THE ENGINEERING CURRICULUM FOR 2020: VALUES, VARIABILITY, IMPROVEMENT AND KNOWLEDGE

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Abstract - Designing an engineering curriculum based on well-established quality principles is the theme of this paper. A curriculum will be presented that is self-sustained and grows to meet and exceed current and future demands. It is based on clear vision, values, variability, knowledge and awareness of the inherent worth of people. It capitalizes on the successful lean production thinking of the automobile industry, proceeds with the Deming philosophy for improving quality, and continues with the inherent human aspect of people. The human aspect utilizes the fact that successful institutions practice their true beliefs rather than simply profess them. This paper concludes by introducing the concept of self-deception to prepare the reader to embrace and implement the current proposed solution: a solution that will reverse the continuous escalating cost of our education system by creating an environment of teaming, continuous improvement, flattening the organization, and assigning the faculty to do what they were trained and hired to do, in a happy and healthy productive working environment.

Index Terms-values, variability, improvement, knowledge, self-deception

I. INTRODUCTION

Writing about the way to structure the engineering curriculum of 2020 and beyond requires understanding and knowledge from several disciplines. It also requires respect and love for people. A significant amount of knowledge can be gained by studying the “lean thinking” approach that was successfully developed for and applied in the automobile industry with significant improvements and a wide range of applications in many other areas. Lean thinking will be addressed in the first section, and will lead in a very natural way to other disciplines.

I.1. Lean Engineering/Lean Thinking [1]

The birth of lean thinking/lean production/lean engineering came as a result of the automobile industry’s struggle for growth and survival. The lean production method of automobile research and thinking is documented on the Massachusetts Institute of Technology’s [1] five-million-dollar study on the future of the automobile, a groundbreaking analysis of the worldwide move from mass to lean production.

There are numerous similarities between the automobile industry and the education field. Namely people need a car and people need education as well. People expect a good car and people expect a good education. People have a choice of where to spend their resources to get a car and people have a choice of where to spend their resources to get an education. People want to get a car from a place that has a good reputation that reflects happiness, growth, and stability. Likewise, people want to get their education from a place with these similar attributes.

However, there are also some differences. The great difference that education can capitalize upon is that the automobile industry has already gone through many changes and crisis. The industry has produced documentation at a much earlier time and is thirty years ahead of what the field of education is currently facing (escalating costs and plenty of re-work).

The success of Lean Production [1] by the MIT national bestseller work of Womack, Jones and Roos offers guidelines for the auto industry. As stated in their book and as the result of much research, lean thinking requires: teamwork, communication, the efficient use of resources, the elimination of waste, and continuous improvement. By implementing lean production, the advantages over mass production are significant. Lean production requires: half the human effort in the factory, half the manufacturing space, half the engineering hours and half the time to develop new products. Since the field of education is seeking to achieve similar improvements, the auto industries’ approach will be the heart of our effort. Similarly, the automobile industry utilizes many different technologies, different continuously changing requirements, and international and domestic competitions. In particular, they require a tightly knit project team, clear leadership, and the willingness of many specialists to contribute their personal knowledge and insights to a group effort.

Japan pioneered the concept of lean production. Lean production combines the advantages of craft (perfecting details by doing one piece at time) and mass production. It avoids the high cost of the craft and the rigidity of the mass production. At the end, it employs teams of multi-skilled workers at all levels of the organization. Lean production continuously requires learning new professional skills and applying them creatively in a team setting rather than in a rigid hierarchy. For education, it means:

- Teaming and the need for multi-disciplined knowledgeable educators
More team thinking and fewer levels of management
Continuous faculty development and synergy in the educational environment,
Teaming should be a way of life and a stimulus for growth.

