Accounting for costs of software for sale or lease; Issues paper (1984 February 17)

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Accounting for Costs of Software for Sale or Lease

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Table of Contents

Table of Contents
(Continued)

Introduction

1. The Accounting Standards Executive Committee's Task Force on Accounting for the Development and Sale of Computer Software has prepared this paper to address issues relating to accounting for *computer* *software* costs.*

2. Accounting for computer software costs is addressed in

- FASB Statement No. 2, *Accounting for Research and Development Costs*,
- FASB Interpretation 6, *Applicability of FASB Statement No. 2 to Computer Software*, and
- FASB Technical Bulletin No. 79-2, *Computer Software Costs*.

Those documents address costs incurred for the internal development of software

- as products or processes or as parts of products or processes, to be sold, leased, or otherwise marketed to others,
- to be used as parts of processes whose output is product that will be sold, leased, or otherwise marketed to others, or
- to be used in research and development activities.

* Terms defined in the glossary (page 67) are underscored the first time they appear in this issues paper.

3. Neither the software industry nor the accounting profession has uniformly interpreted the standard, the interpretation, or the technical bulletin. The Securities and Exchange Commission, concerned about increasing diversity in accounting for computer software costs, has set rules, discussed in paragraphs 84 through 86. Those rules limit accounting practices in this area for publicly held companies until guidance is provided by the FASB. In addition, the Association of Data Processing Service Organizations (ADAPSO) has requested guidance on accounting for computer software costs.

4. This issues paper examines accounting for computer software costs in light of present conditions and changes that have occurred in the industry since the standard, the interpretation, and the technical bulletin were issued. This paper does not address accounting for costs of combined computer software hardware construction projects, computer software constructed by an enterprise for use in its own operations, or purchased software.

Historical Perspective

5. In the 1950s, manufacturers and users of computer hardware were the predominant producers of software. During that period, hardware manufacturers typically provided systems software with their hardware, and most users built their own applications software. Few packaged software products were produced for resale during that period.

6. In the 1960s, though there was a growing tendency for users to have custom applications software built by others, separately priced software packages still were not common. Computer manufacturers, including IBM, generally provided their hardware customers with systems software at no extra charge.

7. In 1969, IBM "unbundled," that is, started charging separate prices for hardware and software as well as for other services, such as systems engineering services and education services. A rise in the demand for systems software sold separately was a direct result of unbundling, but applications software was also affected, because more users began to consider buying that software as an alternative to creating it inhouse. Unbundling, then, increased the opportunity for independent producers of software to enter the market.

8. During the 1970s, changes in the types of hardware and reduced costs made computers available to a broader range of users. Some companies with centralized data processing functions found it feasible to decentralize that function and small businesses started to buy and use computers. Though many companies with large mainframe computers continued to employ technical personnel to program and operate their equipment, many other companies and small businesses bought computers that could be operated by nontechnical personnel. That spurred the demand for more packaged software.

9. In 1974, a combined total of about 700 independent producers of packaged and custom software had aggregate revenues of about $1.4 billion, of which nearly $400 million was attributed to packaged software. In 1976, shortly after FASB Statement No. 2 and Interpretation 6 were issued, the number of software package producers alone was about 600, and those companies accounted for approximately $600 million of the total $4.2 billion of revenues in the computer services industry. By 1982, more than 1,800 independent software package producers accounted for $5.3 billion of the total $26.4 billion of revenues in the industry.

10. That growth was achieved as software companies expanded markets by finding new applications for existing software technology. The marketing strategies, delivery systems, and service and product mix of software producers changed. Some companies specialized in specific industries or markets, while others provided packages that crossed industry lines, and some companies integrated their product lines to provide expanded products.

11. In 1974, ADAPSO found that two thirds of the companies responding to its annual industry survey provided primarily financial software. Today, software packages serve a wider variety of needs, and they may be used in a wider variety of ways. For example, one firm, specializing in computer services for medical group practices, provides software for bookkeeping, collections, insurance processing, patient accounting, word processing, medical chart tracking, and appointment scheduling. Its software packages are available for mainframe, mini, and microcomputers. Some are bundled with hardware into turnkey systems, while others are available through processing services.

12. Managers of software companies have also become more experienced and more sophisticated in managing software product planning, production, and distribution, enabling them to increase

marketability of software products and recoverability of costs.

13. Stock of many software companies is now publicly traded. In 1970, of the 25 computer service companies whose stock became publicly traded, five were software producers. In the first 10 months of 1983, 22 of the 26 computer service companies whose stock became publicly traded were software producers. The total number of publicly held software companies is difficult to estimate, because of the fast pace of initial public offerings and mergers in this area and because of the diverse product lines of many computer service companies. However, at present, a majority of the nearly 200 publicly held computer service companies obtain a substantial portion of their revenue from software products.

14. The entrance of software companies into the public financing market has increased the need for additional accounting guidance on how they should apply existing literature in today's environment. Opinions differ. Some of the differences reflect disagreement on the issues, and some are caused by disagreement on how software is now transformed from an idea to a finished product. The following description of this process has therefore been prepared as further background for consideration of the issues.

The Software Product Process

15. The software product process can be described as a series of stages in the planning and construction of a software product, from its conception through key decision points to its completion. It involves interdependent technical and business activities and decisions. Product enhancements, which are improvements in or extensions to the original product, also pass through the same stages, though the stages normally require less time.

16. The process is basically the same among all software producers, but the details of each activity and the terminology describing the process differ from company to company. For simplicity, the process is described here sequentially, though activities in different stages may occur in practice at the same time, and certain activities may be performed more than once using a variety of approaches. For example, in the early stages of the product process, design activities may occur several times as various designs are considered. Or, an activity such as cost recovery analysis might occur several times for a variety of product concepts and might result in major changes to the plans for

the product. In the later stages, however, there is generally less iteration and changes are usually minor.

17. The overall process involves two major phases:

- a planning and design phase and
- a construction phase.

The Planning and Design Phase - Establishing Technological, Market, and Financial Feasibility

18. The planning and design phase is a series of iterative technical and business activities and decisions. It continues until final decisions are made regarding the design for a product and the technological, market, and financial feasibility of producing and selling it. In some companies, planning is formally documented; in others, planning may be more informal. In either case, planning must be sufficiently detailed and documented for management to determine a product's overall feasibility.

19. Feasibility may be established at various points in the process, depending on the product, the company, and other factors. Some software products may be so similar to other products that little detailed technical or business planning is required to establish their feasibility. Others, however, may be so different that detail program design and even considerable coding, which this paper describes as construction activities, may be

necessary to establish technological feasibility. Those products may also require greater efforts to establish market and financial feasibility.

20. Companies that formally document their planning, typically develop

- a product plan, which includes preliminary product specifications and design, a market analysis, and a marketing plan,
- a construction plan, and
- a financial feasibility plan.

Those plans address

- the market and competitive environment,
- the product functions, features, and performance requirements necessary to meet market needs,
- the product specifications that direct the implementation of the product functions, features, and performance requirements,
- the construction approach or methodology,
- personnel and computer resources required to construct the product, and
- the financial feasibility of the product, including an evaluation of the expected return on investment.

21. As the plans are prepared, alternatives are narrowed, until a single approach is ready for management approval. If the approach is rejected, the process may be discontinued or plans may be revised until management is satisfied that the product is feasible. If the plans are approved, work begins on constructing a product that meets the technological, market, and financial requirements specified in the plans.

The Product Plan

22. An individual or a team with marketing, technical, and applications experience prepares a product plan for management approval. The plan

- defines the business or consumer need the product will meet,
- provides a market and environmental analysis,
- describes the product function and feature requirements,
- evaluates technical constraints to determine required technical characteristics,
- specifies the software design in sufficient detail to support the technological feasibility analysis and construction planning, and

- describes documentation and customer support requirements.

23. Business or Consumer Need. The business or consumer need could be for an applications product, such as a type of game or a software package to automate a business's purchasing function, or it could be for a systems product, such as software to provide more efficient data management. Some companies use the term "problem statement" in describing the defined need. That statement is used to set the product's scope by specifying the problem the software will address.

24. The Market Analysis and Marketing Plan. The market analysis examines the nature of the market and the ability of the software producer to distribute to that market. It addresses such questions as

- What kinds of organizations need this product?
- What sizes are those organizations?
- How many of those organizations exist?
- What would those organizations be willing to pay?
- Where are those organizations located?
- When is the product needed?

