

NEED FOR CHANGE IN ENGINEERING DESIGN - HOW TO INCREASE THE NUMBER OF WOMEN IN THE BUSINESS

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Abstract: *This paper is a reasoning paper that brings forward the issue of an increased outsourcing trend of European manufacturing industry. Not to loose product development abroad, new ways of thinking and new competitive advantages are asked for. The paper aims to bring forward women as one important resource in the process of developing and producing new products, a resource which has not been fully employed. Two cases are presented, one from industry where a concept car has been developed only by women and one from academia where traditional engineering design educations has been redesigned to attract more students and specially women. The authors conclude that a change in engineering design educations in order to attract women to the business is one way to get new competitive advantages. Focusing on functionality and practicality in products will attract women and keep women in the educations.*

1. INTRODUCTION

For several years there has been an increased threat against European manufacturing industry. Companies choose to move strategic important activities such as production abroad to low-wage countries, loosing important competence on how products should be produced and manufactured. This phenomenon is surprisingly evident within the Swedish manufacturing industry with significant loss of employment opportunities, thus undermining small communities. An important but clearly underestimated aspect of this change is the relation between production and product development. Studies show that success in product development and production to a great deal depend on the close interaction and co-operation between the two activities. Integrated product development, concurrent engineering, collaborative product development are some, among other, approaches that pronounce the interaction between the two. A logical conclusion could be drawn from this situation: product development will follow the footsteps of production if we do not find other ways to compete than with low wages. There has to be new ways of thinking, releasing old traditions stuck in vicious circles, to find new competitive advantages.

This paper is a reasoning paper that aims to bring forward the issue of one important resource in the

process of developing and producing new products which not has been fully employed – women.

The paper includes a background description of engineering design educations in Sweden, one example from the industry and a case description from academia. The problem area and the cases are discussed, and last the conclusions are presented.

2. BACKGROUND

In Sweden, engineering design undergraduate educations have been popular and attractive, attracting lots of students during most part of the 20th century. However, the trend has shifted; youth of today does not want to spend several years in academia to earn this kind of degrees. The number of applicants has gone down.

2.1 Technology and young people

During the 1990s the number of young people decreased in Sweden (low numbers of child-bearing in the 1980s). Moreover, these youths seemed to lack interest in studying technology and sciences. The prognosis indicated that there would be a lack of engineers in the near future, and that the number of engineers in Sweden had to be increased to deal with the upcoming international competition. Therefore, the Swedish government initiated a 5-year project in 1993, the NOT-project, to increase the interest for technology and science among young people [1]. The strategy for the NOT-project has been to adapt

young people to one important area – technology [2]. This approach has been publicly criticized: “The project starts from an old-fashion perception that young peoples’ attitudes towards education should be changed, when in actual fact it should be the other way around – the educations should be adapted to the students.” [3] (translated from Swedish).

Still today, worries and debates exist regarding young people’s lack of interest in technology and science, thus the project has been extended for another five year [1].

2.2. Compete by thinking different

Apart from the problem that technology educations do not attract students in general, it certainly not attracts women. Women are conspicuous few within technology education and research, also in the market focusing on technology [2]. This is not merely a Swedish problem in any way. In an article, presented at ICED 2006 (International Conference on Engineering Design) in Melbourne, Australia, Aasland [4] discusses similar issues occurring in Norway; decrease in the number of students applying for engineering educations and the lack of female applicants. At NTNU (The Norwegian University of Science and Technology) in Noway a project-based education approach has been applied which attracted more female students. Further, the European Association for Women in Science, Engineering and Technology (WiTEC) has struggled with this problem since 1993. The organization aims to increase the number of women studying science, engineering, and technology subjects and to help them progress to related careers (www.witec.se, 2006-04-25). WiTEC argues that the industry of today is built on globalization. Companies are realizing the importance of women’s competence and the advantages it brings; a broader perspective and new viewpoints which leads to creativity and a productive working environment (www.witec.se, 2006-04-25). Less than a quarter of the students on higher educations in technology in Europe are women. In high positions in industry women are a minority [2]. This is waste of resources. Attracting women should be seen as a great opportunity to develop the organization and attract new interesting competences.

