

Master's Program in Statistics as Platform for Co-operation between University and Official statistics

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1. Introduction

Official statistics is not a university discipline but cuts across and borrows from several university disciplines, including Statistical science, Sociology, Economics and Computer science or Informatics. Although the universities have no departments or faculties for Official statistics, in some countries there exist special programs, usually at the Master's level, geared to Official statistics. The Joint Program in Survey Methodology (JPSM) in the USA is an example, with a mixed Statistical science and Behavioural science content. A more clearly Mathematical/Statistical orientation is found in Finland's Master's program in Statistical systems (MPSS), run jointly with Department of Mathematics and Statistics, University of Jyväskylä, and Statistics Finland. We discuss in this paper the MPSS as a platform for co-operation between the university and the National Statistical Institute (NSI).

2. MPSS - Master's Program in Statistical Systems

The most common phrase used to refer to the holder of a basic university degree in Finland today is the Master (in Finnish "maisteri"). The basic university degree corresponds closely to the Anglo-American Master's degree, French "Maîtrise" and German "Magister", and is usually referred as a Master's degree whenever international comparability is desirable. Master's degree is obtained by passing a university degree programme which usually comprises multidisciplinary, object-oriented studies combining theoretical and methodological studies and working-life practices in the disciplines concerned. The number of completed Master's degrees in all university disciplines in Finland is twelve thousand per year in average. The share of Statistical science is very small comprising about 0.3% of all degrees.

The extent of studies for a Master's degree is given in credit units¹. A total of 160 credit units are usually required for a Master's degree. As a part of studies, the extent of a Master's thesis is defined as 20 credit units. Many professional-oriented Master's programs in the University of Jyväskylä operate under this general framework. This holds also for the Master's Program in Statistical Systems.

The Master's Program in Statistical Systems (MPSS) was launched at the University of Jyväskylä in 1995 (Pahkinen 2001). The program has been financed jointly by the University and Statistics Finland since 1996. The Department of Mathematics and Statistics has the responsibility to run the program. The MPSS concentrates especially on the production of experts of statistics

¹ A credit unit refers to an input of approximately 40 hours of work by student for the attainment of pre-defined objectives. A credit unit can include a specified number of lecture hours, exercises, seminars, PC training and an examination as well as a set of compulsory reading.

specialised in Survey sampling and Survey methodology. In addition to this main branch, the program covers two other branches: Biostatistics and Industrial statistics.

The MPSS involves similar properties as the Joint Program in Survey Methodology (JPSM) run jointly by the University of Maryland, the University of Michigan and Westat Inc., and l'Ecole Nationale de la Statistique et de l'Administration de l'Economique (ENSAE) run by l'INSEE (France) (Web sites of programs, see References). A common property of all these programs is a close link to the national Official statistics. This is demonstrated e.g. by the fact that courses specific to Official statistics are included in the curriculum of each of the programs.

The two-years MPSS comprises of studies of a total of 60 credit points (cru's). To have access to the program a student should have passed a relevant intermediate university degree (e.g. B.Sc.) or equal amount (about 100 cru's) of studies including studies in Statistics or Mathematics (35 cru's), and also studies in applied information technology. A student can obtain Master's degree either in the Faculty of Mathematics and Natural Sciences or in the Faculty of Social Sciences.

The teaching modules in the MPSS are built mainly on the regular curriculum of the Department of Mathematics and Statistics, but there are a number of special courses designed for the MPSS. Courses covering important topics in survey sampling and survey methodology have been included in the curriculum of the MPSS. The key theoretical areas of Statistical science included in the curriculum are the theory of statistical inference, principles of statistical modelling (linear models in particular), and probability theory. Survey sampling, study design and data collection methods include basic and advanced sampling techniques and estimation procedures; edit, imputation and weighting techniques; cross-sectional and panel survey design; experimental design; and electronic data collection techniques such as CASIC. Textbooks in survey sampling used in teaching include e.g. Särndal *et al.* (1992) and Lehtonen and Pahkinen (1996). In addition, the program includes profession-oriented studies in order to strengthen student's skills in team work and interpersonal communication.

Co-operation of the Department of Mathematics and Statistics and partner organisations outside the university provides an important feature of the program. A Master's thesis is prepared as a joint research project on a topic that is agreed jointly with the co-operating partner organisation, the Department of Mathematics and Statistics and the student. Statistics Finland, research and development units of governmental agencies and large companies, and research institutes are typical partner organisations. Benefits for the partner organisation arise from the fact that the partner will be provided with a scientifically sound solution for a topical research and development (R&D) need. The University gains from having access to real-world problems to be offered for a student as a topic of the Master's thesis. From the student's point of view, this kind of a networking arrangement is useful e.g. in order to get touch with working life and real-world problems and real data, and to train to work as a member of a multi-disciplinary team. And last but not least, research work is co-financed and thus, expenses and risks will be shared between the partners.

The actors in a Master's thesis project consists of experts of the partner organisation, the MPSS student, and a scientific supervisor provided by the university. The responsibilities and share of labour are described below.