- Is there an ongoing need for the product?
- What is the projected life of any required hardware?

The market analysis also evaluates the competition and considers these questions:

- Is there a similar product available today or about to be announced? At what price will it be offered?
- Who is the competition? What are their strengths and weaknesses?
- What are the strengths and weaknesses of the company in relation to its competition?
- What sales approach should the company use to outsell the competition?

Based on the market analysis, the software producer develops a marketing plan, which addresses such factors as

- the advertising, marketing materials, and personnel resources necessary to sell and distribute the product and
- the cost to implement the plan. This cost is further analyzed as a factor of financial feasibility.

25. Environmental Analysis. Environmental analysis examines

the direction of certain hardware vendors as well as the needs and expectations of users. Timing is often critical here, as the expectations of users can change.

26. Product Function and Feature Requirements. Using the results of the previous activities as a starting point, a development team defines the functions the product must perform to satisfy the business or consumer need. The functions of a product are its major capabilities. For instance, a function of a payroll system is to print checks. The functions are then analyzed in terms of the expectations, operational requirements, and technical environment of the product's anticipated users to determine what features the product must contain. Features are a subset of functions. The ability to print checks on a variety of forms and the ability to print messages on checks are potential features of a check printing function.

27. Required Technical Characteristics. The development team evaluates the technical constraints within which the product must operate to determine its required technical characteristics. The team defines how the product must function technically to implement its feature content, specifically, how the software must interact with the operating hardware. That activity considers

the hardware on which the product will operate, the programming languages to be used, and any specialized technical capabilities required, such as the ability of one software product to share data or interface with another. Technical performance issues are also addressed. These include the volume of data to be processed, processing efficiency, online response time, compatibility with required systems software, and ease of implementation, operation, and upgrading. The product's technical functions are defined and measurements are established that will later serve as standards to determine whether the product has been completed successfully.

28. Specifications for the Software Solution. Specifying the software solution is a comprehensive design activity that includes

- generally defining how the component programs of the software must work together to implement the product functions, features, and performance requirements,
- evaluating alternative methods of meeting those requirements, considering each alternative's feasibility and relative cost,

- defining the scope of the software solution relative to hardware and manual functions the product must interact with,
- generally defining interfaces to other products in or outside the company's software line, and finally
- creating a general design, which is a model of the software product in sufficient detail to serve as product specifications. The specifications are subsequently used to support a further commitment of resources to create a construction plan, and, later, to guide the detail program design activity in the construction phase.

Typically, product specifications include such elements as

- general input (online screens and batch transactions),
- general output (online screens and hard copy reports),
- major processes or data transformation definitions,
- data storage and data structure requirements,
- general data flow and interaction with transforming processes, and

- general definitions of software control facilities such as processing activity journals, approval checkpoints, and audit trails.

29. Companies prepare specifications in varying detail at this point. The level of detail may vary not only from company to company but also from product to product. In some companies and for some products, the level of detail may more closely parallel the detail program design activity described in paragraph 39 of this paper.

30. Documentation Requirements. A documentation plan outlines the areas the documentation will address. Documentation is written material, usually provided with software products, which explains to customers how to use the products. Many companies have standards to make sure that documentation is comprehensive and consistent from product to product and that it provides an appropriate level of detail. Documentation is often developed in sections parallel to the product. Completed sections of documentation may serve as a control to check the accuracy of completed portions of the product.

31. Customer Support Requirements. Future customer support requirements and the methods and resources that will be used to

meet those needs are identified. The nature of the market and product are important factors in determining customer support requirements. Requirements might include how the product will be delivered, the technical assistance that will be needed to install the product, the training customers will need to start using the product, and the assistance customers will need in daily use of the product.

The Construction Plan

32. The construction plan addresses the physical construction of the product. It determines methodologies for transforming the product specifications into the detail program design (analogous to construction blueprints) and for actually building the product. It provides estimates of the project complexity, the manpower, skills, and skill levels required to construct the product, the hardware and software resources required, the availability of resources necessary to successfully complete the project, and the project timetable. If any resources are unavailable or limited, the scope, timing, or performance level of the planned product may be affected. The construction plan may also include specific milestones or checkpoints for management to use in reviewing the progress of the project. Those milestones

are often represented graphically, along with specific resource requests.

The Financial Feasibility Plan

33. An appraisal of the expected return on the investment in the product is fundamental for a management decision. Building on the product and construction plans, an individual or team prepares a financial feasibility plan that generally includes a forecast of sales based on estimated prices and unit volumes of the package and a forecast of costs that reflects the personnel and computer resource requirements described in the construction plan. Other significant costs that might be included are travel costs incurred in surveying potential users, costs incurred in product planning, and estimated costs of product distribution.

Establishment of Technological, Market, and Financial Feasibility

34. The product specifications in conjunction with the documentation requirements, customer support requirements, and the construction plan provide the information necessary to determine the technological feasibility of the product. In making the decision on technological feasibility, management evaluates whether the skills and the hardware and software technology are available to build the product. Some products may require con-

siderable research and therefore more detailed planning before the software company is willing to assume the risk that the product can be built. In addition, if the product is an enhancement, management must consider whether the product can be built using the existing technical foundation. That decision can generally be made quickly by people who know the base product.

35. Technological feasibility is established when it is probable* that the product can be built to meet its design specifications within the technical and business constraints established in the product, construction, and financial feasibility plans. That decision is usually made by management by the end of the planning and design phase. However, technological feasibility is not necessarily established at the same point in the process for all products and all companies. For many products, technological feasibility can be established earlier in the process, for example, when the product does not differ significantly from existing products. For other products the establishment of technological feasibility may require completion of some construction activities to resolve uncertainties inherent in the product.

36. In considering market and financial feasibility, management evaluates the market analysis and marketing plans, the

* In this paper the term probable is used as defined in FASB Statement No. 5, that is, "the future event or events are likely to occur."

construction plan, and the financial feasibility plan and assesses the risk of failure by examining such factors as

- the experience of the organization,
- the reliability of previous planning,
- the capability of the organization to finance, build, market, and support the product,
- the size and nature of the market,
- the product life cycle,
- the viability and volatility of the market,
- the risk of technological and market obsolescence, and
- the length of development time.

Those risks are considered in light of the expected return, and in some instances management may decide to proceed despite high risks and without the establishment of feasibility, because the expected return is high as well.

37. The planning and design phase ends with a decision to accept or reject the plans for the product based on management's determination that those plans demonstrate its feasibility. If the plans are rejected, the process may cease or plans may be revised until management is satisfied that feasibility has been

established. Once the plans are approved and management commits the resources necessary to construct and market the product, the construction phase begins.

The Construction Phase

38. The approved product, construction, and financial feasibility plans from the planning and design phase serve as guidelines through the construction phase. The construction phase consists of three stages:

- detail program design,
- code and test, and
- packaging.

Though this phase is less iterative than the planning phase, certain earlier activities and even some planning and design activities may be required to solve problems as they arise. Those activities, however, are generally performed on a smaller scale, since the solution to specific problems is the objective, not overall redesign of the product.

39. Detail Program Design. In the detail program design phase, the product specifications or general design is transformed into a detailed design that serves as the lowest level blueprint for the product. This stage is required before

coding, testing, and packaging of the software product. It takes product function, feature, and technical requirements to their most detailed, logical form before coding begins.

40. In some companies the same individual or team may work on the product from start to finish, that is, from the planning phase through coding, testing, and writing documentation to packaging. In other companies duties are segregated. For instance, the design function may be separate from the coding function, or the design function may be divided so that the design in the planning phase is done by one individual or group and the lower level of design in the construction phase is done by another individual or group.

41. Detail program design specifications vary from company to company depending on the product, the complexity of the project, and the design technique used. Many design methods exist. Program processes may be represented as step by step narratives, illustrated in the form of data input -- computer process -- data output, diagrammed using a specific design technique, or represented in some other way. The result is a detailed, logical picture of all program processes, which is easy to code from. In some cases, some critical fragments of computer-readable code are

written; in others, detailed specifications that are not yet in a form the computer can accept provide the logic framework. The development team

- determines the activities necessary to transform the general product design and specifications into a detailed design,
- divides the activities into smaller tasks,
- assigns people to the tasks,
- determines when each task should be completed, and
- develops test plans and test data to be used during coding and testing.

At this point a test of the design or a design verification walkthrough may be performed to determine if the design satisfies the requirements specified in the product, construction, and financial feasibility plans.

