

Why Are Young Women Attracted to Survey Education in Sweden

Boo G LILJE, Sweden

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ABSTRACT

Surveying is the ideal educational programme for those interesting in engineering, law and economics.

Education of surveyors started in Sweden 1628. The education was in the beginning concentrated on map production. In the middle of the 18th century re-allotment of Swedish rural land was the main task of the Surveyors. Knowledge in legal matters as well as in economic subjects was expected.

The education was organised by The National Land Survey. In 1936 the first surveyors graduated with an MSc from The Swedish Royal Institute of Technology, Stockholm (KTH). Education is from 1992 conducted even at Lund Technical Institute (LTH).

The occupation was entirely male until 1963 when the first woman graduated. During the next ten years it was still rare with girls. Around 1975 the number of girls increased to be some 20% of the students. The development continued and from the beginning of 1990:s the number of girls studying to become land surveyors are around or above 50%.

The education in Sweden combine engineering, law and economics and results in a MSC from Technical University without being to technical. This attracts girls.

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1. INTRODUCTION

Surveying is the ideal educational programme for those interested in engineering, law and economics.

A central task for graduates in surveying is the creation and development of land information systems. The production of maps (cartography) is a traditionally important task that is developing rapidly thanks to the advent and development of IT. Other work includes real estate valuation and administration and participation in the development of urban and rural areas.

2. SURVEY EDUCATION IN SWEDEN

As the Swedish king Gustav II Adolf during the war against Poland in the beginning of the 17th century found it necessary to employ German land surveyors in the Swedish army, he asked the mathematician Anders Bure to educate some persons in land surveying. The National Land Survey of Sweden started on the 4th of April 1628. From the very beginning, six surveyors were educated by Anders Bure to form the staff. Their task was to map the landscape, so called geographic maps, and the villages, so called geometric maps.

It was soon noticed that the staff was too small. The employed surveyors were supposed to educate others. This system was used for some years. However it resulted in poor qualifications among the staff. In 1687 examination of the staff was therefore introduced. Examination and approval of the ability of the surveyors was carried out by the surveyor general and involved not only the new staff, but also all earlier employed surveyors. Already at this stage, it was considered necessary to recruit the staff from the universities with knowledge in arithmetic, astronomy, geography and geometry. In the end of the 17th century the number of surveyors was close to 100.

During the first half of the 18th century no major changes in the education of surveyors occurred. But in 1757 re-allotment of agricultural land was introduced. The agricultural development forced changes in land allocation. This meant that the surveyors needed education and examination in how to grade the land. It was found out that this part of the re-allotment was the most difficult one.

In 1783 it was decided that the examination should be public. The demands of the knowledge of a surveyor were versatile and consisted of knowledge in mapping and demarcation of boundaries, in agriculture to be able to do the grading of the land and in legal matters. Furthermore knowledge in geology and mineralogy was requested. The re-allotment-work meant an increase in the number of surveyors needed. The number of surveyors was doubled and amounted to about 200.

At the same time cartographic activities were reduced and in 1766 exempted.

In 1827 a new law about re-allotment was decided by the Parliament. This meant that the surveyors would be active to change the structure of the Swedish rural area. The instruction for the National Land Survey declared that examination to become a Land Surveyor should be public and the students should be examined in

- geometry, trigonometry, levelling, map-construction, etc,
- chemistry, mineralogy, geology,
- agriculture, forestry,
- economy especially about interests, taxation, buying and selling of land,
- all laws in respect.

The number of surveyors had now increased to about 400.

Due to the re-allotment activities, the geographic mapping in the beginning of the 19th century was organised within the Swedish Army. It thus continued during the whole century. In 1894 a new civil mapping organisation was organised.

Still, the survey education was organised by the National Land Survey. However in the middle of the 19th century proposals were put forward to start university education in land surveying. The change would not occur until 1932 when the survey education started at Swedish Royal Institute of Technology (KTH) in Stockholm.

Changes in the survey education were few during the 19th century and the number of surveyors had been reduced and was about 200.

With the beginning of the 20th century a new era started for the Swedish National Land Survey. Thus even the survey education was developed, but still under the responsibility of the National Land Survey. The education was divided into two courses with a practical period in between. The first course contained education in Mathematics, Geodesy, Practical land surveying (map construction, area calculation, grading of land), Legal knowledge, Understanding of old documents, Geography and Archaeology. The second course contained education in Farming, Grading of agricultural land (Physics, Chemistry, Mineralogy, Geology, etc), Forestry, House- and bridge-building, Road-building, Urban planning.

