Establishing a Statistical Consulting Unit at Universities

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Abstract

In this paper an overview is given of the ideas behind establishing statistical consulting units at Departments of Statistics & Mathematics. Also a comparison between commercial and noncommercial units is made. We stress that if a suitable environment for research and its reward are ensured for the consultants, the members of staff participating in commercial consulting have comparable (or even better) career opportunities to ordinary university graduates. Furthermore, we present two examples of European statistical consulting units at universities.

KEYWORDS: Self-supporting units at universities, consultancy bureau

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1 Introduction

In this paper we give a personal opinion about the role of a statistical consulting unit within a university. The fact that we work at a university where we do, besides research, consulting work, gives us the opportunity of exploring the issue from an inside point of view.

The minimal requirement to enable statistical consulting varies from resident statistical experts at the departments to consulting units. It is suggested (see Minton and Freund, 1977) that a consulting unit within the statistical/mathematical department has probably the most advantages: the recent advances in the statistical methodology can be applied if needed, and the service courses are revitalized by the consulting problems, to mention the most important ones. But before explaining our point of view about the role and place a consulting unit can play at the host university, we give a brief summary of the available literature about statistical consulting units.

There is an extensive literature about university-based statistical consulting units (see Boen (1982) and the references therein, or Khamis and Mann (1994) for a more recent review), containing valuable information about such centres at universities in the United States. The existence of these units is based on the fact that statistics is a special science, as its methodology is used in almost all other sciences and its use is booming in industry (see Bacon, 1999). There are several examples showing that the informal "service" provided by members of staff to colleagues is not effective. An organization is needed for performing excellent consulting.

The literature about European practice is more sparse: some examples for successful, university-based consulting units are presented in Zempléni (1997). Does (1999) is a recent paper with many examples of research problems, initiated by the consulting work.

We have found more examples of the noncommercial (or mostly noncommercial) units than of the commercial ones- see Carter et al. (1986) and Khamis and Mann (1994) for examples. That does not prove that there are only a few commercial units – it could be the case that their consultants are too busy to disseminate their experience. A nice example of a self-supporting unit is presented by Boen (1982) in the area of Biometrics. Our aim is to add new examples from Europe, where we observe differences in traditions.

Another important point is that consulting activities are usually not supported by the universities' traditional evaluation system, in which research is considered the most important activity (several grants and personal rewards depend on the research activities of the given department), followed by teaching - but in this case quite often the quantitative characteristics are more important than the qualitative ones. The services - provided to colleagues from other departments or to interested people from the outside world - are considered far less important. In this situation the establishment of a consulting unit does not only have the usual organizational difficulties, but there is a danger that the participants themselves become unsure about their preferences and so the work might be done less enthusiastically and effectively. In Section 2 of this paper we give a list of differences between commercial and noncommercial units, which should be taken into consideration when deciding to establish a unit of either type. Section 3 summarizes the opportunities and the problems when a commercial consulting unit is already in operation. We summarize both sections in the form of a table. Section 4 contains our examples, showing how we tried to overcome the observed difficulties when establishing consulting units in the Netherlands and in Hungary.

2 Comparison of commercial and noncommercial statistical consulting units

In practice the different traditions at universities have resulted in certain departments or faculties having their own experts in statistics. It is quite clear that such local experts are not capable to cover all the possible needs. So often there is a (either formal or informal) unit within the departments of mathematics/statistics serving the needs of other departments and/or industry.

There are two main types of such statistical consulting units:

- a noncommercial unit, serving mainly the needs of the other faculties of the university;
- a commercial unit, which is open for clients both from inside and outside the university on a fee-for-service basis.

Of course these pure, extreme cases are rare: often one finds mixtures with emphasis on either the noncommercial or on the commercial aspects.

2.1 Finances

The most important (and probably the decisive) question when thinking about the foundation of a consulting unit is the following: is the university (or any other institution) in a position of offering long-term support to the statistical department (or analogous unit) for providing statistical consulting service to other departments or not. As it can be seen from the literature (cf. Carter et al. 1986), the mission statements of noncommercial units emphasize the positive effect of consulting on teaching and the research. But consulting is of course a time consuming activity, therefore the participating members of staff should get a reduction in the teaching load (financed by the host university). This type of unit has the advantage of causing less tension to the members of staff: there is little pressure from the clients for very strict deadlines and there is definitely less responsibility.