<u>University</u>	<u>Student</u>	<u>Partner</u>
- scientific supervision	- advanced studies	- subject-matter supervision
- scheduling	- research work	- research environment
- project guidance	- preparation of thesis	- funding

Scientific supervisors usually are staff members of the Department of Mathematics and Statistics, but scientifically competent experts outside the university are sometimes invited for this task. The expertise of scientific supervisors covers such areas as survey sampling, biostatistics and industrial statistics, and in relation to these, design of experiments. Computer intensive methods constitute another important area of expertise making up an interface of statistics with information technology. Table 1 shows the distribution of Master's thesis by MPSS study areas and partners.

It has been noted that in the production procedure of a Master's thesis, best success is obtained when the scientific supervisor's own research interests meet the topic of the Master's thesis. It is expected that a scientific supervisor would be an expert in a specific field of statistical methodology and has a good command of some of the data collection methods.

Table 1. The number* of Master's thesis projects by MPSS study area and partner type.

MPSS study area	MPSS partner type				
	Official statistics	Pharmaceutical industry	Research institute	Private enterprise	All
1. Survey methodology	12	1	4	1	18
2. Biostatistics	..	6	2	1	9
3. Industrial statistics	2	2	4
4. Other areas of statistics	1	3	4
All	13	7	8	7	35

(*) Covers Master's thesis projects started in 1996-2001

In the MPSS, the establishment and completion of a joint Master's thesis project usually involves a set of practical steps. First, a contact with a potential partner must be taken (research and development departments, quality management departments and similar units have appeared to be good potential partners). The topic of research and practical and financial arrangements will be agreed in detail with the partner. An agreement of co-operation is signed. During the two years of studying, a student usually spends, as a salaried trainee, a total of 6 months (shared into two periods) in the premises of the partner organisation. The salary is paid by the partner organisation. The final product (i.e. a Master's thesis) will be delivered to the partner organisation according to an agreed timetable.

Transforming the research work for a Master's thesis into a joint research project requires constant and well scheduled follow-up. In the MPSS, monthly follow-up seminars are organised. Students are obliged to give presentations in the seminars to show their progress, and the results are discussed by the supervisors. Seminars are arranged according to the protocol of a scientific workshop. In order to familiarise students with international co-operation, students have been occasionally funded to participate in international scientific conferences on statistics.

The pedagogical approach adopted in the MPSS can be seen to differ from the so-called "learning through doing" method, in which the main goal usually is to train a person to carry out routine tasks at work. In the problem-solving oriented approach of the MPSS, a student is encouraged to look for innovative solutions for practical problems. By using the permanent networking scheme, this is achieved by combining the special features of university teaching and research with the special features of real-world environments in research and development oriented organisations.

3. Statistics Finland as a partner in the MPSS

Statistics Finland (the national statistical agency of Finland) produces two-thirds of all government statistics and supervises and co-ordinates the statistical work of other authorities. Statistical activities in Finland are governed by the Statistics Act, which lays down the general principles of collecting data and compiling statistics, the duty of disclosure, and confidentiality. Statistics Finland currently has a staff of about one thousand (including local interviewers)². Over a half of the staff have academic degree, mainly in social sciences, economics, or statistics. A number of staff members have completed Ph.D. degree.

² The population of Finland is 5.1 million inhabitants.

Co-operation with universities is arranged using an approach of permanent networking (Lehtonen 1998; Statistics Finland 2000, Lehtonen *et al.* 2000). Permanent networking comprises such components as long-term research contracts with universities, joint academic posts with shared funding, different fellowship schemes allowing scientific visitors, and post-graduate and master's programs in fields relevant to official statistics. The aim of networking is to promote the utilisation of scientific research in quality improvement, raise the level of staff competence, train statistical experts for the agency and introduce innovative methods of statistics production and dissemination. Networking is seen as a means of realising several goals: risk sharing, generating ideas, and getting results. Formally, networking is frequently carried out by signing agreements of co-operation with universities. Similar activities can be found in other statistical agencies as well (see e.g. Federal committee on Statistical Methodology, 1998).

Co-operation of Statistic Finland with the University of Jyväskylä in the context of the MPSS is based on a long-term agreement (2000-2005) between the agency and University of Jyväskylä. According to the agreement, Statistics Finland takes yearly 2-5 students as trainees to prepare their Master's thesis and funds one-third of the annual salary of the professorship in Survey Methodology. An important aim of the MPSS is to produce statisticians with a sound knowledge in the fields of statistics important to official statistics. The potentials of the program have been also in recruiting junior statisticians for the statistical agency. This is important for the agency especially with respect to the increasing need of junior statisticians in the future.

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Web sites of the following Master's Programs: ENSAE (France) www.ensae.fr, JPSM (U.S.) www.jpsm.umd.edu and MPSS (Finland) www.stat.jyu.fi/mpss.

RESUME

On a montré que un programme de la maîtrise universielle peut s'effectuer come une base de coopération entre l'universite et l'institute nationale de la statistique.