In 1932 the education started at KTH in Stockholm. The education was completely unison with almost none possibilities to specialisation and mostly geared at working for the National Land Survey and with tasks related to real estate formation and land administration. Thus it continued up to the beginning of 1970:s. Some important changes had though occurred. In 1965 a professor in real estate valuation was appointed at KTH. Graduates from the University had found their way to an increasing market working with evaluation of real estates both in urban and in rural areas. Earlier on surveyors, agronomists and forestry officers had by further training carried out evaluation work.

The 1970 curriculum started with two basic years including subject as mathematic, basic law, geology, economic theory and basic courses in surveying subjects. After these two years the students could choose between 25 different blocks. The numbers of combinations were many. However by practical reasons seven to eight combinations were used.

A new step was taken in 1978 when a new curriculum was introduced. A curriculum that is still valid at KTH. The students graduate with four specialisations – measurement and mapping, real estate formation, real estate valuation and spatial planning. A fifth specialisation has been introduced, specialisation in environmental engineering.

At the moment a new curriculum is discussed at KTH. A close cooperation will start with the Civil Engineering Program. Thus the two programs will have a joint admission to the education. The first year the students will have the same courses. Thereafter specialisation will occur in “Land and real estate techniques”, in “Building and real estate economics” or in “Geographical information techniques”. The start will be autumn 2002.

In the beginning of the 1980:s the students tended to study at the university closest to their hometown. This was more important than to choose a certain education. Thus, those studying the survey programme mostly came from the area around Stockholm. And after graduation, the students tended to remain in Stockholm. As the rest of Sweden faced a shortage of surveyors, it was decided to start up survey education at Lund Technical Institute (LTH). The education started in 1992 and the curriculum was more or less copied from KTH but adjusted to the competence and resources of the University. The technical specialisation was not geared towards geodesy and photogrammetry but instead towards GIS. With the increase in competence and of staff etc, the curriculum is changed from 2001. The students have six semesters together. After a basic semester with mathematic and basic law, the subjects are integrated into five theme-semesters, namely Land and Environment. Geomatics, Real Estate Information, Real Estate Valuation and Real Estate Formation. A project each semester brings together the various subjects. After these three years specialisation takes part in three areas – Real Estate Economy, Real Estate Legislation and Geomatics.

3. FEMALE GRADUATES

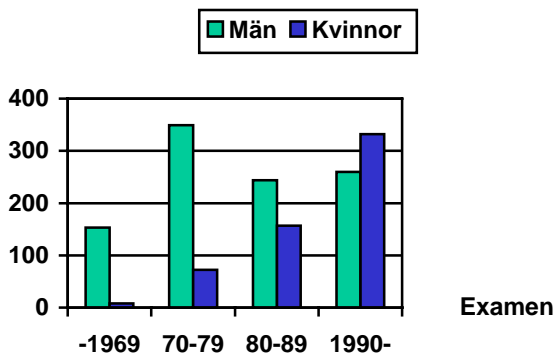
From the very beginning, a land surveyor should be a man. In the instruction from the 17th century it says that the existing land surveyors should “to land surveyor educate sons to honourable men”. It was also stated that university exams in certain subjects were required to be educated to land surveyor. And matriculation examination was needed to enter university studies. Not until 1870 were girls given the right to get a matriculation exam. But still the girls had a minor role in the society. Thus it was not until 1945 that women got an equal position as men to posts within governmental organisations.

However, girls were not “supposed” to study technical subjects. In secondary schools the girls should concentrate on languages, while boys should study technical subjects as mathematic, chemistry and physics. To enter a Technical University, matriculation exam with these technical subjects were required. It took quite some years to change this habit.

The first female Land Surveyor graduated in 1963. Thus it took 335 years before Sweden got its first female Land Surveyor. Other male occupations were Forestry Officer and Veterinary Surgeon. As can be seen in the table below, it was for the next ten years (1962 – 1972) still unusual with female students at the Surveying Program. Only 13 females graduated out of a total number of 338 (3,8%). The number of female Land Surveyors increased considerable during the next ten years (1973 – 1982) and out of 467 graduates all together, 107 were females (22,9%). This development continued during the next ten years (38,9%) and nowadays the female Land Surveyors are in majority. During the last ten years the female graduates are 52,6% out of all graduates.