On the other hand, if there is no – or only limited – direct financial support available from the host university, then the unit should be self-supporting. There are examples (see section 4 and Zempléni, 1997) where the commercial unit not only became self-supporting, but succeeded even in providing financial support to its faculty and/or university.

The different financial status has an important effect on the scientific merits of the projects, too. If one is responsible for keeping the annual budget of a commercial unit, then there is a strong pressure to induce income even if the project is not interesting from a scientific point of view. Such pressure is rare in the case of noncommercial units.

The pricing policy is also different for the two types of units: the noncommercial unit is not so heavily dependent on making profits, so there is a possibility for applying flexible charges, depending on the project and the client. On the other hand, the commercial units cannot afford to produce losses, so usually a fixed price per consultant per day is charged.

2.2 Personnel

There are some important points about the skills to be possessed by the members of staff which should also be taken into consideration when thinking about the foundation of a statistical consulting unit.

The different clientele implies that the applied communication skills are different: if one deals with university graduates only (which is usually the case for a noncommercial unit), it tends to be easier to achieve respect and to make oneself understandable. However, when communicating to people from the shop-floor of a manufacturing company, one has to possess the skills of a good facilitator (cf. Snee, 1996).

Moreover, the commercial unit has to have a competent head, who is capable not only of understanding the problems and estimating the difficulty of the projects, but of managing the whole unit as well. This requires the skills of an entrepreneur, because he has to negotiate about project price and details with other managers. These skills are rarely found in statisticians from a university, and the recruitment from outside is not an easy task. The lack of a suitable manager often is the reason for rejecting the idea of establishing a commercial unit.

The organization, planning and documentation of the work is also different for the two types of units. At a noncommercial unit in the worst case the scientific reputation of the author is at risk. To be a consultant at a commercial unit of course involves taking more responsibility, since in this case legal consequences can follow an erroneous advice. Hence the work – and the responsibilities – should always be documented during the whole process of working on a project, (cf. Kirk, (1991). There is a related question of deadlines. Whilst in the case of noncommercial units the deadlines are rarely strict, it is not for projects of the commercial consulting units.

2.3 Operational structure

As the units are usually part of the Department of Mathematics or Statistics, the rules of the university should be accepted. Some pecularities are worth mentioning. For instance, the commercial consulting unit should assume a well-chosen name in order to be distinguishable from the "old-fashioned", academical department.

Usually, there is no need for major investments, if the establishment of such a unit is agreed upon, whence – if the consultants have positions at the department – the financial risk is limited. However, this comfortable situation has its dangers, too: if the head of the unit does not have enough motivation or skills to arrange new contracts, then there is no perspective for the commercial unit. The noncommercial unit does not need to be so well-managed, as the clients usually come on their own initiative.

In case of a successful commercial unit, after a few years in operation the unit's growth makes it necessary that the reins are slackened. Hence, the unit gains more independence. In this case the host department/faculty can create a supervisory board controlling the policy of the unit and the use of the accumulated profit, but not its everyday life.

2.4 Typical projects

Examples from the practice of the Institute for Business and Industrial Statistics of the University of Amsterdam (IBIS UvA) in the Netherlands show (see Section 4) that the total involvement approach in projects is effective (cf. Marquardt, 1979). Here the consultant is actively involved in the complete trajectory, from the formulation of the problem through understanding the processes, recognising the possible problems, implementing the practical solutions to the result-checking and follow-up. In such cases the power of statistics can be fully utilised.

Even in other cases, where the projects are not directly industrial, knowledge about the motivation and the expectations of the client are vital to work effectively. A deep understanding of the background is also needed for the suggestions to be useful and realisable.

Although the abovementioned type of participation in projects would of course be useful in the case of noncommercial units as well, usually the consultants can afford to spend only a limited amount of time to the clients. So there is little hope for the total involvement which needs months or sometimes even years of continuous work. This lack of time results in the situation that even the formulation and agreement on the output are not always done.

As the statistical theories and methods are expanding, it is almost impossible for a person to be familiar with the most recent trends in more than one field of application. So a specialization is needed (especially in the case of a commercial unit): either the unit itself concentrates on a specific subject (like Industrial Statistics in the case of IBIS UvA, see Section 4) or the specializations of the senior members of staff define the limits of the consulting. For a noncommercial unit, there is more flexibility in choosing projects. The reason may be a much looser time-schedule.