In a lean production environment the workers are no longer willing to be treated as a variable cost or as an interchangeable part. Management’s right to layoff or terminate employees is severely restricted. Continuously hiring employees at higher pay rates under substandard conditions is not encouraged. For education, it means:
- The creation of a healthy environment where faculty contribute and the fear of termination do not exist.
- The hiring of new faculties at higher rates should be discouraged and eliminated.
- The creation of a healthy environment will encourage continuous enhancement of faculty’s skills and in return a gain in their knowledge, experience, and seniority.
- The creation of a university community where teamwork and collaboration flourishes.
- In return, the university will have a totally committed faculty that will remain loyal for their entire working lives.

In lean production, it actually cost less per part to make small batches of stampings than to run off enormous lots. First, one small batch eliminates the carrying cost of the huge inventories of finished parts. Second, making only a few parts before assembling them into a car causes stamping mistakes to show up almost instantaneously. For education, it means:
- Shorter terms that offer the needed courses
- Student will graduate in the shortest possible time
- The faculty will be able to teach a variety of courses and continuously improve the quality of education
- The faculty will be more in tune with the overall curriculum, and with the need for the student to master the material for each course since it is the prerequisite for the following course that they may be teaching
- Lean thinking will increase communication among faculty, which will result in an improvement of the overall educational system
- A continuous corrective mechanism in the event a student did not master the material for a particular course. It will show immediately the following term, where time will be allowed for corrective action.
- Faculty will be able to correct any problems before the student is ready for graduation.

The first step in lean production is to group workers into teams with a team leader rather than a foreman. The teams are given a set of assembly steps, their piece of the line, and told to work together on how best to perform the necessary operations. The team leader handles assembly tasks as well as coordinates the team, and in particular would fill in for any absent worker, a concept unheard of in mass-production. For education, it means:
- The leader must be an experienced capable educator that can handle many of the teaching and research assignment in a minimum notice
- The leader will normally teach at least one course per term on a continuous basis and teaches different courses through the period of his/her tenure
- The leader has knowledge of the teaching process and is an integral part of the system
- The creation of institutions that are very lean on top, and most of the resources are allocated to the faculties that are responsible for producing outstanding graduates
- Intimidation and termination will not flourish in this environment, and will be replaced by cooperation and teamwork, for the good of the institution

The next step in lean production is to give the team the task of housekeeping, minor troubleshooting, and quality checking. For education, it means:
- During the teaching of the course, faculty can incorporate changes to better the course, and continuously perform assessments to see that the students are mastering the material
- Based on this continuous assessment mechanism corrective actions will take place
- Continuous improvement will occur at the individual course content level... a revised course description, new software packages, an adoption of different textbooks or writing their own textbook, and many others

The final step of lean engineering is applied after the teams are performing their duties smoothly and without difficulties. Time must be set aside periodically for the team to suggest ways to collectively improve the overall process. This continuous, incremental improvement process, Kaizen in Japanese, took place in collaboration with the industrial engineers who still existed in the auto industry but in much smaller numbers. For education, it means:
- On a continuous basis the faculty and their working leader should have a brainstorming meeting to continuously improve the overall curriculum
- Members of the departmental advisory board can be present at those improvement meetings to give the industry prospective on this effort. Also, it would be beneficial for the parents of the students to be present at those meetings together with past graduates. Of course, this can only be accomplished if you have happy parents, happy graduates and happy current employers of your graduates. It is a binding relationship that is established through a commitment to quality, through respect for your student, through commitment to teach at the highest possible caliber, and from an institution of the highest possible values.
In lean production, problems are not treated as random events. They are not only repaired in the hope that they will not occur again, but they are treated as a system problem that needs to be corrected using the “five why’s” system approach. Production workers are taught to trace systematically every error back to its ultimate cause, then to devise a fix, so that it will not ever occur again. For education, it means:

- Faculty should be empowered not only to rectify the problem but also to determine the cause and take appropriate actions so the same problem will not occur again. Yes, this will require some time to be done, but in the long run this is the best investment that any institution can make to its program. In no time at all those problems will be minimized and a productive program will emerge. This newly emerged program will produce quality graduates that will more than satisfy the demands of the prospective employers.