42. Code and Test. With detailed specifications complete, coding of the product begins, though some coding may have been done earlier, depending on the product. Coding involves writing detailed instructions in a computer language to carry out these requirements described in the detail design. Such coding may consist of thousands of instructions. During coding and testing,

part of the development team or a separate individual or group continues to document product capabilities. This documentation forms a substantial part of the materials that will eventually go to customers to support product use. Quality assurance activities in this process could include walkthroughs of programs and documentation and analysis of results against the detail design specifications.

43. Programs are usually tested individually and in groups before the whole system is tested. That is often called unit testing. When all the programs have been completed and tested, the system is tested in its entirety. That product quality assurance step is often referred to as system testing. To make sure their systems are tested impartially against specifications, many organizations use quality assurance groups that are not part of the construction teams.

44. A test plan is developed that specifies certain test cases to help determine if the product meets feature, function, and technical performance requirements set in the planning and design phase and if it works in accordance with the design and the documentation. Any errors detected during system testing are corrected. Once that procedure is completed, the product is

ready for packaging.

45. Packaging. In the packaging stage, which is part of the construction phase, a base or master version of all software product components is produced. Those base components can be collected into deliverable packages and produced for customers on a master product medium. The documentation is edited, and some sections may be rewritten to make sure it fully explains product capabilities. Customer support plans are put in final form. When those plans, documentation, and supporting training materials are complete, the product is ready to be delivered.

Applicable Literature

46. The FASB has issued three documents that apply to accounting for the costs of software development:

- FASB Statement No. 2, Accounting for Research and Development Costs,
- FASB Interpretation 6, Applicability of FASB Statement No. 2 to Computer Software, an interpretation of FASB Statement No. 2, and
- FASB Technical Bulletin No. 79-2, Computer Software Costs.

47. Paragraph 8 of Statement No. 2 defines research and development

> Research is planned search or critical investigation aimed at discovery of new knowledge with the hope that such knowledge will be useful in developing a new product or service ... or a new process or technique ... or in bringing about a significant improvement to an existing product or process.
>
> Development is the translation of research findings or other knowledge into a plan or design for a new product or process or for a significant improvement to an existing product or process whether intended for sale or use. It includes the conceptual formulation, design, and testing of product alternatives, construction of prototypes, and operation of pilot plants. It does not include routine or periodic alterations to existing products, production lines, manufacturing processes, and other on-going operations even though those alterations may repre-

> sent improvements and it does not include market research or market testing activities.

48. Regarding the application of those definitions to computer software, paragraph 31 of Statement No. 2 states that

> Computer software is developed for many and diverse uses. Accordingly, in each case the nature of the activity for which the software is being developed should be considered in relation to the guidelines ... to determine whether software costs should be included [in] or excluded [from the definition of research and development.] For example, efforts to develop a new or higher level of computer software capability intended for sale (but not under a contractual arrangement) would be a research and development activity encompassed by this Statement.

49. Paragraph 7 of Interpretation 6 requires that "costs incurred for <u>conceptual formulation or the translation of knowledge into a design</u>" [emphasis in the original] be classified as research and development "if the development of software is undertaken to create a new or significantly improved product or process without any contractual arrangement." It also requires "other costs, including programming and testing software" to be classified as research and development costs if they are "incurred in the search for or evaluation of product or process alternatives or in the design of a pre-production model." However, programming and testing costs are not to be classified as research and development "when incurred, for example, in

routine or other on-going efforts to improve an existing product or adapt a product to a particular requirement or customer's need."

50. The interpretation does not address the classification of costs incurred after the search for or evaluation of product or process alternatives or after the design of a preproduction model.

51. Technical Bulletin No. 79-2 is intended to answer a specific question: "Are all costs incurred to produce computer software considered research and development costs under Statement 2 and Interpretation 6?" It answers that "Statement 2 and Interpretation 6 do not require that all computer software production costs be considered research and development costs..." For many, however, that answer, though unequivocal, does not respond to the implementation questions of Statement No. 2 and Interpretation 6.

52. Technical Bulletin 79-2 also says, that "...a determination that software production costs are not research and development costs does not necessarily mean that they would be inventoriable to future operations."

53. The subject of inventoriable costs for intangible assets

that are eligible for capitalization is addressed in APB Opinion 17 paragraph 24, which states that

> a company should record as assets the costs of intangible assets acquired from others... [and] ...as expenses the costs to develop intangible assets which are not specifically identifiable.

The opinion is silent on accounting for the costs of internally constructed identifiable intangibles, though the opinion states, in paragraph 6 (as amended by paragraph 4 of Statement No. 2) that they are within the scope of the opinion.

54. Guidance on capitalization also exists in the definition of an asset in FASB Statement of Financial Accounting Concepts No. 3, Elements of Financial Statements of Business Enterprises. There, assets are defined as

> probable future economic benefits obtained or controlled by a particular entity as a result of past transactions or events.

Though that definition is useful as a general guide, there is considerable disagreement regarding its application in recognizing and measuring costs of developing and constructing software. Some have therefore sought guidance in standards pertaining to similar costs, such as those costs incurred in developing record masters and motion pictures for which the tangible value of the product is insignificant in relation to its total value.

55. Paragraph 11 of FASB Statement No. 50, Financial Reporting in the Record and Music Industry, uses recoverability as the determining factor for capitalization:

> The portion of the cost of a record master borne by the record company shall be reported as an asset if the past performance and current popularity of the artist provides a sound basis for estimating that the cost will be recovered from future sales. Otherwise, that cost shall be charged to expense.

56. Paragraphs 10 and 11 of FASB Statement No. 53, Financial Reporting by Producers and Distributors of Motion Picture Films, unconditionally require that, "costs to produce a film (production costs) ... be capitalized as film cost inventory and...be amortized...in the same ratio that current gross revenues bear to anticipated total gross revenues." The statement also requires that such assets be written down to net realizable value if estimated gross revenues are not sufficient to recover the film's unamortized cost.

57. Though the guidance in FASB Statement Nos. 50 and 53 may be clear, some believe that developing and constructing software is not an activity analogous to developing and producing records and motion pictures, and they would therefore not apply the principles in those statements to software.

Diversity in Practice

58. The present diversity in accounting for costs of computer software is manifested in a variety of ways. The major accounting decision is whether to capitalize certain costs or charge them to expense when incurred. That decision is influenced by definition and classification issues that have not been resolved in existing literature. A survey by ADAPSO and another by Deloitte Haskins & Sells have attempted to determine how diverse practice is.

Surveys

59. ADAPSO found that 58 of the 231 computer service companies responding to its July 1982 survey reported some costs of internally developed software as assets. Thirteen of the 58 respondents were publicly held companies.

60. In its January 28, 1983, survey of the accounting policies described in the financial statements of 30 publicly held companies that develop, license, or sell computer software to others, Deloitte Haskins & Sells found that four had disclosed that they had capitalized some internally developed software costs. Of the four, two indicated that enhancements and improve-

ments of existing products were capitalized. The other two indicated that enhancement costs were charged to expense while certain construction costs -- coding, testing, debugging, documentation costs, and costs to develop related operating procedures -- were capitalized.

61. Though a significant portion of software is developed and marketed by companies that are primarily hardware manufacturers, those companies have not been surveyed. Nevertheless, it appears from informal discussions that some capitalize some costs of software construction.

62. The diversity in practice is supported by diverse interpretations of the relevant literature, which some attribute to ambiguities in FASB Statement No. 2, Interpretation 6, and Technical Bulletin 79-2.

FASB Statement No. 2

63. Ambiguities exist in both definitions and examples in FASB Statement No. 2.

64. Research. The research defined in paragraph 8(a) of Statement No. 2 occurs early in the software product process. Though all agree that research costs should be charged to expense when incurred, there is some disagreement about the activities to

be classified as research.

65. Development. Paragraph 8(b) of Statement No. 2 defines development in terms of

- translation of research findings into a plan or design for a new product or process or for a significant improvement to an existing product or process,
- conceptual formulation, design, and testing of product alternatives, and
- construction of prototypes and operation of pilot plants.

There are two different interpretations of how to apply that definition of development to accounting for software.

66. Development until product completion -- Some hold that development does not end until the software product is essentially completed, because whether it can be completed is uncertain until then. They believe that for development to end, a prototype or something similar is necessary and that the first working version is the prototype or something similar. Further, the need for design modifications in the construction phase is evidence that development takes place throughout that phase.

