Ladies and Gentlemen it is a pleasure for me and also a challenge for me to be here to take part in this Symposium. I'll start this speech with a little story and a word of warning. Many years ago (1991-1992) a colleague mine from an English university was teaching some courses at my institute. Afterwards he wrote a report of his experience that made us stop and think. He wrote: “It has been a nice time here. I got to know your students and I think that they are very demanding and frankly speaking I think that you are spoon-feeding your students too much.” Further he wrote: “your students might be better analysts but our students are more self-confident and more creative”. On second thought I think he was right. In fact I know he was right. Students are overloaded, they suffer factual overload. For years we tried to squeeze too much knowledge into the syllabus of existing formally taught courses. This resulted in frustrated and overloaded students and lecturers. After that We/I changed the teaching format resulting in new avenues of teaching and learning i.e. Project Organized Teaching and Learning.

Here comes the word of warning: I once heard that if you are stuck with a problem, if you don’t know how to find your way in the maze of life or if you are worried about how to address an assembly like this or how to start an after dinner speech, then you can always find a word of consolidation, a helpful hint, a joke that will dissipate the gloom, if you look up your problem in Shakespeare. Nothing in human life was an alien to him, not even engineers. By the way, the bit about the fun of having “the engineer hoist with his own petard” (SN36-1990), meaning that engineers should be blown to pieces by their own cracker work or bombs, is rather embarrassing to our profession, but it should start some of us to go over our project once more. It reminds me about the situation that arose almost half a century ago, when Vance Packard professor of economy at Harvard University published The Hidden Persuaders, consumers were deeply shocked by the mendacious machinations of marketing types. See Harvard Business Review June 2003 p.16.

By the end of 2008 the TREE (Teaching and Research in Engineering in Europe) program ended (www.unifi.it/tree). I was a member of this SIG (Special Interest Group) B3 during the three years it lasted. A final report of this work was published with the title: “Facilitating
From the introduction of this report the following is quoted:

Modern engineering education should be focused, among others on some generic competencies. Some of these competencies like: Teamwork, interpersonal skills, the ability to work in an international team with students of different disciplines, nationalities and study levels are of special importance. An engineer today must be able to cope with a broad scope of disciplines such as: economics, management, communication, languages and a solid training in interdisciplinary and international teams.

Further:

Today’s graduates of engineering

- expect to work in an engineering company
- expect to work in their home country
- have entrepreneurial skills

But this model of an engineering graduate is not suitable for the 21st century since it does not comply with the expectations and challenges in the modern united Europe. The number of engineering students is going down every year mainly do to the fact that engineering is treated as a very difficult area. Engineering education is still in trouble and has been that for many years.

Here are some statements to prove that:

**Statements**

- Why do fewer students take engineering education? (SN36-1990)
- Engineering students suffer factual overloads (SN36-1990)
- Looking ahead to 2020, what will be the most important skills, knowledge and behaviors for students to acquire to provide Ohio with competitive advantages in the global economy? (ASEE 2. Jan. 2009)

The paper I submitted to this symposium has the title: Project Management and Teamwork therefore this speech is about projects carried out by people working in teams i.e. Teamwork and People Management described in handout slides 2, 5, 6, 12 provided.
The definition of teamwork can therefore be expressed as follows:

**Teamwork**

- Is more than just teambuilding.
- Is the ability to work together towards a common vision.
- Is the ability to direct individual accomplishment.
- Is the fuel that allows ordinary people to attain extraordinary results.
- Is less I and more We.

Simply stated, Teamwork is less I and more We. There is an expressed need to develop teamwork with specialists collaborating in and contributing to the design. This is called working in an integrated engineering context.

**Integrated Engineering**

- Integrated engineering involves the interrelated work of several disciplines
- The disciplines involved in a given project are chosen according to the need of the project provider and the academic world
- Working in an integrated engineering context emphasizes development of personal competences

Integrated engineering projects are learning and teaching methods by which new material and competencies may be introduced, it is not just an opportunity to practice what has been previously taught. This multidisciplinary activity, shown in slide 16 in the handouts requires a collective effort of specialists with different kinds of expertise.

It is often said, that teams promote synergy where results outweigh the sum of individual team members contribution. It is important therefore, that each member of a team not only contributes but also adapts and is ready to accept the idea of others. The group must
concentrate its effort on getting the most out of each individual that meet the strengths and ability of each team member. The Phrase: “The whole is greater than the sum of the parts” eloquently encapsulates the concept of teamwork. Thorough attention should be paid to, what I call, the three P’s i.e. the **People** involved, the **Product** produced and the **Process** performed.