- For this to be successfully accomplished, ownership of the individual courses by individual faculty needs to be abandoned. Otherwise it will result in a stagnant highly inert system with no room to move (as we are currently experiencing in education). This situation can be overcome by a more flexible continuously improving highly interactive system, as described in this paper.

The suppliers in a lean production environment are ultimately involved in product development. In a sense they share their destinies with that of the company. For education, it means:

- The university must have good working relationships with various high schools and junior colleges to get a fair share of new and transfer students.

- The university must offer the appropriate courses for the new and transfer students to enroll in, with minimum interruption of the student’s time. Also, if appropriate, the University can offer an opportunity to deserving high school teachers to join in one of the working university teams and to experience the current challenges of their high schools graduates. This is a great opportunity to establish a continuous healthy working relationship with the local educational community.

In addition to the lean thinking principles, the proven quality enhancement ideas of the world famous W. Edwards Deming must be adopted by successful organizations to ensure the quality of their programs and that of their graduates. This topic will be discussed next.

I.2 The Deming Route To Quality And Productivity [2]

The purpose of this section is to introduce some of the key points of Deming’s philosophy and to transform them to the understanding and implementation in the area of academics. However, this is not a substitute for reading Dr. Deming’s book “Out of the Crisis” or its predecessor, “Quality, Productivity and Competitive Position”. Following Deming’s industry philosophy in education will guide academic institutions to produce quality graduates, in a productive happy environment at an optimal cost - with very few surprises or re-work.

Deming’s [2] first point is to: “Create constancy of purpose toward improvement of product and service, with the aim to become competitive, stay in business, and provide jobs.” In academic environment every process must start with the students in mind. Continue research in better ways for students to receive and retain information, is an essential part of this process. New methodologies in designing surveys for continuously assessing programs and courses are an integral part of this process. These surveys should not be limited to the students but should include prospective employers, parents of the current students and past graduates.

The constancy of purpose sets up the course of today to stay in business tomorrow. The top management needs to do more than set the vision for the institution. They also need to constantly provide a revised roadmap for its implementation. Walking the talk should be followed through out. “Walk the Talk” will be the next topic in this next section. Talk is cheap, beautiful colorful brochures and presentations will not take institutions anywhere, unless there is constancy of purpose. Constancy of purpose affects the opportunities of tomorrow.

Knowledge is a key to this first point. Doing your best is not good enough. You have to know what to do. Then do the best. Knowing what to do establishes the constancy of purpose and then doing your best maintains consistency of purpose. Maintaining consistency of purpose is a problem of range or dispersion. And managing dispersion is often more difficult than managing the mean. For education, it means:

- Leaders must be knowledgeable educators that continuously establish improving plans for the student to follow.

- Continuously monitoring and assessing the plan to keep the variability on the fundamental knowledge gained by the student to the minimum and to keep the mean of the quality of knowledge acquired by them at the highest possible level.

- There is no substitute for knowledge: it takes time and determination. There is no fast fix for education.

Deming’s [2] second point is to: “Adopt the new philosophy. We are in a new economic age, created by Japan. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.” Many people think that all one really needs to do is get back to the basics and everything will be fine. They are wrong. Because they are repeating the things they have done in the past, over and over again with
the same negative results. With the use of technology they are doing it at a much faster rate. As a result, a loss of their capital investment occurs at a faster rate. And the key message to all this is: that productivity only increases when the quality improves, and quality improves if and only if there is less rework. For education, it means:

- A need to work collectively to increase the knowledge of our students without leaving anyone behind. It is an attitude that needs to be adopted. It is a system challenge and not the weakness of an individual student.
- A need to create new educational approaches to see that all the students accepted in our institution are graduating within an established minimum tolerance and with an optimum mean knowledge of the chosen field. This can be done throughout their educational career.
- Things that worked in other institutions several years ago, will not work in your institution at the present time. Our current environment is continuously evolving and changing. The key point is to continuously look for new ways of doing business.