67. <u>Development until product construction</u> -- Others hold that development is essentially completed before the construction phase begins and that design modifications during construction are too minor to conclude that development continues during construction. They note that the translation of research findings and the conceptual formulation, design, and testing of product alternatives occur before the construction phase. Indeed for construction to begin there must be a single product design. Further, though testing occurs during the construction phase, they point out that it is testing of the product's operation, not testing of product alternatives. In their view, the construction of prototypes and operation of pilot plants is irrelevant in applying the definition of development to software, because they believe the software product process generally does not include production of a prototype and never includes the operation of a pilot plant. They regard the establishment of technological feasibility as the key point in determining when development has ended.

68. <u>Efforts to Develop a New or Higher Level of Computer Software Capability</u>. The last sentence in paragraph 31 of Statement No. 2 --"For example, efforts to develop a new or higher level of

computer software capability...would be a research and development activity..." -- has been interpreted in several different ways:

- "New or higher level of computer software" means new in the technological sense, which would exclude most current software construction from the definition of development, because it does not use new technology.

- "New or higher level of computer software" means "new or higher level" in the product sense and is determined by reference to the company.

- "New or higher level of computer software" is determined by reference to the market. If the product, or one substantially similar, already exists in the market, efforts by others to produce the product are not development. In other words, only the first company to develop, construct, and market the product incurs development costs for that product.

- Assuming that it has been determined that the software product is a "new or higher level capability," there are still two opinions about the phrase "efforts to develop:"

  -- The "efforts to develop" run through the entire software product process. Though all innovation would probably have occurred before construction begins, the entire construction process is part of the "efforts to develop" and therefore is development.

  -- "Efforts to develop" are completed before construction starts.

69. <u>Examples of Activities</u>. Paragraphs 9 and 10 of Statement No. 2 include examples of activities that are and are not

research and development. Those examples have also been applied in diverse ways to software.

70. Examples (a) through (d) of paragraph 9 are generally considered to take place before construction. Example (e) in paragraph 9, -- "modification of the formulation or design of a product or process" -- can happen throughout the software product process but generally does not occur to any significant degree once construction begins. Some say development is not complete until all design modifications are complete. Others say the design modifications during construction are too minor to conclude that development continues during construction. Still others contend that development is not complete until the detail design is complete.

71. Examples (f) through (h) of paragraph 9, particularly (f), are considered by some to point to the need for a prototype before completion of software development, even if the prototype is the end product itself. Others say those examples are irrelevant to the software product process; moreover, they are generally relevant only to tangible products, not intangibles such as software.

72. Paragraph 9(i) provides this example of development:

"engineering activity to advance the design of a product to the point that it meets specific functional and economic requirements and is ready for manufacture." Some believe that for software, manufacturing is the duplication of the master version of the product and that all activity to advance the design of the product to the point of manufacture is research and development. Others say that all the engineering activity to advance the design of the product occurs before construction, because for software, manufacturing is construction of the product.

73. Diversity in interpretation of paragraph 10 of Statement No. 2 is generally limited to examples (a) through (c) -- engineering follow through, quality control and testing, and troubleshooting. Some believe those activities occur only after sales have begun and that similar activities during the construction phase are part of development. Others say that those activities are construction activities, that some are even customer support activities, and that their presence in the construction phase is further indication that construction is not development.

Interpretation 6

74. Some are unsatisfied with Interpretation 6, because it does not address what they believe is the primary issue, namely,

accounting for construction costs. In addition, many believe that Interpretation 6 uses undefined terminology, uses an example that may be viewed as either restrictive or illustrative, and can lead to questionable conclusions on accounting for enhancements.

75. Preproduction Model. Paragraph 7 of Interpretation 6 states that "costs are research and development costs when incurred in the search for or the evaluation of product or process alternatives or in the design of a preproduction model."

76. The phrase "search for or evaluation of product or process alternatives" is subject to the two different interpretations discussed in paragraphs 65, 66, and 67 of this issues paper. The reference to a preproduction model is difficult to interpret, because the term is undefined as it applies to software. Some say the preproduction model is the same as a prototype and that all costs incurred before a prototype is completed are research and development costs. Others say that generally no preproduction models are made for software, though mockups of systems or product simulators are occasionally made before construction, depending on the technical complexity of the software product and the management discipline and experience of the developer.

77. "For Example." Paragraph 7 of Interpretation 6 explains

that costs for programming and testing are not research and development costs when incurred, "for example" [emphasis added], in routine or other on-going efforts to improve an existing product or adapt a product to a particular requirement or customer's need." The phrase "for example" in that statement has diminished clarity regarding the classification of costs. Some interpret the phrase to mean that costs for programming and testing are not research and development costs only when incurred to improve an existing product or to adapt a product to a particular requirement or customer's need. Others believe that the example is not intended to be restrictive and that costs of programming and testing related to activities other than those in the example can also be other than research and development costs.

78. Enhancements. A literal reading of Interpretation 6 could lead to the conclusion that no enhancement activities are research and development. Some question whether that conclusion is reasonable. The software product process for enhancements is essentially the same as for a new product, and some of the process for a new product is research and development. They ask why one is research and development and the other is not if the activities and their objectives are virtually identical.

Technical Bulletin 79-2

79. Technical Bulletin 79-2 states that "all costs incurred in producing a given software product or process are not necessarily research and development costs... However, a determination that software production costs are not research and development costs does not necessarily mean that they would be inventoriable or deferrable to future operations."

80. The problem in implementing that statement is that it provides no guidance on how to determine which costs are and which costs are not research and development. Likewise, it provides no guidance on how to determine which costs might be "inventoriable or deferrable to future operations."

Other Applicable Research

81. Paragraphs 39 and 40 of FASB Statement No. 2 refer to statistics appearing in various studies on success rates for research and development projects. Those statistics support the view that "there is normally a high degree of uncertainty about the future benefits of individual research and development projects.... For example, one study, involving a number of industries found that an average of less than 2 percent of new product ideas and less than 15 percent of product development projects were commercially successful."

82. Paragraph 40 states that

> Even after a project has passed beyond the research and development stage, and a new or improved product or process is being marketed or used, the failure rate is high. Estimates of new product failures range from 30 percent to 90 percent, depending on the definition of failure used.

83. At the request of the AcSEC Task Force on Accounting for the Development and Sale of Computer Software, ADAPSO surveyed its members in September 1983 to determine if the failure rates for software products that were essentially out of the planning and design phase were the same as those quoted by the FASB. The results of the survey, presented in Appendix B, provide some

perspective on the experience of the Association's members. The indicated failure rates are far below those cited in paragraph 40 of Statement No. 2.

Benefits of Additional Guidance

84. The SEC has adopted rules on capitalizing costs of internally developed software that are intended to limit the amount of diversity in practice. Those rules preclude companies that had not disclosed a policy of capitalizing software construction costs in their audited financial statements issued before the rule's April 14, 1983, effective date, from beginning or continuing to capitalize those costs, though others who both had capitalized them and made such disclosures may continue to capitalize.

85. The SEC has indicated that it will reconsider its rules

> when authoritative literature provides better guidance for determining (1) which activities associated with developing such computer software are not research and development activities, and (2) the appropriate accounting for costs of those activities, if any, which are not research and development activities....

86. Thus the rules are a temporary measure for companies reporting to the SEC, and they are effective until the issues are more clearly resolved in the authoritative literature. Guidance is needed, however, not only for publicly held companies but also for privately held companies that must classify and account for software development and construction costs. Such guidance will

result in improved comparability of financial statements among both publicly and privately held companies.

ISSUES

87. To resolve the diversity in the application of existing literature there must be agreement on the threshold issue raised in FASB Technical Bulletin 79-2.

Issue 1:

Must all costs incurred to produce computer software for sale or lease be charged to research and development expense as incurred?

Yes

88. Though Technical Bulletin 79-2 states that not all costs incurred in producing a given software product or process are necessarily research and development costs, some disagree and hold that they should be classified as such and charged to expense as incurred, because

- all costs incurred to produce a prototype, that is, a working version of the product, are research and development and in the case of software, the prototype is produced near the end of the software product process,

- design modifications, which are defined as a development activity in Statement No. 2, occur throughout the software product process,
- significant uncertainties regarding the technological feasibility and recoverability of the software product are not resolved until the software product process is substantially completed, that is, when there is a working version of the product, and
- in many companies the accounting system does not collect costs in a manner that would enable them to separate costs that are research and development from those that are not.