Teamwork is

- Group performance with regard to:
  - The product produced
  - The process executed
  - The people involved

Please note that teamwork is social rather than solitary. Students do not necessarily develop team skills by working in a project group. Projects done are learning and teaching methods by which new material and competencies may be introduced and are not just an opportunity to practice what has been previously taught.

**Learning in Teams**

To meet identified needs of interested parties such as society, industry, university and students, we must help participants in teamwork to develop their professional and their personal competencies. We must give them the opportunity to use their acquired knowledge, to develop a deeper understanding of technical and business subjects and include them in an integrated engineering context. We must help students develop their interest in a subject that will inspire them to take a deeper approach to studying it. Active involvement of students has been found more learning effective than straight lecturing in the class. It is important to provide more time for project work or even better team-based project work. It is therefore suggested to select teaching and learning methods that teach students how to tackle unstructured problems and solve them.
Establish a benign learning environment and improve supervisor support. Being a member of a team-based project group consisting of people coming from different cultures and disciplines you have to be especially aware of the existing diversity. In addition some people come from deal-focused environments and others from countries with a relation-focused attitude. A number of the key issues are differences between a deal focused and a relation oriented way of conducted meetings and negotiating between different suggestions. Sensitivity to status differences the rigid hierarchies frequently displayed in a number of universities may also provide initial uncertainty in students. Although we very much look alike on the outside does not mean that we are coded with the same mindset. On the contrary there is a good chance that a group of four people coming from four different countries represent four paradigms. To make people, of great diversity, work as a team is both a struggle and a challenge for students and supervisors involved.

Group performance is a collective performance of people coming together to work on projects as members of a team towards objectives that are shared. Project work in that sense is social rather than solitary. In doing teamwork you learn what synergy means, you learn to value differences, which is necessary to make a successful group-project. Diversity in cultures accentuates different ways of perceiving, interpreting and understanding things. This is why it can be very cumbersome and time consuming to deal with international teamwork students. Thomas Kuhn introduced in his book “The Structure of Scientific Revolution” the paradigm shift and showed the significance of first break with tradition, with the old way of thinking, with the old paradigm. Also the book: “Cross-Cultural Business Behavior” by Richard Gesteland referenced in the paper is recommended.

**Group work, Effectiveness and Size**

As stated earlier it is important to make sure that advantages of working in a group is sustained. I have experienced that these advantages can be lost if faulty group processes that degrade the cognitive and political activity of the group is allowed to exist. Members of the team have to organize their intellectual activities to prevent cognitive problems to arise. It is
essential that they all understand the project issues and develop a shared understanding of what is happening and why. To ask of a group of great diversity to develop a shared commitment can be difficult. It is not easy for all to accept direction and give up their autonomy. If some do not adapt, to the conditions agreed by the team, and accept to be directed, political problems can arise. We have to remember that students are taught to be individualist and therefore find it difficult to work collectively. An effective group therefore seems to be a team of individuals who are all able to adapt and all willing to participate in this collective activity and able to carry out different roles and tasks. A group size of between four and six people is appropriate and fairly easy for the students to manage. Larger group sizes of 8-12 students seem to attract others. However, it can be very difficult to manage and control groups with many members of different mindsets and many tasks to perform.

Now, here are a few words about assessment. Assessment has the following elements

- Individual contribution to the group report
- Individual contribution in the teamwork i.e. the teamwork process performed
- Self and peer assessment

Project Management

On a teamwork course students should learn how to manage engineering projects. The team should be involved actively in defining, systematizing, planning and navigation of their project in cooperation with the project provider, usually a company outside the school. Microsoft project management software is used to plan and work out of Gantt chart to keep track of agreed tasks. On weekly project meetings things of concern are presented on an agenda worked out by the team. It is the responsibility of the student teams to prepare the room for the meeting and to send out an agenda in good time to give the participants a chance to be well prepared for the meeting. At these meetings students learn good meeting techniques and disciplined behavior. They all take turn in chairing a meeting and in working out minutes of a meeting. Supervisors attend these meetings and company advisors attend if their busy timetable allows.

Project Execution (working on projects)
In teamwork teaching you should state clearly what is expected of the participants. Such as: It is expected that you all show responsibility, take initiatives whenever needed. Try to take ownership of your project and your time. Try to develop a 'we-attitude' in your team. Ask yourself how you can join your own effort with the effort of others to achieve a greater success? Remember that the whole is greater than the sum of the parts. Also remember: Dependent people need others help to get what they want. Independent people can get what they want through their own effort. Interdependent people want to combine their effort with the effort of others to achieve a greater success. According to Stephen R. Covey: The seven habits of highly effective people. Simon & Schuster UK Ltd. 1999:

Dependence is the paradigm of YOU. Independence is the paradigm of I. Interdependence is the paradigm of WE.