Deming's [2] third point is to: "Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place". We all are managing processes. Every one of us is a customer and a supplier. We all affect the quality of the product. A process is a transformation of inputs such as people, material equipment, methods, and environment into outcomes. Some of the inputs transform and some of them are transformed. In business organizations these processes are interrelated and one process output is another process' input. Some processes are people and others are materials or methods or environments that contribute to the variability. The old expensive way of doing business is to try to manage the outcomes by detecting defects. A much better way is to improve the process to prevent the occurrence of defects. In this approach the prevention mechanism incorporates feedback from the process itself and from the customers to modify the process before the outcome is produced. It is a form of feed-forward detection and feedback prevention to keep the process under control or within the stated variability. As we all know every process contains many sources of variability especially when one process feeds another, then the variability is compounded and most of the time results in out-of-control conditions, unless procedures to prevent defects are implemented inside the process. Empowerment and knowledge is the key. For education, it means:

- The creation of an environment with zero defects. Or, to keep the defects to a minimum manageable level, and still produce a product at an acceptable level.
- Not overlooking the fact that those in education are people not parts or objects.
- Designing the curriculum with the minimum number of building blocks or building processes and each process to be defect free by prevention techniques and of a managed time frame. A possible solution is to have a quarter system with four terms per year and each term to have only one building block. (the semester system will have three terms per year, and again one block per term). During the beginning terms this can be possible and towards the senior year the students may have a choice between two blocks only for specialization purposes, if needed. This however will not be necessary, since with team teaching topic diversity can be integrated within the block.
- The teaching will be done on a teaming basis with a wide range of material covered and requires a wide range of expertise from the faculty. The faculty will be assigned to a block rather than to a particular course. It will give the faculty the opportunity to communicate with colleagues from other disciplines on a continuous basis throughout the term. Additionally, by teaching diverse subjects the faculties will continuously monitor the system to prevent defects. For this to be accomplished different teaching styles will be introduced, different assessing methodology will be created, and most important the students will be key players in this process. A win-win situation!!!!. A savings in registration procedures, a savings in time for assigning faculty to courses, a savings in time to stop the ownership of courses by faculty. The faculty now will clearly be able to see the big picture and the interrelation of the various blocks. A lesson in decreasing variability, a lesson in the understanding in designing assessment mechanism, an opportunity to experience different teaching styles, and an opportunity for the faculty in the various disciplines to continuously interact and learn from each other. Finally a great experience in team learning, team teaching, continuous improvement and lifelong learning will occur.
- The faculty will spend most of their time improving the content and delivery of the material for the block and will have no time to criticize others. Leaders will now concentrate in evaluating the overall program and seeking opportunities for its improvement. They will become part of the process, with no need to continuously evaluate others' performance. These evaluations have been proven to be dehumanizing and counter productive. Thus managing now needs to be transformed to leadership.

Deming’s [2] fifth point is to: “Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs”. The process of continuous improvement spirals toward a customer target. It is accomplished by following the Deming cycle of “Recognizing the opportunity” then “Testing the theory to achieve the opportunity”, then “Observing the results” then “Acting on the opportunity” and the cycle repeats. The opportunity...
for improving in this customer-driven process can be thought of as the gap between the customer’s need expressed through the customer-feedback-loop and the process-performance expressed through the process-feedback-loop. The opportunity diminishes as the two get closer together and the process variability gets smaller and smaller. For education, it means:

- The continuous improvement cycle should be in place and after a few cycles the variability will decrease to close to zero. The cycle should be in place at all levels, from the course to the curriculum level. As soon as the variance gets close to zero, the bar should be raised to a higher level of accomplishment in pursuit of greatness.