In Table 1 a summary of the abovementioned issues is given.

Aspect	Commercial units	Noncommercial units
Financial status	Self-supporting	Supported by the host university
Pricing	Fixed (based on working days)	Flexible
Clients	Both internal and exter- nal	Mostly internal
Skills needed	Professional, managerial and communicational	Professional
Responsibility	Legal	Scientific
Selection of pro- jects	Not always possible	Important
Method of work	Written contracts, policy statements	Informal agreements
Operational structure	Independent manage- ment	Possibly within the de- partment
Projects' field	Usually specialized	Might be more diverse
Typical projects' depth	Total involvement	Clinic-type

Table 1: Comparison of commercial and noncommercial units

3 Opportunities and problems when running a commercial consulting unit

Let us investigate the main points related to running a commercial consulting unit at a university department.

3.1 Research

Even in the case of commercial units, the university background should never be forgotten. The practice will provide the consultants of research problems (see Does, 1999 for a wide range of examples).

It is emphasized even in some earlier papers (cf. Marquardt, 1979) that the statistics applied in the industry or sciences has increased to a highly sophisticated level. Often suitable procedures for nonstandard situations can only be developed by a Ph.D. level consultant. It is the task of the head of the unit to encourage the publication of the results. Usually, it is not a major problem to get the permission from the clients to publish the achieved results in scientific journals. However, it is surprising that these results are not everywhere accepted as an achievement comparable to the (not always really applicable) methodological papers. The promotion and extension of the use of statistical methods to other disciplines are important goals of applied statistics (cf. Carter et al., 1986). One should be aware of the danger of accepting any client only due to financial considerations: if there are only trivial problems involved in the consultancy projects, the consultant might feel he has been overeducated.

3.2 Teaching

The teaching aspect of consultancy requires that the consultant should possess the ability to communicate the statistical knowledge to the clients, who might have a very different statistical background. This ability is also important when delivering service courses to students of other faculties. Furthermore, the different projects widen the views of the members of staff and provide excellent examples for illustrations.

On the other hand, a busy consultant might not have enough time to deal with the problems of individual students. It might also cause tensions if the consultant is the supervisor both of his Ph.D. student's thesis and his consulting work (cf. Boen, 1982).

3.3 Career

If the applied research of the consultant is recognized, then the career opportunities are not worse than for university graduates in statistics, who have mainly published papers in (theoretical) statistical journals. On the other hand, a consultant has extra options, since he is more than just a scientist: he has to be an entrepreneur, too (through the "total involvement" in the projects, and because practical experience has been acquired in team work and managerial skills - cf. Marquardt, 1979). This ensures that he is a strong candidate for management positions in industry or research institutes.

This is of benefit for the consultant himself, but causes a major problem for the head of the unit: he must be able to keep the experienced employees (at least for a while), as too much fluctuation of consultants causes problems in operating the unit. One way to avoid this is to give the consultants competitive salaries to the statisticians who work for private consulting companies. This – together with the abovementioned research opportunities and the relative freedom of working at a university – is hopefully enough to solve the problem. However, this might cause tension between the lower paid university staff and the consultants of the commercial unit, which can be resolved in two ways: first, the host department should also gain from the existence of the unit (usually some percentage of the income is handed over); second, the participation in the unit's work should be made possible to other members of staff as well.

In Table 2 a summary of this section is given.

Aspect	Opportunities	Problems/dangers
Research	Real-life problems; possible (joint) publications also in nonstatistical journals	Limited time is left for re- search; less scientific recog- nition
Teaching	Real-life examples for courses	Less time for individual work with (under)graduates
Career	Enterpreneurial, communica- tional skills learned	Slower procedure of promo- tion

Table 2: Opportunities and possible problems related to running a commercial consulting unit

4 Units in Europe

In this section we present our experience in two European countries (the Netherlands and Hungary), with rather different economic and scientific background.

4.1 The Netherlands

The Institute for Business and Industrial Statistics of the University of Amsterdam (IBIS UvA) has been operational since May 1, 1994. It was able to start with (commercial) statistical consultancy due to a two-year startup grant of the Faculty of Mathematics and Computer Science. It turned out that from the start the unit was so successful that the grant was not necessary.