3. WOMEN’S IMPORTANCE IN INDUSTRY – VOLVO CASE

Naturally, industry is suffering from the lack of interest in technology. Thus, the motivation for a more even sex ratio in industry and especially in product development is an organizations opportunity to compete with other means; to think and become different. A colorful example of what surplus value women in product development bring is the development of a concept car at Volvo Cars, Sweden. The development of YCC (Your Concept Car) started up as a project which aimed to develop a concept car for women by women. 60 women

within the Volvo Car Corporation were involved in the project. The project resulted in YCC, an asset-light sports car with a variety of clever solutions and functions adopted for women’s everyday life and needs. Some of the solutions included no hood (who wants to put their head down there anyway, it is to much electronics?), refilling of windshield-washer fluid from outside (why do we have to open the hood for that, when we can fill up the gas tank from outside?), and folded seats by default to facilitate luggage storing (if no one ever sit in the back why have the seats in upright position?). The aim was to make the car ownership easier and funnier. The car distinguished by focusing on ergonomics, everyday keeping, visibility, comfort, easy to handle, and by its masculine shape. The last was very much surprising; people had believed that the car should be more of a station wagon than a sports car due to the female project team. Moreover, when the car was presented at the motor show in Geneva 2004, the car attracted a large share of men, who appreciated both the logical and functional solutions in the car and the shape of it [5].

The project leader, Camilla Palmertz, argues that female influence on product development is not at all a new phenomenon at Volvo Cars, but in this project the rules are being stretched and the female influence is total. She believes that the female customer wants everything the male customer wants when it comes to performance, prestige and style. However, the female customer wants more than that. She argues: “-If you meet the expectations of women, men’s expectations are exceeded.”. Right or not, there are differences in how women and men develop products, and it becomes clear in this kind of project. The experience from Volvo, according to [5] is that men tend to focus on technology, women focus more on functionality and practicality. However, this may be about to change, more and more young men becomes more and more interested in the traditional “female focus areas” [5].

This example describes the positive outcome of a project with only women in the project team. It shows in a good way that women’s knowledge in product development or engineering design can not be ignored. However, the synergy effects of a team consisting of both women and men may be greater.

4. EDUCATIONAL CHANGE

In 1998 there were 20 applicants for the traditional mechanical engineering education at the department of Innovation, Design and Product Development, Mälardalen University, Sweden (www.idp.mdh.se). Two of these applicants were women (10%). A radical change was needed to attract more students and attract more women, to make the education and area survive at the department.

Back then, there existed two engineering programs at the department; Mechanical Engineering and Industrial Economy. The situation for the two was

similar, dropping application numbers; they were no longer attractive educations. These programs were traditional in the sense that they focused heavily on math, mechanics, solid mechanics etc. There were little emphasizing on design, shape, innovation and entrepreneurship.

In 2001, Sten Ekman, head of the department of Innovation, Design and Product development, argued that: “- We are living in a new and fast changing environment, where industry, companies, occupations and jobs are exposed to high pressure of change. New occupations are added as well as new way of working. It is obvious that this change also is valid for engineering science, engineering educations, and engineering work in the future. We can not ignore this by just looking on and keep doing what we always have done, with only minor changes within the system. Strategic thinking aiming at the future, radical change and new thinking is needed in industry as well as in engineering educations.” [6]. This was the beginning of a radical change of the engineering educations at the department. It was concluded that we cannot change the students back to what it was; they have new interests, new priorities and new incentives. It is the educations that have to change (cf. [3]).

4.1. Results

Students in the engineering educations were analyzed in respect of their interests and motivations. The result pointed towards some interesting facts:

- If students see career opportunities and connections to companies in the educations it motivates them to study.
- Students of today see that quality of working life is a large part of quality of private life. They do not accept hard work only for money.
- Men accept to study on command (“Study 15 ECTS of math and prove that you are good”) to a greater extend.
- Women are more particular when it comes to motivation, ethics, and moral in educations.
- Design and shape attracted many women.

Based on this and other studies on change of values with young people, the engineering educations were changed. A new strategy was formed aiming towards a more applied education where theory and practice were combined in new ways. The strategy was partly built on the belief that subjects should be taught in pairs, e.g. technology and science should be parallel with for instance algebra to clarify the applicability of math in technology and vice versa. During the first year in the education some key activities were emphasized; connection to industry, the joy in the act of creating, collaboration, and individual commitment. There where a high degree of collaboration between the different engineering educations during the first two years to create a feeling of security and to give a broad base for the student to start from. During the third year the

students specialised. Because the education was built on the premises that students have their own responsibility, and that they form their own education, the first two years where very important. To make the students confident about their choice of specialization in third grade a solid introduction was needed.