Number of female graduates from the Survey Programme

Year	Total	Women	% women	Year	Total	Women	% women
1963	14	1	7,1	1982	47	20	42,6
1964	23	0	0,0	1983	50	12	24,0
1965	24	0	0,0	1984	61	18	29,5
1966	27	1	3,7	1985	35	14	40,0
1967	25	1	4,0	1986	52	25	48,1
1968	40	1	2,5	1987	48	18	37,5
1969	37	3	8,1	1988	37	18	48,6
1970	43	1	2,3	1989	52	16	30,8
1971	50	2	4,0	1990	36	16	44,4
1972	55	3	5,5	1991	57	26	45,6
1973	48	6	12,5	1992	30	15	50,0
1974	53	5	9,4	1993	66	34	51,5
1975	52	10	19,2	1994	64	33	51,6
1976	43	8	18,6	1995	83	47	56,6
1977	49	10	20,4	1996	60	37	61,7
1978	43	11	25,6	1997	74	32	43,2
1979	49	18	36,7	1998	71	44	62,0
1980	48	13	27,1	1999	120	56	46,7
1981	35	6	17,1				



4. MARKETING OF THE EDUCATION

4.1 General

The Land Survey Education in Sweden is a comparatively small Educational Program. It is therefore important to make the education known to the students in compulsory school. As competence in highest grade of mathematics is required, the marketing of the Education should start early to interest the young ones to choose the line of natural science. These efforts do not differ between boys and girls. However first priority is to make the education well known.

4.2 The Trade-Mark

In Sweden the name “Land Surveyor” is unknown to most Swedes. The Educational Board in Lund has seriously discussed to change the name of the Educational Program. However the Board has not been able to find a more suitable name. Therefore the Board has decided to market the trade-mark “Land Surveyor” (Compare table under chapter 5).

4.3 Marketing Activities

From a questionnaire to the students when starting their education, it is noticed that pamphlets are important when informing about the education. As number two in importance, we find “the family and friends”.

	Lund	Stockholm	Total
In what way did You get information about LTH/KTH	%	%	%
Study consultants	31	28	29
Teachers	11	15	14
Friends	54	43	46
Family	31	36	35
Visit to LTH/KTH	37	29	31
Visit from LTH/KTH	14	9	10
Technicians day	3		1
Competition "Technical-eight"	3	1	2
Girls at Technical University	6	6	6
Internet	46	27	32
Pamphlets	71	68	69
Ministerial catalogue	57	38	43
Advertisements	0	10	7
Educational fairs	20	47	40
Study informers at LTH/KTH	6	3	4
Students at LTH/KTH	23	27	26
Others		4	3

(More than one alternative could be marked)

Especially the pamphlet was decisive when the student should choose the education. Therefore it is of great importance to have a good pamphlet informing about the Education and the future possibilities in the occupation. This is surprising when we live in a technical computerized world and want to attract boys and girls with technical interests. Note that "Internet" is lower than both "Pamphlets" and "Friends".

From Lund Technical Institute we send our produced pamphlet to all Land Surveyors in Sweden and to all students in the Southern part of Sweden finishing secondary school. We also make sure that we have a well functioning web-side on the Internet. We produce a Power-Point File to be used by Land Surveyors when informing about the profession. Finally, our students take part in fairs.

	Lund	Stockholm	Total
What was deciding for Your Choice	%	%	%
Study consultants	0	2	1
Teachers	0	2	1
Friends	14	7	10
Family	6	19	11
Visit to LTH/KTH	11	9	11
Visit from LTH/KTH	0	4	3
Students at LTH/KTH	0	2	1
Technicians day	0		
Competition "Technical-eight"	0	0	
Girls at Technical University	0	0	
Internet	9	5	7
Pamphlets	43	33	37
Ministerial catalogue	14	0	4
Advertisements	0	0	
Educational fairs	3	7	7
Study informers at LTH/KTH	0		
Others		9	7

(Only one alternative could be marked)

4.4 Increase of Number of Applicants

If it is easy to be accepted to an Educational Program, the Program loses in interest and status among the students. It is therefore important to get both a lot of applicants and a high entrance-points.

In Lund we have managed to raise the numbers of applicants as well as the level of entrance.

Year	1997	1998	1999	2000	2001
First hand applicants	38	33	46	50	59
First hand applicants per seat	1.3	1.2	1.5	1.7	2.0
Total number of applicants	387	356	395	386	443
Total number of applicants per seat	13	12	13	13	15
Entrance points				13.42	15.84

(15 points means the testimonial "very well" in all subjects. "20 points means the maximum testimonial in all subjects)

The Surveying Program at LTH do well even in comparison with other Universities and other Educational Programs as can be seen in the table below. The number of applicants to the Surveying Program in Lund is far greater than the number of applicants to KTH. This is due to among other things to the housing-situation in Stockholm.