Deming’s [2] twelfth point is to: “Remove the barriers that rob the workers of their right to pride of workmanship. The responsibility of supervisors must be changed from stressing sheer numbers to quality. Remove barriers, that rob people of the right to pride of workmanship. This means, in inter alias, abolishment of the annual merit rating and of management by objective”.

The performance appraisal system destroys teamwork and fosters mediocrity. It reduces initiative and risk-taking because it is an attitude-type system. The application to education is obvious. Again, the management works on the system, and the people works in the system. Thus, the problem is not the people it is the system.

Deming’s [2] eighth point is to: “Drive out fear, so that everyone may work effectively for the company”.

Removal or reduction of fear is a key for the management to start implementing. Without an atmosphere of mutual respect no system will work, and the waste due to fear is enormous. It is the invisible figure that will destroy any organization. Dr. Deming observed, that fear of knowledge is pervasive in many level of management and through their fear of ignorance they increase the cost of their operation by hiring additional support members….. a shielding mechanism. Some are too close to retirement to have any motivation to learn while others have fear of what the new change will bring. A better solution to ease the fear of the unknown is continuous learning. Anyone who stops to learn is old, whether at twenty or at eighty. Anyone who keeps learning stays young. The greatest thing in life is to keep your mind young. For education, the same principles apply, a system needs to be implemented where new knowledge is continuously incorporated and fear does not exist.

Deming’s [2] ninth point is to: “Break down barriers between departments. People in research, design, sales, and production must work as a team to foresee problems of production and in use that may be encountered with product or service”.

In education a better approach is needed for this point to be accomplished. The current problem of breaking the curriculum into a set of courses, have been with us for many years. And the ownership of courses by individual faculty is a way of life. A better way is to break down the curriculum into a minimum number of blocks. In each block many faculty from various disciplines are teamed for the assessment, improvement and teaching of the block. By doing this, the ninth point of Deming will be easily accomplished. At the same time this will eliminate the wall building approach that currently exists in our educational institutions, replacing it with teamwork, cooperation, continuous improvement, and direct the focus of the faculty on the material that they are trained to perform. Its implementation will result in a transformation to an effective continuously improved managed institution where values, ethics and knowledge freely flow.

The success of any institution is in the commitment and respect of its people. The next topic of this section will give a good prospective and awareness of the inherent worth of people.

I-3. Walk The Talk: And Get The Results You Want

The Walk the Talk [3] is a book about the inherent worth of people. For an organization to succeed, commitment, cooperation, and unselfish dedication must prevail. These priceless qualities are integral to the success of any substantive endeavor. It is very hard for people to practice what they preach, and their research will bring it to focus. Leaders are struggling to get their group to perform like a team and to hire, retain, and manage productive people. They are continuously searching for ways to be more profitable and in sync with their mission, vision and values. Surviving organizations must find solutions to the challenge of competitions, delegation, quality and institution’s integrity. Walking the talk is the very essence of what today’s management must adopt as a credo of choice. Their research work shows how to blend values and ideals into daily practice. For education, it means:

- The need to take another look at the workings of the institution. It is an invitation to regroup and take stock of all resources
- It is a challenge for the institutions to cultivate the rich resource of people, their fertile minds and hidden talents. It espouses honesty and integrity and goes even deeper, to be better stewards of both the institution as one entity and individual lives
- It is about living out the convictions and dealing with contradictions. Whether the deed is small or large, there is little that goes unnoticed in any institution
- Delegating, empowering, and turning beliefs into practice are all integral to walking the talk. It is extremely important to be sure that the true beliefs and institutional values are practiced, rather than merely professed
- To assess this situation, a walk through the corridors of the institution to observe the interaction of faculty, student, and staff will suffice. Are the doors to the offices open and does communication flow freely or are
the doors closed with fear prevailing? Are the department heads and deans visible and genuinely interacting with students, faculty and staff? All these are great indicators of a healthy organization. It is easy to detect happiness in a productive healthy organization. The opposite is also very true; you can detect an unhealthy organization from miles away. The way the administration treats the faculty and staff is the same way they will treat their students.