<u>No</u>

89. Technical Bulletin 79-2 specifically states that in accordance with FASB Statement No. 2 and Interpretation 6, "all costs incurred in producing a given software product or process are not necessarily research and development costs." Further, the Technical Bulletin implies that some costs may be inventoriable to future operations. In addition,

- a prototype or a working version of the product is not necessary to establish technological feasibility,
- design modifications in the construction phase are generally minor and are not a redesign of the overall product,
- significant uncertainties are generally resolved in the feasibility analyses before product construction begins, and
- most companies would probably modify their accounting systems if the benefits of allocation were to exceed the cost.

The first three points above are considered in greater detail in the issues and subissues that follow.

<u>Subissue 1A</u>:

> <u>Are all costs incurred to produce a preliminary working version of a software product, considered by some to be the prototype, research and development costs</u>?

<u>Yes</u>

90. Paragraph 8b of Statement No. 2 states that development

includes construction of prototypes. In the software product process a tested prototype does not exist until the process is essentially completed, that is, until there is a preliminary working version of the product. Until that point, technological feasibility is not established. Further, substantial design modifications can occur in the so called construction phase and sometimes entire modules may be redesigned.

91. Technological feasibility for all products can only be established by prototypes. Permitting the establishment of technological feasibility for software by means other than a prototype would effectively enable software vendors to classify activities as nonresearch and development that others would be required to classify as research and development. That is, for other products it may also be possible to establish technological feasibility without constructing a prototype; an exception for software is unsupportable.

No

92. Though development is defined in Statement No. 2 as including the construction of a prototype, that part of the definition is illustrative, not prescriptive. That is, the definition does not require that all the activities described as

research and development occur. It merely states that if those activities occur, they are development activities. For example, the definition also includes operation of pilot plants as a development activity. Surely it was not intended to require construction of pilot plants for all products.

93. The first definition of a prototype in Webster's New Collegiate Dictionary is "an original model on which something is patterned." The model is tangible in a manufacturing environment, though it may not resemble the final deliverable product. The purpose of a prototype is to establish the technological feasibility of a product before committing to construction. Establishing more than technological feasibility is unnecessary, but establishing less than that would mean that technological risk is still high. When technological feasibility is established, the goal of the prototype has been accomplished. As described in paragraph 35, technological feasibility for software is established when it is probable that the product design specifications can be achieved within the technical and business constraints set for the product. That is generally accomplished before a preliminary working version (prototype) of the product exists.

94. For some software products, for example, products using new technology, it may be difficult to establish technological feasibility without constructing at least portions of the product. For those products, companies may use mockups of systems or product simulators as an aid in determining technological feasibility and in designing their products. Those models are used, however, before the final product design is selected, and they are not always necessary to prove technological feasibility.

95. The decision on technological feasibility is not complex for most software products. Some have compared the software product process to the construction of a building. Once the overall design is planned and approved, construction is a known process that can be mechanically implemented.

96. The decision on technological feasibility for software products can be made by analyzing the

- product function and feature requirements (paragraph 26),
- required technical characteristics (paragraph 27),
- specifications for the software solution (paragraph 28),

- documentation requirements (paragraph 30), and
- customer support requirements (paragraph 31).

Those requirements are determined and documented during the planning and design phase.

Issue 2:

> If technological feasibility has been established, can any costs be capitalized if they occur before market and financial feasibility have been established, that is, before the end of the planning and design phase?

Yes

97. Some believe that product costs may be capitalized before market and financial feasibility have been established, because costs for the production of inventory are typically capitalized based on the presumption of market or financial feasibility. Software does not have unique characteristics that should require additional feasibility tests.

No

98. Though some believe capitalization after the establishment of technological feasibility but before the establishment of

market and financial feasibility may have conceptual merits, from a practical standpoint, the end of the planning and design phase is probably the easiest initial cutoff to implement for accounting purposes. In addition, evidence (the ADAPSO September 1983 survey in Appendix B) indicates that after the planning and design phase is over, technological risk may be closer to the level of risk associated with construction than the level of risk associated with research and development.

99. The technical activities in the planning and design phase are research and development as defined in Statement No. 2 in that many of the activities occurring in the planning and design phase closely parallel the activities described in paragraph 9 of Statement No. 2 as research and development activities. The other activities in the planning and design phase, as described in this paper, are primarily market analysis, financial feasibility analysis, and management activities, costs of which would not be capitalized under GAAP. Further, until the planning and design phase is complete, the risks associated with the product may not be sufficiently reduced to indicate that an asset is being created and costs should be capitalized.

Issue 3:

Under certain circumstances should software construction costs incurred after the planning and design phase be capitalized?

Yes - if recoverability of costs is determined to be probable.

100. Statement No. 2, Interpretation 6, and Technical Bulletin 79-2, do not require that construction costs be charged to expense when incurred. The FASB did specifically reject selective capitalization as an alternative to an immediate charge to expense in the Basis for Conclusions Section of Statement No. 2, but that was in considering accounting for research and development costs, not accounting for construction costs.

101. If recoverability of costs is determined to be probable, an asset, as defined in FASB Statement of Financial Accounting Concepts No. 3, is being created. Further, some software products require several years to construct, and their lives, which are lengthened by enhancements, may be relatively long, for example, more than five years. Thus, capitalization and allocation of costs is necessary to achieve a matching of expenses with related revenues.

102. The decision to capitalize software construction costs or charge them to expense should be based on expectations regarding

recoverability of costs incurred. Unlike accounting for most other assets, there should be no presumption that construction costs are recoverable. For software construction costs to be capitalized, their recoverability should be assessed as probable, that is, likely to occur. The methods by which costs will be recovered should be identified and the amounts should be objectively measureable. Thus, recoverability requirements for software construction costs should be in concept as restrictive as those required for the record and music industry in FASB Statement No. 50.

103. Recoverability assessments should be made by reference to each company's circumstances. For costs of a product to be deemed recoverable, substantial evidence of recoverability should exist. Most of that evidence can be found in the documentation created in the planning and design phase, that is, in the establishment of technological, market, and financial feasibility.

104. Viewing the software industry as a whole, the probability of recovering costs in general has improved, and the ability to demonstrate the probability of future economic benefits has also improved, because of improvements in product planning. Technical, market, and managerial risks have been significantly

reduced in many companies in the industry.

105. Once costs have been capitalized, recoverability assessments should be made continuously, in accordance with FASB Statement No. 5. If information available before issuance of the financial statements indicates it is probable that capitalized software construction costs are not recoverable, those costs should be written off as required by Statement No. 5.

Yes - if recoverability of costs is determined to be probable and certain construction activities have been completed.

106. Some argue that some construction costs should be capitalized if recoverability of those costs is determined to be probable but only after certain construction activities have been completed. For example, some believe capitalization should not begin until the detail program design is completed (paragaph 39). Others believe it should not begin until coding and testing are completed (paragraphs 42 through 44). They believe there is greater assurance of product feasibility after those activities are completed.

No

107. Construction costs should be charged to expense when incurred, because the useful life of software products is

generally so short that capitalization and allocation of costs, compared with an immediate charge to expense, would result in only minor differences in the timing of expense recognition. In addition, it is generally difficult, if not impossible, to demonstrate that the future economic benefits of software construction are probable. Software is a unique type of product in that it is affected by many interrelated factors, and recoverability is often affected by the resolution of problems that occur in those interrelationships. Examples of specific factors that may preclude recoverability are listed in paragraph 36.

Subissue 3A:

108. Once a cutoff is established, accounting problems may persist, because sometimes a product is in more than one stage of the process at one time. Some of those stages may involve research and development activities and some may involve non-research and development activities. Further, though a product may be in the construction phase, some research and development activities may be required to resolve construction problems. Establishment of a cutoff therefore requires resolution of this subissue:

<u>If construction costs should be capitalized should research and development activities that occur when the product is primarily in the construction phase be capitalized</u>?

<u>Yes</u>

109. Those costs should be capitalized, because the overall phase should control the accounting treatment for activities. Once a product is out of the planning and design phase, it is illogical to charge to expense as incurred additional costs incurred to produce it even though those costs might normally be classified as research and development costs. Though the activities that occur are research and development in nature, they do not occur on the same scale as when the product was in the planning and design phase. Further, the level of risk associated with the product is not the same, because technological feasibility has already been established.