Educational Program	Number of applicants per seat		Entrance points
	First hand	Total	
Surveying			
KTH	0,9	5,9	All
LTH	2	14,8	15,84

New Programs, as Industrial Design, or Programs existing only at one University, as Risk Management, always attract a lot of applicants. The same goes for artistic Education as Architecture.

Educational Program	Number of applicants per seat		Entrance points
	First hand	Total	
Architecture			
KTH	6,7	19,3	18,92
Chalmers	8,1	27,5	19,37
LTH	7,7	33,1	19
Civil Engineering			
KTH	0,9	7,5	All
Chamers	1,5	8,6	14,72
LTH	1,7	9,8	14,79
Luleå	1	8,9	All
Other Programs at LTH			
Industrial Management & Engineering	5	25,3	18,9
Engineering Physics	1,5	7,1	16,59
Electrical Engineering	1	5,9	13,83
Computer Science and Technology	1,9	10	15,39
InfoCom Engineering	4	21,7	16,06
Mechanical Engineering	1,2	8	15,45
Chemical Engineering	1,1	8,7	15,9
Biotechnology	2,5	13,7	17,38
Industrial design	4,7	10,6	Test
Environmental Engineering	1,4	6,9	14,81
Risk management and Safety Engineering	8,7	20,2	18,26

4.5 Hometown

One of the problems the Surveying Program faces is that the students both at LTH and KTH are recruited fairly locally. Thus 46% of the students in Lund have their hometown in Skåne, the County in which Lund is situated. The situation is even worse at KTH, whereby 61% of the students are from Stockholm and its surroundings. It is noticeable that almost no students from the Northern part of Sweden study to surveyors. As the students are unwilling to take posts far from their hometown, the Northern part of Sweden will face difficulties to recruit land surveyors in the future.

	Lund	Stockholm	Total
The hometown is	%	%	%
Skåne	46	11	21
Blekinge	9	0	2
Småland	17	7	10
Halland	6	0	2
Göteborg with surroundings	6	5	5
Mellersta Sverige	6	3	4
Stockholm with surroundings	11	61	47
Uppsala	0	2	1
Gästrikland/Dalarna	0	4	3
Middle North Sweden	0	5	4
Northern North Sweden	0	1	1

4.6 When is the Application Made?

The students can be divided into three equally big groups. One group decide to apply for a seat at the Technical Institutes during the secondary school, the second group after secondary school and the third group at the time of the writing the application. This later group consist of students in secondary school as well as those who do the application after leaving the school. It is therefore important to contact the students but also to reach those who have left school. This later group is more difficult to reach.

	Lund	Stockholm	Total
When do You decided to apply for a seat	%	%	%
Before secondary school	0	3	2
During secondary school	35	37	36
After secondary school	38	31	33
At time of application	26	29	29

5. CHOICE OF EDUCATIONAL PROGRAM

The aim of the marketing of the education is to interest the students to apply for a seat. It is necessary to fight for the young ones, being fewer the years to come.

It is interesting to notice that there is a great difference between the answers given by the students at the Surveying Program and at the other Educational Programs.

In the table below it can be seen that the students applying for the Surveying Program do tend to have a lower interest for the education than students at other program have. The answer is that the students probably have no or little knowledge about the education. Other factors decide the choice of Educational Program.

	Lund Surveying 2001	Lund Surveying 2000	Stockholm Surveying 2000	Lund Total 2001	Lund Total 2000
Why did You choose this education	%	%	%	%	%
Interest	18	23	16	54	47
The education has good reputation	5	0	3	3	2
The width of the education is attractive	45	60	68	21	25
The facultative education is extensive	5	0	0	1	2
Interested in a certain specialization	14	3	9	5	4
Interest to future tasks	5	7	5	11	14
Expectations of high salary	5	0	0	2	3
Others	5	7	0	2	2

6. WOMEN IN SURVEYING EDUCATION

As has been shown before, the women nowadays are equal with men or in majority at the Surveying Program.