- Good intentions and lofty goals are great, however words are just words unless the leadership of the institution actually follows them. For an institution to survive and prosper it needs to walk the talk and practice what they profess. Acting in accordance to its stated beliefs and values is the greatest challenge that an institution faces. Conflicts between practices and stated values have devastating effects in any institution and if not properly attended to, it will result in confusion, mistrust, firings and resignations, personal attacks of the faculty and staff, high rate of absenteeism/sickness, students leaving the institution, a decrease in enrollment, and eventually total destruction.

Leadership must exist in any organization and is the next topic.


This section will introduce new knowledge to pave the road to transform our current managed institutions to the one proposed in the book [4]. It will ease with the resistance to its implementation. The Arbinger Institute [4] was formed to solve the age-old problem of self-deception, or what was originally called “resistance”. Most of the organizational problems are not separate problems but are symptoms of the single problem of self-deception.

Self-deception blinds people to see the true cause of problems, and once blind, any solution regardless how great it is --- will make matters worse. Reading the book will help accomplish three things: (1) it will help you to understand how people create their own problems, (2) it will enable you to see that they are creating their own problems, and (3) it will allow you to see how they are resisting any attempt to help them to cease creating those problems. Their work addresses and helps handle this phenomenon, which is the heart of many organizational failures. New solutions to existing challenges seem intractable, for the simple reason of self- deception---resistance to the solution. The cure for self-deception is to look at people as people rather than objects and to focus on the big beautiful picture for the results you want to accomplish.

Handling self-deception gets you in a state of mind to see clearly the situation as it currently is, and takes away all previous beliefs you may have through past experiences. Readers of Dr. Hadjilogiu’s paper need to be in the state of non self-deception to embrace and implement the current proposed solution. It will reverse the continued escalating cost of our education system by creating an environment of teaming, continuous improvement, flattening the organization and assigning the faculty to perform what they were trained and hired to do, in a happy healthy productive working environment.

Satisfying the accreditation requirements is a must for any institution, and is the next topic. It combines knowledge and the development of its people.

II. Accreditation Requirements [5]

The accreditation Engineering Criteria 2000 is based upon what the students learn in the course of their programs as opposed to what they are presented in a curriculum. Thus, institutions are required to have educational objectives and to employ outcome assessment techniques to determine the degree to which program goals and objectives are being attained. The assessment, in turn, is used in an ongoing process of improving student learning through enhancements to the program. The objectives and outcomes are: An ability to apply knowledge of mathematics, science and engineering; an ability to design and conduct experiments, as well as to analyze and interpret data; an ability to design a system, component, or process to meet desired needs; an ability to function on multi-disciplinary teams; an ability to identify, formulate, and to solve engineering problems; an understanding of professional and ethical responsibility; an ability to communicate effectively; the broad education necessary to understand the impact of engineering solutions in a global and social context; a recognition of the need for, and an ability to engage in life-long learning; a knowledge of contemporary issues; an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

The interesting thing of this accreditation section is that all the objectives, outcomes, and processes are addressed in this paper. Thus, this proposed curriculum for 2020 automatically satisfies all these objectives, outcomes and processes. This is because the design of the curriculum for 2020 is based on sound quality principles.

III. The Engineering Curriculum For 2020

All the items appearing in bold and/or in bullet form in this paper should be used as guided principles in the design of the engineering curriculum for 2020. Some of these principles have to do with values for people, some of them have to do with the variability of student performance in a classroom environment, some of them have to do with processes to continuously improve performance, while others have to do with the important attributes of knowledge. There is no substitute for knowledge, but knowledge without values, variability and continuous improvement will not
This paper addresses the need for teaming of a multi-disciplined knowledgeable faculty, for team thinking with few levels of management, for continuous faculty development and synergy in the educational environment, for teaching to be a way of life and a stimulus for growth, for reduced variability and continuous corrective mechanisms, and for all these attributes to be accomplished in an optimum way the curriculum must have only one block of material for every term. And this should be true, regardless if the university is on a semester or on a quarter system.