<u>No</u>

110. FASB Statement No. 2 specifically defines certain activities as research and development activities. The timing of those activities does not affect their classification. There should be consistency in accounting for certain activities. That is, if

determining product function and feature requirements is a research and development activity during the planning and design phase, it should also be a research and development activity if it occurs during the construction phase. In addition, classifying certain activities as nonresearch and development activities when the product is primarily in the construction phase might result in different accounting for costs of the same activities, that is some costs might be charged to expense when incurred and others might be capitalized.

Subissue 3B:

> Should construction costs incurred for new and significantly improved products and enhancements be capitalized under the circumstances described in paragraphs 100 through 105?

Yes

111. Though Statement No. 2 and Interpretation 6 specifically apply to costs incurred for new and significantly improved products, those documents do not require that nonresearch and development costs incurred to produce those products be charged to expense when incurred. The treatment of enhancements is not addressed.

112. Opinions differ on the definitions of "new," "significantly improved," and "enhancements," but all agree that establishing technological feasibility for products that are new or significantly improved requires greater efforts than establishing it for enhancements or products that are not new or significantly improved. Precise definitions of those terms are unnecessary. That is, technological feasibility must be established for all products; new and significantly improved products may require considerable research and development activity, enhancements may require less, and other products may require virtually none. However, once technological feasibility is the planning and design phase is ended, the accounting should be controlled by the same factors described in paragraphs 100 through 105.

<u>No</u>

113. Construction costs incurred for new and significantly improved products as well as enhancements should be charged to expense as incurred. The risks associated with constructing new and significantly improved products and enhancements are complex, subject to rapid change, and rarely sufficiently reduced to indi-

cate that the costs should be capitalized. Those factors add unique risks that preclude the level of assurance necessary to decide that costs are recoverable.

114. In addition, the rate of change in the industry is uniquely high. New and significantly improved products and enhancements, as well as other products, may become obsolete before construction is completed. Also, because of the relative ease of entry into the industry, there may be more companies in this industry that lack marketing and distribution capability and experience than in other industries, and that may make recoverability assessments more difficult for new and significantly improved products and enhancements.

Issue 4:

Does existing literature provide adequate guidance to evaluate recoverability on an ongoing basis?

Yes

115. FASB Statement No. 5 provides guidance on evaluating recoverability on an ongoing basis. Though the implementation of that statement requires the exercise of judgment, few believe that

guidance that is more specific would be useful. Some argue that guidance that is more specific would lead to the kinds of implementation problems encountered in applying, for example, FASB Statement No. 13.

116. The problem in the computer software industry has been the ambiguity in the literature on accounting for research and development as it applies to computer software. The literature on recoverability has not been a problem. In other industries recoverability questions have been successfully resolved under existing standards, and there is no evidence that suggests that this industry has unique problems that would require additional guidance.

<u>No</u>

117. The current confusion in the industry shows that additional guidance is necessary to avoid diversity in practice. If recoverability criteria are not specified, the risk of errors in judgment in this industry will be so high that some will charge costs to expense while others continue to carry the costs.

<u>Issue 5</u>:

<u>Does existing literature provide adequate guidance regarding the types of construction costs</u>,

that is, direct costs, indirect costs, or administrative overhead, that should be capitalized?

Yes

118. The software industry does not have unique cost identification and measurement problems that require a special industry standard. Identifying construction costs to be capitalized is a matter of professional judgment in accordance with existing standards. More precise standards would have a broad effect beyond the scope of this issues paper.

No

119. Specifying construction costs to be capitalized is necessary for comparability of financial statements of software companies. If only specific costs may be capitalized, the asset amounts on the balance sheets will reflect measurements of the same types of costs. Some believe direct costs should be specifically identified as the only construction costs to be capitalized, because it is difficult to demonstrate the association of other than direct costs with the product.

Advisory Conclusions

120. The task force voted as follows on the issues:

	Agreed with Yes Arguments	Agreed with No Arguments
Issue 1 - Must all costs incurred to produce computer software for sale or lease be charged to research and development expense as incurred?	0	7
Subissue 1A - Are all costs incurred to produce a preliminary working version of a software product, considered by some to be the prototype, research and development costs?	0	7
Issue 2 - If technological feasibility has been established, can any costs be capitalized if they occur before market and financial feasibility have been established, that is, before the end of the planning and design phase?	0	7
Issue 3 - Under certain circumstances, should software construction costs incurred after the planning and design phase be capitalized?	7(paras.100-105)	0

	Agreed with Yes Arguments	Agreed with No Arguments
Subissue 3A - If construction costs should be capitalized, should research and development activities that occur when the product is primarily in the construction phase be capitalized?	0	7
Subissue 3B - Should construction costs incurred for new and significantly improved products and enhancements be capitalized under the circumstances described in paragraphs 100 through 105?	7	0
Issue 4 - Does existing literature provide adequate guidance to evaluate recoverability on an ongoing basis?	7	0
Issue 5 - Does existing literature and practice provide adequate guidance regarding the types of construction costs, that is, direct costs, indirect costs, or administrative overhead, that should be capitalized?	7	0

121. AcSEC and its task force unanimously believe that

- FASB Statement No. 2, Interpretation 6, and Technical Bulletin 79-2 do not require that all costs incurred to produce computer software for sale or lease be charged to research and development expense as incurred. (Issue 1)
- Though the establishment of technological feasibility is a necessary research and development activity, it can be accomplished without a prototype. (Issue 1A)
- No software construction costs may be capitalized before completion of the planning and design phase. That applies to all software products, including new and significantly improved products and enhancements. (Issue 2)
- Neither the establishment of technological feasibility nor a management commitment to construct a product is a sufficient basis for capitalization of construction costs. Construction costs should be capitalized only if
  -- technological, market, and financial feasibility have been established,

-- management has committed the resources necessary to construct the product, and

-- recoverability of construction costs from future sales is determined to be probable, that is, likely to occur. (Issue 3)

- Recoverability of capitalized costs should be continually reassessed, and if information available before issuance of the financial statements indicates it is probable that capitalized software construction costs are not recoverable, those costs should be written off as required by FASB Statement No. 5. (Issue 3)
- Research and development activities that occur when the product is primarily in the construction phase should be charged to research and development as incurred. (Subissue 3A)
- Construction costs incurred for new and significantly improved products and enhancements should be capitalized if they meet the criteria for capitalization. (Subissue 3B)
- Existing literature provides adequate guidance to assess recoverability on an ongoing basis and to identify the types of costs that should be capitalized. (Issues 4 and 5)

GLOSSARY

Applications Software

Software to accomplish tasks and provide information for business and personal use, for example, accounts payable, payroll, general ledger, and Pac Man.

Central Processing Unit

(CPU) The unit of a computer, containing electronic circuits, that performs high-speed mathematical or logical calculations on data and temporarily retains data in processor storage while it is being operated on.

Code

Written instructions that can be executed by a computer. As a verb, code means to write those instructions.

Computer

A central processing unit (CPU) that can accept, store, and follow coded instructions. The terms computer, computer system, and hardware are often used interchangeably. Computer systems can be classified by data storage size and processing speed, with mainframe being the largest, mini next, and micro last. Those distinctions are blurring, however, because of rapid advances in technology.

Computer System

A system composed of a computer (or computers), input and output equipment, and the software necessary to make them operate together.

Computer Services Industry

All firms that sell data processing services, software products and services, or turnkey (integrated) computer systems.

Custom Software

Software prepared to the special order of a customer.

Customer Support

Services performed by vendors to assist customers in their use of software products. Those services might include installation assistance, training classes, telephone question and answer services, newsletters, and on site visits.

Deliverable Software Product

A software product that is ready to be marketed or sent to customers. It has been tested and it meets the predetermined feature, function, and performance requirements.

Detail Program Design

See paragraph 39.

Documentation

See paragraph 30.

Enhancement

An improvement or extension to a software product increasing its capabilities. Enhancements are often priced separately from the originally delivered software product.

Hardware

The physical components of a computer system, including processors, storage devices, and input and output equipment.

Mainframe

See Computer.

Master Product Medium

A recorded copy of a completed software product, usually on magnetic tape.

Microcomputer

See Computer.

Mini Computer

See Computer.

Online Screen

A report or form displayed on a video terminal for the purpose of viewing or entering information.

Packaged Software

See Software Product.