Accepted women to the Surveying Program at Lund Technical Institute

Year	Total	Women	% women	Year	Total	Women	% women
1992	33	18	54,5	1997	33	20	60,6
1993	33	13	39,4	1998	33	18	54,5
1994	33	14	42,4	1999	42	20	47,6
1995	33	16	48,5	2000	50	23	46,0
1996	31	17	54,8	2001	35	17	48,6
					356	176	49,4

Accepted women to the Surveying Program at KTH, Stockholm

Year	Total	Women	% women
1997	140	68	48,6
1998	89	48	53,9
1999	117	62	53
2000	95	51	53,7
2001	104	59	56,7
	545	288	52,8

All students at the Surveying Program at Lund were asked to answer the question “Why they had chosen the Surveying Program” in order to investigate if there is a difference in attitude between the boys and the girls. Out of 164 students, 53 girls and 42 boys answered the question (58% of the students, which is a good result as the question was asked during examination the week before Christmas.)

Why did You choose the Surveying Program
(More than one alternative can be marked)

	Girls		Boys		Total	
	Number	%	Number	%	Number	%
Interest	24	45,3	17	40,5	41	43,2
The education has good reputation	2	3,8	1	2,4	3	3,2
The width of the education is attractive	44	83,0	28	66,7	72	75,8
The facultative education is extensive	2	3,8	5	11,9	7	7,4
Interested in certain specialisation	12	22,6	11	26,2	23	24,2
Interested in future tasks	18	34,0	12	28,6	30	31,6
Expectations of a high salary	8	15,1	13	31,0	21	22,1
Wanted to become MSc	28	52,8	26	61,9	54	56,8
Relatives in the occupation	2	3,8	5	11,9	7	7,4
Others	6	11,3	8	19,0	14	14,7
	146		126		272	

As can be seen, there is no significant difference between the reasons why a boy or a girl has chosen the Surveying Program.

7. WHY ARE YOUNG WOMEN ATTRACTED OF SURVEY EDUCATION?

We have to seek the answer among other factors. First let us see if there is a difference in the number of girls studying at LTH and in the different Educational Programs at LTH:

Other Programs at LTH	Total seats	Girls	% girls
Industrial Management & Engineering	71	28	39,4
Engineering Physics	118	25	21,2
Electrical Engineering	152	12	7,9
Computer Science and Technology	133	14	10,5
InfoCom Engineering	54	10	18,5
Mechanical Engineering	166	42	25,3
Chemical Engineering	69	38	55,1
Biotechnology	65	40	61,5
Industrial design	26	16	61,5
Environmental Engineering	64	37	57,8
Risk management and Safety Engineering	91	24	26,4
Architecture	72	43	59,7
Civil engineering	113	30	26,5
	1194	359	30,1

The situation is similar at KTH. The Surveying Program attracted 59 girls out of a total of 104 students (56.7%) while the girls totally at KTH represent only 3135 students out of 9184 students (34.1%).

The Surveying Program is not the most popular Program among the young women. As can be seen from the table the Biotechnology Program together with the Chemical Program is the most attractive Program among the young women. These Programs are considered technical of a “softer” kind. The students need not to study hard technical subjects for example about concrete, etc. Next the young women go for the artistic programs as Architecture and Industrial Design. The Surveying Program follows after these chemical and artistic Programs.

The most important factor for the young women to choose the Surveying Program is the width of the education. The combination techniques, laws and economics is of importance and attracts those who wants to get a MSc

Important in itself for the students at the Surveying Program is to become MSc without studying a lot of technical subjects as physics, tenacity, etc. The students often points out how important it is to get a technical academic exam. Discussions have taken place to increase the number of applicants by decreasing the entrance qualifications and accept those with lower mathematic competence. This will lead to a non-technical MSc and will make the education less attractive for a lot of applicants. It will also give Sweden a new kind of Surveyors. So far there has been no proposal.

We find the interest of the occupation first in third place. This factor has for the students at LTH as a whole, the highest ranking. But it is a well-known fact, that the students applying for a seat in the Surveying Program, has no or very little knowledge about the education and the future tasks related to the education. The students choose the Program by the two reasons mentioned above. Those students who have marked the factor “Interest” have also to a great extend marked the factors “Interested in future tasks” and “Interested in certain specialization”. These students want often to specialize in Real Estate Valuation or Real Estate Management.

8 CONCLUSIONS

The Surveying Program attracts young women by being a MSc-education with a lot of non-technical subjects. The combination techniques, laws and economics is the trade-mark of the education. The young women is in majority and sets the level of the social life at the Program. This is of importance when marketing the education.

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BIOGRAPHICAL NOTES

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