The services that are provided deal with implementing Statistical Process Control (cf. Does et al., 1999) and related quantitative quality programs such as Six Sigma (cf. Van den Heuvel et al., 1997 and Hahn et al., 1999), quality improvement (as a part of Total Quality Management), courses and general statistical consultancy. Currently, there are seven enthusiastic consultants employed (4 full-time (senior) consultants and 3 part-time senior consultants of which three are also professor at the Department of Mathematics). To support and constantly improve the consulting activities, IBIS UvA aims to:

- contribute to scientific research in business and industrial statistics on an international level (cf. Does and Roes, 1996 and Does, 1997 and 1999 for overviews);
- promote the application of industrial statistics in all relevant parts of society.

IBIS UvA has developed a comprehensive package of training courses and workshops. These involve Statistical Process Control, Six Sigma, Measurement System Evaluation, Kaizen, Design of Experiments, Statistically Robust Design, Taguchi Methods, Shainin-Bhote techniques, Failure Mode and Effect Analysis and Quality Function Deployment. These workshops are strongly based on the broad and hands on expertise available within IBIS UvA.

The customers of IBIS UvA cover a wide range of products and services; from low-volume to mass production. The IBIS UvA approach has helped its customers to achieve lower costs, higher productivity and better quality.

From 1994 through 1997 IBIS UvA was part of the Department of Mathematics. From the turnover the University charges 5% and a fixed price of 3500 Euros per consultant for housing. For usage of the infrastructure of the faculty an extra 7% of the turnover is paid. The total profit in that period was about 250,000 Euros which has been allocated into a fund. This fund can be used for sabbatical leaves and for initiating research in industrial statistics.

Since 1998 the IBIS UvA became a private company within the Holding of the University. In this Holding all the commercial activities of the University are embedded. The profit of IBIS UvA is now divided into three equal parts: one going to the Holding, one to the Department of Mathematics and one to IBIS UvA. The current situation allows IBIS UvA to keep the consultants' salaries on a level comparable to other professional consultancy bureaus. This really was necessary to keep the employees.

4.2 Hungary

At Eötvös Loránd University, Budapest, at a traditionally theoretical department in Probability and Statistics, the tendency for increasing the importance of applied statistics in teaching has started in the 80s, when the new insurance companies needed young mathematicians. There were heavy cuts in the universities' budgets at the end of the 80s: the number of staff was decreased by nearly 20%, and even the daily life of the faculty became impossible without the aid of several grants (research projects or other development funds).

The support of the European Union was got in the form of a Joint European Project grant during the years 1995-97 for gaining the knowledge and information needed to be able to create a successful consulting unit. The Universities of Amsterdam (the Netherlands), Dortmund (Germany), Goteborg (Sweden), Lisbon (Portugal) and Sheffield (Great Britain) were involved in this project. At most of these universities there is a statistical consulting unit (cf. Zempléni, 1997 for an overview).

The abovementioned economic need motivated our choice for the commercial unit rather than the noncommercial one. The members of staff are university graduates and students of the department, so a balance in consulting and other duties should be found - which was achieved within the first two years. The accounting and legal advice is given by the university, enabling the members of the unit to concentrate on the professional part of their work. Here over 20 % of the project value has to be paid to the university and an additional 6% to the host department. It is obvious that this service cannot be cheap. Therefore the quality of the work and the reputation of the university should be a factor when winning clients. Which was actually the case, as since its formal establishment in 1998, there were five consulting contracts fulfilled with a total value of nearly 20,000 Euros.

However, as its foundation is only a few years behind us it is too early to form an unambigious statement about its role and prospects.

5 Conclusions

In most cases there is a need for a university-based statistical consulting unit, which is able to encourage valuable applied statistical research and that can provide the students a practical training. There is an option for this unit to be commercial or noncommercial, which depends mostly on the university's willingness to finance this consulting activity.

If the commercial way is chosen, then one can expect more problems with financial and legal administration, and one should be aware of the danger of being overrun by the budgetary expectations. The presented example of the IBIS UvA has shown that it is possible to overcome these difficulties and to accumulate not only a substantial profit but scientific recognition as well.

In the developing economies of Central and Eastern Europe one cannot expect such a quick expansion, but the need for advanced statistical applications is increasing, so it is worth being prepared for the challenges.

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