Processing Services

Services that enable customers to use a vendor's computer system to accomplish tasks and provide information from their own data, for example, service bureaus or timesharing companies.

Programming Languages

Prescribed sets of instructions by which systems and applications software are transformed into hardware machine code. The American National Standards Institute (ANSI) has set standards for many of the commonly used languages.

Software

A set of coded instructions that are followed by a computer to accomplish a task. There are two general classes of software: systems software and applications software.

Software Product

Software that is constructed, marketed, and supported for use by multiple businesses or individuals.

Software Product Interface

A transfer mechanism between software products that allow them to share mutually useful information.

Systems Software

Software that controls the operations of the hardware; that is, it allocates data storage space, schedules the operation of applications software, and manages data storage, retrieval, and communications.

Technological Feasibility

See paragraph 34.

Test

To operate software to verify that it meets the specifications of the detail program design.

Turnkey (Integrated) System

A complete package of hardware and software assembled to satisfy the data processing needs of a user or a group of users.

APPENDIX A

Illustrations

The following illustrates how the advisory conclusions might be applied in accounting for software costs.

Product A

Product A has not been offered previously by the company but uses existing knowledge in the public domain. It could be, for example,

- a general ledger,
- an inventory control system,
- a demand deposit accounting system,
- a word processing system,
- an electronic spreadsheet,
- a sort program, or
- an industrial machine control system.

The product uses proven technologies. The technical staff has produced similar, commercially successful products within budgeted costs and time. The product will be compatible with mainframe hardware now owned by the major potential customers of the company.

The product type has been proven in the marketplace by others, though certain features to be included in the company's product are believed to offer better performance than competitors' products. Management has performed extensive market research and estimates the discounted cash flow from projected sales (net of selling and delivery costs) of the product to be several times the budgeted cost of construction. No vendor dominates the market, and the company's revenues estimates are predicated on a small market share. The company has an effective sales force selling a related product to a similar customer base.

The sales volume of the company, founded five years ago, has grown at an average rate of 15 percent a year. The planning and design phase has been completed, and the product has passed through all key checkpoints of executive management review. Resources are available and have been committed to production.

Conclusion

Analysis of the conditions affecting risk indicates no significant uncertainties. Recoverability of costs for product A appears highly probable. All construction costs incurred after completion of the planning and design phase should be capitalized.

Product B

Product B is new and uses concepts and knowledge not previously applied in a commercially available software product. As a new product it may use

- unproven methods of obtaining access to data,
- process and response time substantially shorter than currently available, or
- new algorithms for solving the major problem requirements of the software product.

The product being considered could be

- a new modeling or simulating technique,
- a new programming language,
- a new data base management approach, or
- systems software for a new computer hardware design not previously marketed.

The planning and design phase has been completed, except for the establishment of technological feasibility. The technological advances for this product require completion of substantial portions of the detail program design, coding, and testing to establish technological feasibility. Nevertheless, the company has decided to construct the product.

Market research indicates a need for the product. Thorough studies conducted on a small sample of the total market indicate that the product would meet the need. Market research staff believes the results of the sample can be applied to the whole population of the target market. The sales management believes the product can be sold and has developed an aggressive sales strategy. Projected cash flows are three times the projected construction cost.

The sales volume of the company, founded five years ago, has grown at an average rate of 15 percent a year. The company is considered an innovator in the industry and has successfully developed and marketed several new products. Product B has passed through all key checkpoints of executive management review, and resources have been committed to production. Projected production cash flows indicate that inflows will be adequate and correctly timed to cover cash outflows for product costs.

Conclusion

The need to verify the new technology delays the completion of the planning and design phase until the amount of detail program design, coding and testing necessary to establish technological feasibility are completed. Until then, all costs should be charged to expense when incurred. After technological feasibility is established, recoverability should be reassessed to determine whether any construction costs should be capitalized.

Product C

Product C is functionally similar to product A, but will operate on microcomputers made by various manufacturers. Those manufacturers have a market share that is sufficient to provide a broad customer base for product C. It is expected that computers capable of using the product will not be displaced by another incompatible generation of microcomputers for 40 months. Sales after that point are not necessary for the product to be profitable but are nevertheless expected to occur for several years. Other market factors are similar to product A. The planning and design phase has been completed, and management has committed the resources to construct the product.

Conclusion

Analysis of the conditions affecting risk indicates no significant uncertainties. Recoverability of costs for the product appears highly probable. Product construction costs should be capitalized.

Product D

Product D is the same as product C, but the company has not previously constructed or marketed software. The software is being designed for a microcomputer that has been on the market for two years and has achieved only modest success. The software does not run on other manufacturers' microcomputers. Enhancements to enable the software to run on other microcomputers are feasible, but such enhancements have not been planned. The planning and design phase was completed six months ago, but the company only recently acquired the financial resources to complete construction of the product. The distribution channels recommended in the market analysis have not been set up.

Conclusion

Activities performed to produce the product would not be research and development, because technological feasibility has been established and the planning and design phase has been completed. However, costs incurred for construction should not be capitalized, because there are substantial uncertainties affecting recoverability, for example,

- the potential lack of market, that is, the number of users of the compatible hardware may not be a large enough market for the software developer to recover its costs,

- uncertain marketability, because distribution channels have not been established,
- the lack of experience in the organization, and
- the possible need for product enhancements.

Product E

A newly formed entity has begun constructing product E, a computer aided design program for a minicomputer. The programming technology is not new. Some features of the product are innovative and not currently available in the market.

The company has not conducted a formal planning process and has not attempted to determine the market for the product. Further, though product technical requirements have been addressed in a general way, they have not been documented.

Conclusion

The failure to complete a formal planning and design phase before beginning construction does not by itself preclude capitalization of construction costs if the company performs the activities of the planning and design phase in some manner; however, until those activites are completed, costs should not be capitalized.

Because the technological feasibility of product E has not been established, costs should be charged to research and development expense when incurred.

Product F

Product F is a video game, and its producer is a large, successful designer, manufacturer, and distributor of video games. There is no similar product in the market. The company has had a small number of games that achieved significant commercial success, many games that were moderately successful and many games that never achieved significant market acceptance. It has found that its successful games typically have relatively short sales lives and that it is difficult to predict whether a game will be successful.

Conclusion

Though activities performed to produce the product would not be research and development, construction costs should not be capitalized, because there are substantial uncertainties regarding recoverability of the costs of constructing this product.

Product G

Product G is an enhancement to an existing, commercially successful product. Product features have been defined, but other aspects of the planning and design phase such as studying market and financial feasibility have not begun. The enhancement could, for example,

- improve efficiency of operation,
- add a calculation option,
- improve the documentation to make the product easier to use,
- improve the data editing features for greater accuracy,
- increase the capacity of the product,
  - to handle more volume or
  - to process additional data types,
- generate new report formats for a general ledger system,
- add tax tables and calculations for
  - a payroll tax system or
  - an income tax system,
- change the language in which the product is programmed to a different proven, existing language,
- adapt the product to operate on a different computer that is well accepted in the market, or

- change the data input technique from one form to another (for example, cards to online video units).

The product uses proven technologies. The technical staff has produced similar, commercially successful products within budgeted costs and time. The product will be compatible with mainframe hardware now owned by the major potential customers of the company. The sales volume of the company, founded five years ago, has grown at an average rate of 15 percent a year.

Conclusion

Product G is in the planning and design phase and costs incurred currently should be charged to expense when incurred. After completion of the planning and design phase, assuming technological feasibility has been established, construction costs may be capitalized if those costs are probably recoverable.

1983 ADAPSO SOFTWARE PRODUCTS SUCCESS SURVEY

conducted September 1983

TABLE OF CONTENTS

SURVEY SCOPE

This survey was conducted as a first step in determining software product success rates; its purpose was to provide estimates of the percentage of products which are unsuccessful and the percentage of development money spent on these products.

In order to conduct this survey quickly and obtain a high response rate, the survey was made as short and easy to complete as possible. We therefore asked for estimates on the number and cost of products rather than more precise package by package questions on success and failure. We also eliminated one question, on products which were rejected and recycled prior to construction, as it proved difficult to answer.

In addition, in order to shorten the survey and make it easy to read, we decided not to specifically define the types of packages (mainframes, enhancements, micros), "technically infeasible", nor "planning stage" (as in "do not include those projects which did not get beyond the planning stage") within the questionnaire.

