoundly. How does one relate to ambiguity in education and in day-to-day scenarios? It holds different meaning for the novice and the expert. Each one perceives it differently. How does academia balance such a wide spectrum of students, curricula, novelty, and educational practices? Ambiguity in assessment and placement places on record the VUCA influence. Last benchers rock while the brighter ones shy away from the career responsibilities. Digital access and transformation behoves us all to pause and understand how the environment is influenced by VUCA. VUCA alerts us to be aware, alert and like a scout be prepared, armoured with practical tips and various solutions.

Students learning patterns, design thinking, multiple solutions to a single problem, hierarchical dissemination and divergent approaches add flair to face this ambiguity with confidence.

In the present mind boggling, dynamic and interconnected world, everything is in a consistent condition of motion; Boundaries are obscuring, equivocality is expanding, prompting a scope of complex associated natural, social, political and monetary difficulties. New age is setting new gauges and is pushing us to reconsider associations between use, utilization, social behaviour and individual significance. This present day circumstance has offered ascend to different large scale slants that are clearing our reality. Open Innovation has quickly assumed control over our lives and is quickly changing our general surroundings. Ordinary association with open innovation is getting quick and economical, changing the manner in which we live, work, devour and identify with one another. Individuals are happy to grasp unpredictability and are moving towards responsiveness, featuring a requirement for adapting innovation. Urban areas are growing up as are the requirements for creating robotized and easy to understand administrations and reasonable urban conditions. Organizations are getting increasingly more affected by innovation and taking more up to date structures to bring comfort for customers – be it web based shopping, music, transport, travel and so forth.

To overcome this VUCA, universities and higher education institutions need to join hands with the industry to formulate and envision engineering education in the 21st century in line with societal and real time problems. They have to understand and be prepared to look at engineering education as an emerging enterprise.

## **3. Modus Operandi in an academic VUCA world for Capacity Building for Faculty Competitiveness:**

The operational technique in a VUCA World, of VUCA academic world specifically in an Engineering Institution is executed by primary techniques borrowed from various other fields but tuned to be applied here in this arena.

### *3.1 Design thinking Approach: from pedagogy to andragogy*

The first two years of engineering curriculum revolves around basic sciences. Translating the pedagogical approach to the andragogic one via design thinking is one of the best ways to combat VUCA. Charted digital experiences, innovative models like Purdue's EPICS, MIT's CDIO approach will help academia design curricula to cater to the

21<sup>st</sup> century learners.

### *3.2 Student Centric:*

Evolution, revolution renaissance in the academia is threatening it with quick sands. Learning styles, work place culture, industry institute integration, problem solving approaches and project based learning are changing the spirit of the learning journey. The manner in which individuals learn is likewise evolving. Like never before, engineering institutions must have a knowledge into the changing needs and yearnings of their students to be effective. Decision oriented learning situations for a reliable, proficient outcome must become an organizational learning culture. Leadership must percolate into each individual to strive for excellence in this VUCA world.

### *3.3 Think Local and Act Global*

The formula to profound success is to 'Think Global, Act Local' and vice versa. [6] Any Educational institution needs to comprehend what national and international students need. They have to create opportunities for the students to experience a global experience on the campus. Global exposure, student exchange programs, a multicultural, international heterogeneity, ability to learn more languages and be sensitive to different social cultures are the norms needed. Engineering institutions of tomorrow should be neither miserably nearby nor carelessly worldwide.

### *3.4 Pulling in the creamy layer of faculty*

The capacity to pull in, create and hold the best ability is the thing that makes institutions effective in the long haul. Progressively, faculty need to work for an organization that mirrors their very own qualities. On the off chance that they trust in a typical vision and the bigger corporate reason, they are inspired to convey extraordinary execution. Competencies needed to handle the millennials, personalized learning and higher degrees of motivation to sustain in this VUCA is a must for the faculty to be trained constantly.

### *3.5 Prescience and Gracefulness*

The cards of triumph requires the capacity to, at the same time oversee both the present moment and the long haul objectives of the academic setting. In violent and quick evolving occasions, inter, intra personal skills are important. Networking with the right people at the right time will earn symbiotic respect and create a conducive learning-workplace. The job of the faculty or the service providers is to have a reasonable perspective about the future and manufacture an association that can explore towards that goal through great occasions, and significantly, likewise in terrible turmoil.