The quarter system will have twelve blocks and the semester system eight. Each term, a different team of faculty from the various disciplines will be assigned to improve and teach a block. And to optimize the flexibility of the program for ease of student registration and the fastest possible way for graduation, every block should be taught every term. The leader of the block team will normally be chosen from the department where the block is assigned and this is not a permanent assignment. On special occasions high school teachers may be assigned to be part of the team.

In this system the faculty will be able to be involved in a variety of blocks and contribute to its improvement. They will be more in tune with the overall curriculum and will increase communication among faculty from the various disciplines in the pursuit to continuously improve the content of the course, correct any potential problems, add and remove material, and directly involved with issues directly related with the retention of the material by the students. They will perform assessments to continuously evaluate the variability in the student retention and will experiment with a variety of teaching methodologies to best serve the students. A brainstorming session should take place at the end of each term for the overall improvement of the curriculum.

The design of the blocks will be handled by first defining the purpose of the block. For example for the first block in the computer-engineering curriculum, it may be described as follows: “The purpose of the first block in the computer engineering program is to address the design of specialized processors and the introduction of general processors”.

To accomplish this, the computer engineering faculty will know that the students need to go through the following: define in words the process, draw a state graph, a state table, state assignment, transition table, logical expressions, implementations, simulation, bread boarding, graphing, etc. For this task to be complete, the computer engineering faculty will need assistance from the Math faculty in graph theory, signal representation, functions, discrete mathematics, mathematical modeling...from the Science faculty in the physical aspects of integrated devices, of the physics of semiconductors, in radiation, in heat transfer, and from the English faculty in proper ways to write reports to properly document all the knowledge receive in this block and also in the preparation of the final report to demonstrate the overall course, in the event the team decides to publish their work. This will make the student involve and will get the feeling of ownership of the material for the block since they participated in the improvement for the block.

However, the current material that is currently in every curriculum will be taught but will be totally reorganized and continuously updated in an “as needed” basis by all the faculties. At the block level, the faculties teaching that block for that particular term will immediately handle minor corrections and improvement. And, at regular established intervals all faculty will get involved to update and improve the entire curriculum. It is a form of Just-In-Time -Continuous-Improving delivery in a teaming environment. The continuous improvement mechanism will take place on a term basis, through evaluations and assessment with involvement by all constituents focus for the best interest of the students and of the department. In addition, the faculty (the greatest resource of any institution) will be an integral and key contributors to the overall program rather than concentrating in the improvement and protection of the individual course/courses assigned to them.

**IV. SUMMARY**

Reading the material addressed in this paper is not in any way a replacement to reading the original papers stated in the Bibliography. Every member of any educational institution should be aware of those principles and make them an integral part of life in their institution. Values, variability, improvement, knowledge and respect for people will be the guiding principles in any surviving educational institution. It is hard to compete with external forces without having also to battle with internal inconsistencies...and these inconsistencies are the cause when words and actions are not in sync. And it takes very few values-violations for the leadership credibility of an institution to fall to an all time low. This research work brings to focus the impact of knowledge, value-conflicting behavior, variability, self-deception, performance and escalating cost in our education system. This awareness, teamwork and open-mind attitude will achieve positive changes and lasting results. Variability, assessments, continuous improvements, searches for new knowledge and love with respect for people should be a way of life in our educational institutions. Thus, it will reverse the continued escalating cost of our educational system by flattening the organization and assigning the faculty to perform what they were trained and hired to do, in a happy, healthy, productive working environment.
V. REFERENCES


[5] “Accreditation Board for Engineering and Technology (ABET), Inc.” Baltimore, Maryland (www.abet.org)