The education was also changed regarding to a shift of focus. The education went from focusing on traditional engineering design subjects to focusing on design, shape, innovation, entrepreneurship function, performance, usability etc., in the development of products and processes. The traditional subjects such as mechanics, solid mechanics etc, laid the foundation to the education, however, those where emphasized as tools when working with engineering design, not the overall focus of the education.

In the marketing of the educations there was a strategic effort to attract women. In information material the focus was shifted from traditional male usage of language to a more neutral one. Women was highlighted and presented in catalogues.

The applications went from 20 in 1998 to 85 in 2002. The share of female students admitted to the programs increased from 10 % to 40%. The results were amazing, but. Due to the complexity in these issues and the fact that there are many parameters affecting the results, it is difficult to pinpoint the exact parameter that made the difference.

Thus, organizational change has many pit-falls and causes disagreements. Due to the organisational changes in the educations there was a need to shift resources and competence within the staff. When the organizational change started there were 22 employees teaching subject within the area of engineering design. In five years 11 of these have left the organization, while six new have been employed. These six have other competence areas than the 11 who left. Although one aim with the new educations was to attract women, this has not had any impact on the teaching staff; still there is only one woman among the staff. Further, there have been both positive and negative reactions among staff members. The change brought suspiciousness towards the scientific level of the new changed education programs. Some argued and still argues that the quality of the education would be deteriorated because of the changed focus. However, there exist no prove of that, in the contrary, many of the students have graduated from education and have been offered good positions in industry.

5. DISCUSSION

Have we failed to profit by women in the past? Are women unemployed resources in the area of engineering design today? In such case, why have we failed?

Organizational change is a complex process or as Kotter [7] argues: “The major change will not happen easily for a long list of reasons”. The department of Innovation, Design and Product Development has made this kind of change, experienced its problems and backlashes, but also gained much knowledge on how to attract students and particularly women.

What we have been able to see in these two cases presented in this paper indicates that the area of engineering design may attract women in the same extent as men. However, we believe that it is the prevailing focus that decides whether women’s interest in the area will remain. Traditional engineering design problems, thus education, seem to focus upon technical solutions. This has been clear studying some earlier educational programs at Mälardalen University. In some educational programs the opinion was that the students rarely got to raise their view to get an overall approach to the problems. Focus on technical solutions and to solve limited problems was rewarded. Thus, few women chose the engineering design educations, even fewer completed it and the applications to the education dropped. The problem with dropping application numbers is not isolated to this particular University, the whole area of engineering design in Sweden have to face or faces this problem, evidently also Norway [4]. Considering the findings on what work and activities women tend to find interesting and fruitful; functionality and practicality [5], a “technical problem solving” focus in educations will probably not attract women. We argue that it is not only the young people or the women that has to change and become interested in technology and apply a general technology orientation. As [3] argue we do believe that a change of education also is a proper way to attract more young people and obviously attract women. We have also seen that this works in reality, change of the education towards a more design, shape, innovation, entrepreneurship, function, performance, and usability oriented education attracts more women. What is interesting is that it did not only attract more women (from 10% to 40%), it also attracted more students in general.

The educational and gender issue are issues that concerns us all and have to be dealt with. Increasing our competitive advantages is one possible way to deal with the movement of production and product development and the approaching degradation of European manufacturing industry.

6. CONCLUSIONS

Sweden suffers of an outsourcing trend in the production area. What we should expect is that: product development will follow the footsteps of

production if we do not find other ways to compete than with low wages. Sweden is risking becoming an industrial desert. There has to be new ways of thinking, to find new competitive advantages. We believe that women are an important part of that change. Further, we conclude that a change in educations in order to attract women to the business is one way to do it. Focusing on functionality and practicality in products in the engineering design educations will attract women and keep women in the educations. However, there are many more parameters influencing the outcome, and there is an uncertainty what impact some of the parameters had on the results.

Women are needed in industry and academia to force new ideas and thoughts into the area of engineering design. Today it is evident that industry need women’s way of thinking. Few argues that it is not the case, however, how many are really taking actions and putting effort in a change? What counterproductive forces are still present, since the progress is so slow? This is an important area to address further, not only on under-graduate and graduate level, but also on staff level.

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