## **4. Capacity Building in a VUCA World:**

The present Engineering institutions are never again characterized by fixed working environments, nine-to-five working hours or by a lot of homogenous representatives. Institutions are turning out to be limit less with flexible time frames, choice based curricula, inter and trans- disciplinary research, blended, co-operative and collaborative learning through problem solving and projects. Design thinking will be the order of the day, learning to learn and teaching how to learn to learn will gain ground. Operational and plans of action are being flipped completely around. Institutions to come should work as stages interfacing various, conveyed, and multi-skilled people who will meet up to be transformational leaders begetting leaders.

Values play a big role in breathing life in this VUCA world. As an educator, it is tied with having a genuine north – an inner compass that navigates only towards the organizational orientation. It bequeaths clarity, confidence, rigor and aspiration. It will help social collaborations for better engagement.

#### *4.1 More Focus on Vertical Development:*

There are two distinct kinds of improvement: level and vertical. A lot of time has been spent on "level" improvement (abilities), yet almost no time on "vertical" advancement (formative stages). The techniques for even and vertical advancement are altogether different. Level advancement can be "transmitted" (from a specialist), yet vertical improvement must be earned (for oneself).

#### *4.2. Transition of Ownership to the Individual:*

The urge to grow and transform will be quick when people feel liable for their success. Working as teams with scaffolds from the team- HR, their director, or coaches keeps the spirit ignited. We should assist individuals with trip of the front seat and into the driver's seat of their own advancement. This kind of adaptive leadership will also instil mutual respect amongst all in the team.

#### *4.3. Focus on Collective instead of Individual Leadership:*

Leadership improvement has gone to a point of being excessively exclusively engaged and elitist. There is a progress happening from the old worldview in which administration dwelled in an individual or job, to another one wherein initiative is an aggregate procedure that is spread all through the systems of individuals. The inquiry will change from, "Who are the pioneers?" to "What conditions do we require for administration to thrive in the system?" How would we spread authority limit all through the association and democratize initiative? How we can win and infuse victory collectively [7].

#### *4.4. Greater Focus on Innovation in Leadership Development Methods:*

There are no straightforward, existing models or projects that will be adequate to build up the degrees of aggregate administration required to meet an undeniably perplexing future. Rather, a time of fast development will be required in which associations explore different avenues regarding new approaches that consolidate assorted thoughts in new manners and offer these with others. Innovation and the web will both give the foundation and drive the change. Associations that grasp the progressions will show improvement over.

Educators at the Engineering Institutions must have a deep understanding of this phase and be happy that they are creating a futuristic world through digital transformation, open innovation, interconnected networking, adaptive leadership, empathy, and preparedness with the right embrace of knowledge, skills and creativity. Higher Institutions are imbibing constant training through innovation labs, learning centres, leadership open spaces and mentoring.

## **5. Conclusion:**

We are all influenced by the engineer in all walks of our life. Institutions must engage with the beneficiaries for a sustainable societal disruptiveness: through technological interventions and managerial interventions. The dynamic disruptiveness, a function of sustainability is dictated by 4 Ds: Dialogue, Debate, Discuss and Deliver.

To achieve sustainability the following pre-requisites must be well understood and imbibed as a culture and organizational learning: i. Technology changes. ii. Soft-skilled approach. iii. Human Orientation and iv. Cross-cultural sensitivity.

Many higher educational institutes are strategically planning to train the faculty through faculty development programs on topics of critical importance. The faculty development program orient the faculty on a few of the following:

- i. Organise and direct learning situations
- ii. Assess and evaluate the teaching learning process
- iii. Conceive, design, implement and operate on futuristic skills

- iv. Involve students as partners and owners of their learning
- v. Teamwork
- vi. Adapt digital transformation
- vii. Conform to the values, mission and vision of the organization.
- viii. Be a transformational Leader

The process of design thinking and re-engineering of engineering education will foster stability and create preparedness in the minds of the teach and the taught. Design thinking inspires the academia to frame solutions to relevant problems with rigor. Active mental immersion synergize teams to ideate divergent solutions, experiment, test the solution, and validate based on interpretations from data. VUCA and its challenges will be converted to opportunities and milestones with training, facilitation and imbibing a culture that will be dynamic, adaptive and responsive through careful observation, analysis of data and opening up newer avenues of knowledge and people management. Engineering Education will, with this scientific scaffold not only sustain, but thrive bountifully towards progress and productivity.

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