To work together require the ability:

a. to communicate
b. to cooperate
c. to collaborate
d. to listen actively (with ears and eyes)

The stages are characterized by four headings such as:

1. Forming (Uncertainty)
2. Storming (Individualism)
3. Norming (Invitation)
4. Performing (Implementation)

Stage 1: FORMING (Uncertainty) Slide 8

The insecurity phase is where you are building or forming the team. This initial stage is characterized by insecurity and caution, politeness and tentativeness. The group is not really a team yet. Everybody needs attention, help and concern. You can facilitate this situation by
socializing with each other. Have a chat with each other under more relaxed circumstances. Tell who you are, where you are coming from and why you have chosen to join this project. Have a beer together in the student pub.

**Stage 2: STORMING (Individualism) Slide 9**

Team Development

- Stage 2 – Storming
  - Opinions more openly and forcefully presented
  - Group leadership may be challenged
  - Some infighting as allegiances are questioned
  - Nature of the task and programme challenged
  - Some members feel demotivated and leave

This phase is full of storm and resistance. You try to hide and use a lot of energy trying not to come out in the open with your real personal opinion. Sometimes personalities clash acrimoniously. Nobody seems to speak the language as you. Who is actually responsible for situation? Team members should have a clear understanding of this situation and of the issues in question. They should try to develop a shared understanding of what is going to happen and why. Everybody have to adjust and adapt to the group environment. All members of the group should give up some of their autonomy. The group should try to develop a shared commitment and work collectively to achieve it. Try to take initiative. Think positively and help create a situation where you can agree about something. Try to break the ice with an unexpected proposal.

**Stage 3: NORMING (Invitation) Slide 10**

Team Development

- Stage 3 – Norming
  - More organised with procedures and systems to achieve particular goals
  - The skills level, competences and behaviours norms for each member become apparent
  - Interpersonal barriers fall into the background
  - Increased co-operation and exchange of views, ideas and opinions

"The sooner the group attempts to fulfill certain task goals, the sooner it will break of the infighting stage"
Everything seems to be more relaxed. You tend to think that the storm is over, but it might all be harmony at the surface. You tend at this stage to discuss things that you agree upon. You try to escape conflicts although you sense tension. All team members are getting more deeply involved. All feel that time has come for no compromising any longer. Let us get some work done. We have to find solutions to solve our problems. Try to think positively and take initiatives.

**Stage 4: PERFORMING (Implementation) Slide 11**

This stage is also called the stage of productive work. The group has now come to a stage where they feel that they know the strengths and weaknesses of each other. Usually you now know who is doing what and why. All team members seem to be engaged and committed. Try to pull your part of the agreed workload.

**Research has shown very clearly that we cannot just take a group of highly creative individuals, put them together, and expect them to do better than other teams.**

**Supervisor Roles**

The main contribution of a good supervisor is to be a coach, to help all members of a team to understand the content of the project provided and to ensure that progress is made. It is also to nurture and facilitate the group work, the project performance and the project process. It is especially important to be aware of any cognitive and political problems in the team.

The supervisor should know that the advantages of working together in teams are often lost because of faulty group processes, which degrade the cognitive and the political activity of the group.

**Reasons Why Education Should Be Changed**

Engineers commonly describe themselves in terms of a single discipline, a convention increasingly misleading. The following reasons to change the education should be highlighted:
• Very few engineers work totally within the confines of a single discipline or industry.
• Fundamental changes in working attitudes, and greater emphasis on multidisciplinary and multinational environments, highlights the need for a radically different approach to education and training.
• Traditional specialism no longer apply in the world dictated by a bigger overlap of engineering and science.
• The accelerating evolution of technology accompanied by a growing amount of knowledge, much of which continuously become redundant, require a new approach to education and training and changes of the curriculum.
• We have to provide a “deep” learning environment in which acquiring insight will take precedence over conventional specialist courses.
• Continuing education has become a more determinant factor in career development and is part of a through-career education and training.
• Easier access to knowledge through the ongoing advances in information technology should be coupled with improvements in teaching and assessment techniques.
• Accreditation boards should be aware of the changing conditions and adjust accordingly. They should appreciate the new professional equipped with a broad range of entrepreneurial skills.

This speech has been about international teamwork. It has also been about project management in particular with focus on people management and cross-cultural and multidisciplinary group project work. Engineers commonly describe themselves in terms of a single discipline, a convention increasingly misleading. Therefore reasons to adjust or change education should continuously be an issue.

Remember: It is important to be involved to learn.

My own saying goes like that: You have TO DARE TO DO, TO BECOME!

Thank you for listening!

Arvid Andersen