Comment

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INTRODUCTION

We are delighted that *Statistical Science* is providing a forum in which broader aspects of statistics, like the impact of computing, can be discussed, and we are grateful to the editors for recognizing this issue, as well as to the authors of the present paper for providing an unusually informative account which will help many academic departments in the initiation or expansion of computing activity. Computing is having fundamental implications for directions of statistics research, the types of people we train and hire, our value systems, and our financial priorities. We are in basic agreement with the present paper, and we would hope that the recommendations put forward by the authors will be taken seriously. The present discussion will make a few points which are based on our own personal involvement in computing, both in academic and industrial settings, and we will add a few more specific recommendations to the authors' list of suggestions for the profession.

ISSUES OF STANDARDIZATION

The authors have important things to say about standardization, an issue with many ramifications. On the level of a single computer system, standardization may mean an effort to cut down on the number of nonstandard components both in hardware and software for the purpose of getting the system to run with the least expense of human and financial resources. Very often standardization can be interpreted as buying a complete "off the shelf" system from a single vendor. This approach has its advantages, even if the initial purchase costs are higher. A multitude of suppliers can cause problems in a number of ways: special interfaces and driver software may be needed, the sources of malfunctions may be harder to pinpoint, software updates on the main system may have disconcerting effects on nonstandard peripherals, etc.

On the other hand, there are global aspects to standardization which might make deviations from standards at a lower level necessary. A first example is the following. If a university establishes a campus wide network, a statistics department should set up the required interfaces and software, irrespective of availability from the usual vendor. A second example is provided by the UNIX-type operating systems (UNIX is a trademark of AT&T Bell Laboratories). Such systems are nonstandard alternatives to vendor-supplied operating systems on most mini-sized time-shared computers, but they have grown into a standard, transcending hardware brands. Standardization is meant to grant certain compatibilities which can be in conflict with each other, and statistics departments will have to face questions of compatibility with a user community (committed to an operating system standard), with a vendor (to facilitate maintenance), or across a campus (to access networks or tap expertise in computer science departments).

Yet another complicating aspect of standardization enters if computing is made a research topic rather than kept as an activity to achieve old goals by new means. We will then want to keep up with developments in computer science which may imply radical departures from most of what we are used to. Some may decide that we cannot afford to miss trying out certain innovations for their potential relevance, for example, to data analysis. Only history can prove them right or wrong, but one should not discard the possibility that new standards can be made to happen if research shows their superiority.

BARRIERS IN THE WAY OF COMPUTING

Barriers which obstruct access to computers are many. They range from psychological to institutional and financial. At the level of an individual who would like to get started, there arises the question of how to find expertise and documentation. A more fundamental problem is how such an individual can learn the mental models needed to develop perspective, organize a plan of action, and achieve goals. Failing at this stage imposes a feeling of backwardness on otherwise willing beginners, while a more appropriate response would be to fault the documentation and backwardness of the software. The only way to deal with the current situation is by hiring competent systems personnel from the outset and making instruction a major focus when newcomers like first year students or new faculty arrive in a department.

This brings us to another topic well worked out by the authors: the need of competent staff and the costs

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