The research and development of safe and effective medications is a long and expensive process, which culminates with the submission of a New Drug Application to the Food and Drug Administration. This NDA document represents the accumulated knowledge associated with many years of laboratory and clinical research experience. The creation of the final document by the pharmaceutical company and its review by the FDA is a very time-consuming and expensive process, often including between 100,000 and 1,000,000 pages. Over the past 10 years, pharmaceutical companies and the FDA have attempted to leverage technology to facilitate the production and review processes. While some companies have sought to develop proprietary computer assisted New Drug Applications (CANDAs), Pfizer Inc, along with a few other companies, have forged a strategic partnership with the SAS Institute for the development of a generic, universally available solution.

The strategy of working with a major software vendor to achieve a universally available system solution has been used by Pfizer in other contexts (1993 nominee for ComputerWorld IT Award for Medicine) and was further developed for this application for six business reasons:

- Pharmaceutical Company Can Concentrate on Core Competencies
- Reduce S/W Development Costs
- Reduce Validation Costs
- Leverage Current Expertise
- Use of Standard Software
  - Used for Clinical Trials Analysis

Throughout the Industry
- Accepted defacto Standard at FDA Division of Biometrics
- Insures consistency with NDA reports

- Use of Standard System
  - Full Submission System Allowing Prospective CANDA development at sponsor site
  - Minimal Training of FDA Medical Reviewer for Each Sponsor's CANDA

This paper discusses these business reasons.

Pharmaceutical Companies Can Concentrate on Core Competencies

The development of a new drug is a complicated process requiring scientists from a variety of disciplines that span the physical, biological, medical, statistical and social sciences. The highest levels of expertise is required to discover and create new chemical entities, to prove (or disprove) their safety and usefulness in treating the ailments of the human race, and managing this process.

While the development of computer systems and software may have a less direct impact on the health of humans, the creation, development, and production process leading to effective computer tools requires no less expertise or management.

Companies decide where to focus their expertise. Where there is significant overlap in the knowledge base, methods, and experience needed for project development, synergistic gains are possible. However, when there is little overlap, companies must invest in building and
maintaining this additional expertise. Working with the SAS Institute allows Pfizer to:

• focus on the business competencies needed to effectively manage the drug development process
• communicate these processes to SAS
• receive the benefits of a product that meets the highest software development standards, while
• enabling Pfizer business processes and the processes of the other partners including other companies and the FDA.

Reduce S/W Development and Maintenance Costs

The development of software and systems is resource intensive. It involves not only writing the code but also keeping it current with the changing business standards and procedures. However, for many in the pharmaceutical industry the full implication of this expense was revealed in the development and roll-out process when documentation of various sorts (user, training, system) and training were added. (The costs associated with validation are discussed below.) In addition, as these systems become more complex, they increasingly rely on one of more operating systems and other underlying software. The costs of delivering, documenting, and maintaining systems in this dynamic and seemingly ever changing environment is a full time activity for several staff.

By using the SAS/PH vertical product line, Pfizer will be able to achieve these benefits for the cost of the license renewal which amount to less than .5FTE.

Reduced Validation Costs

Good clinical practice and regulatory guidelines require the validation of software and systems. For the simplest of systems this can be a resource intensive process but for tools used to generate New Drug Applications (NDA), it is formidable, indeed. Electronic data and tools supplied to regulatory agencies to enable more efficient review processes also require significant validation effort. In addition, the results presented in the NDA must match exactly the results that are derived from the electronic tools ("It is critical that the information in the CANADA version be identical to the hard copy submission. Any differences must be specified, documented, and clearly indicated in the CANADA submission." p.16; 1994 FDA CANADA Guidance Manual) The use of SAS/PH tools will allow a single integrated system that can produce the NDA as well as be supplied to regulatory reviewers to facilitate review. The use of this single "commercial off the shelf" (called COTS in the 1994 FDA CANADA Guidance Manual) system must be validated only once for the submission (not for the submission, the CANADA, and the comparison of the two) and "...the COTS vendor’s validation is acceptable, at this point,” to the FDA (p.21; 1994 FDA CANADA Guidance Manual).

Leverage Current Expertise

Every report, table, and graph submitted to regulatory agencies by Pfizer Central Research is generated with the use of SAS. There thus exists much expertise in the use of SAS for computerizing and encapsulating complex clinical algorithms, standard data presentation programs, and data structuring and management. This existent code is usable by the SAS/PH system with little or no modification to algorithms, programs and data. Additionally, the SAS expertise available throughout the organization can be used for integration efforts to further business goals rather than for maintenance and support of systems.
Standard Software
In an industry where processes and procedures are closely guarded secrets and there are about as many ways of doing things as there are companies who do them, SAS is the de facto standard for processing clinical trials data. In a recent conference on CANDAs, participants were asked about their use of SAS as a significant part of the NDA. Everyone who had recently submitted an NDA used SAS for processing the clinical trials data of their submission. Similarly, Contract Research Organizations (used increasingly by pharmaceutical companies to outsource data collection and analysis) use SAS as the software of choice.

While the FDA has had to modify statements that specifically mentioned SAS so as not to give the impression of endorsing a particular product, the language of SAS is used throughout the industry as both a programming language of choice and as a way of expressing ideas and standards.

With the SAS/PH product, this language can now be incorporated into the systems used to surface data to the computer desktop. Thus, the standards for data structure, reporting and analysis used throughout the industry can be accessed and used on the desktop with no more SAS programming knowledge than the pointing and clicking of a mouse. And, as described above, the same software that is used to produce the submission in the first place, is used for the review of the submission electronically, thus, by definition, yielding the exact same results.

Standard Systems
The past 25 years has seen many instances in which pharmaceutical companies have attempted to join the management of their business processes with the development of software to better enable business processes. In most cases these systems have failed to reach production. Even in the best of cases, the development has required significant investment in resources. However, the tight linkage between core business practice and system has resulted in systems that are not generalizable from one company to another.

The partnerships that SAS Institute has developed with several pharmaceutical companies and through these companies with regulatory agencies (i.e. FDA and the Canadian HPB) has obliged the development of the SAS/PH product to provide functionality that is generic across pharmaceutical companies. At the same time, however, this close partnering promotes the mapping of the system to the data, programs and processes of an individual company. This mapping thus enables the use of the system throughout the clinical stage of the drug development process and seamlessly into the regulatory review and post-marketing processes.

The use of the SAS/PH products is consistent with sound business strategies for the six reasons described above. Further, the extensive use of the product can promote more efficient drug development and review processes which ultimately can yield better and less expensive health care.