In order to encourage a high response rate for this survey, ADAPSO staff called all ADAPSO members which construct software packages to inform them that they would be receiving a survey in the mail and that it was important that they complete the survey accurately and immediately return it to ADAPSO. These phone calls were probably responsible for the high (over 70%) response rate from these companies.

FAILURE RATES

	Mainframe/Mini Products	Mainframe/Mini Enhancements	Micros
Average Percentage of software products found to be technically infeasible	4%	2%	9%
Average percentage of completed software products discontinued prior to cost recovery due to inadequate sales	12%	3%	6%
Average percentage of unsuccessful products	16%	5%	15%
Average percent of money spent constructing unsuccessful products as a percentage of all products	10%	6%	11%

	Mainframe/Mini	Enhancements	Micros
Total number of firms with products	83	47	60
Average number of products per firm	20	95	12
Percentage of firms with technically infeasible software products	14%	17%	30%
Percentage of firms with discontinued products	41%	13%	23%
Percentage of firms with unsuccessful products	47%	26%	37%

Type of Software	% Of Firms With Failures	Total Responses In Area
Language	23%	22
Systems	27%	33
Applications	48%	87
Tools	20%	50
Education	11%	9
Games	100%	5

There were too few responses to further break this down by type of package within package size (mainframe, mini, micro).

The higher failure rate for applications seems correlated with the higher number of older (more than 10 years old) responding firms with these products. And, as this question was not restricted to products developed during the last five years, the percent of firms with failures increased as the firms got older, although the percent of failures decreased.

AVERAGE PRODUCT COSTS

	Mainframe/Mini	Micros
Successful new product cost (responses)	$550,584(77)	$212,185(55)
Unsuccessful new product costs (responses)	$185,156(32)	$112,350(20)
Successful enhancement cost (responses)	$110,590(61)	$ 25,180(36)
Unsuccessful enhancement cost (responses)	$41,409(22)	$ 20,666(12)

	Mainframe		Micro	
	New	Enhanced	New	Enhanced
Average cost of unsuccessful product as % of a successful one	39%	52%	45%	95%*
Number of responses	34**	24**	20	12
Number where successful and unsuccessful costs equal (per average product)	2	0	4	4
Number where unsuccessful costs more than successful (per average product)	1***	0	1***	2***

* When one firm is extracted (with one unsuccessful micro enhancement costing four times their successful micro enhancement) this becomes 69%; the median is 63%.

** This is higher than the number used to determine average unsuccessful product cost as two firms used staff time, rather than cost estimates, in their responses.

*** In all of these responses there was only one unsuccessful product.

```
                MICRO STATISTICS

ANNUAL SOFTWARE REV                  LT $1 M
TOTAL RESPONSES                             25
AVG
YEARS CONSTRUCING SOFTWARE                   5
AVG
MICROS FOUND INFEASIBLE                      1
AVG
UNSUCCESSFUL MICROS                          1
AVG
TOTAL MICROS STARTED OR MARKETED             5
AVG
COST OF SUCCESSFUL NEW MICRO        214,863.64
AVG
COST OF SUCCESSFUL ENHANCED MICRO    16,857.14
AVG
COST OF UNSUCCESSFUL NEW MICRO       25,666.67
AVG
COST OF UNSUCCESSFUL ENHANCED MICRO   6,000.00
AVG
% MICROS TECHNICALLY INFEASIBLE           0.11
AVG
% MICROS DISCONTINUED                     0.08
AVG
UNSUCCESSFUL NEW MICRO
COSTS AS % SUCCESSFUL                     0.49
AVG
UNSUCCESSFUL ENHANCED
MICRO COSTS AS % SUCCESSFUL               0.93*
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MICROS                       0.17
```

* This is based on only 4 responses.

```
                    MICRO STATISTICS

ANNUAL SOFTWARE REV                        $1-10 M
TOTAL RESPONSES                                      21
AVG
YEARS CONSTRUCING SOFTWARE                            6
AVG
MICROS FOUND INFEASIBLE                               1
AVG
UNSUCCESSFUL MICROS                                   2
AVG
TOTAL MICROS STARTED OR MARKETED                     17
AVG
COST OF SUCCESSFUL NEW MICRO               116,277.78
AVG
COST OF SUCCESSFUL ENHANCED MICRO           26,000.00
AVG
COST OF UNSUCCESSFUL NEW MICRO              58,125.00
AVG
COST OF UNSUCCESSFUL ENHANCED MICRO         20,600.00
AVG
% MICROS TECHNICALLY INFEASIBLE                  0.07
AVG
% MICROS DISCONTINUED                            0.06
AVG
UNSUCCESSFUL NEW MICRO
COSTS AS % SUCCESSFUL                            0.64
AVG
UNSUCCESSFUL ENHANCED
MICRO COSTS AS % SUCCESSFUL                      0.80
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MICROS                              0.07
```

```
                  MICRO STATISTICS

ANNUAL SOFTWARE REV                          OVER $10 M
TOTAL RESPONSES                                      13
AVG
YEARS CONSTRUCING SOFTWARE                           13
AVG
MICROS FOUND INFEASIBLE                               1
AVG
UNSUCCESSFUL MICROS                                   0
AVG
TOTAL MICROS STARTED OR MARKETED                     16
AVG
COST OF SUCCESSFUL NEW MICRO                 326,818.18
AVG
COST OF SUCCESSFUL ENHANCED MICRO             39,642.86
AVG
COST OF UNSUCCESSFUL NEW MICRO               375,250.00
AVG
COST OF UNSUCCESSFUL ENHANCED MICRO           33,666.67
AVG
% MICROS TECHNICALLY INFEASIBLE                    0.08
AVG
% MICROS DISCONTINUED                              0.03
AVG
UNSUCCESSFUL NEW MICRO
COSTS AS % SUCCESSFUL                              0.35
AVG
UNSUCCESSFUL ENHANCED
MICRO COSTS AS % SUCCESSFUL                        0.20
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MICROS                                0.05
```

```
                          MAINFRAME STATISTICS

ANNUAL SOFTWARE REV                                  LT $1 M
TOTAL RESPONSES WITH MAINFRAMES                                  31
AVG
YEARS CONSTRUCING SOFTWARE                                        6
AVG
MAINFRAMES OR MINIS FOUND INFEASIBLE                              0
AVG
ENHANCEMENTS FOUND INFEASIBLE                                     0
AVG
UNSUCCESSFUL MAINFRAMES,MINIS                                     1
AVG
UNSUCCESSFUL ENHANCEMENTS                                         0
AVG
TOTAL MAINFRAMES/MINIS STARTED OR MARKETED                        5
AVG
TOTAL ENHANCEMENTS STARTED OR MARKETED                            8
AVG
COST OF SUCCESSFUL NEW MAINFRAME OR MINI                 315,000.00
AVG
COST OF SUCCESSFUL ENHANCED MAINFRAME OR MINI             38,236.84
AVG
COST OF UNSUCCESSFUL NEW MAINFRAME OR MINI                57,333.33
AVG
COST OF UNSUCCESSFUL ENHANCED MAINFRAME OR MINI           10,500.00
AVG
% NEW MAINFRAME TECHNICALLY INFEASIBLE                         0.05
AVG
% ENHANCED MAINFRAMES TECHNICALLY INFEASIBLE                   0.00
AVG
% MAINFRAMES DISCONTINUED                                      0.16
AVG
% ENHANCEMENTS DISCONTINUED                                    0.01
AVG
UNSUCCESSFUL MAINFRAME
COSTS AS % SUCCESSFUL                                          0.54
AVG
UNSUCCESSFUL ENHANCED
MAINFRAME COSTS AS % SUCCESSFUL                                0.57*
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MAINFRAMES                                        0.15
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL ENHANCEMENTS                                      0.00
```

* This is based on 2 responses.

```
                         MAINFRAME STATISTICS

ANNUAL SOFTWARE REV                                     $1-10 M
TOTAL RESPONSES WITH MAINFRAMES                                      35
AVG
YEARS CONSTRUCING SOFTWARE                                            8
AVG
MAINFRAMES OR MINIS FOUND INFEASIBLE                                  0
AVG
ENHANCEMENTS FOUND INFEASIBLE                                         0
AVG
UNSUCCESSFUL MAINFRAMES,MINIS                                         1
AVG
UNSUCCESSFUL ENHANCEMENTS                                             0
AVG
TOTAL MAINFRAMES/MINIS STARTED OR MARKETED                            8
AVG
TOTAL ENHANCEMENTS STARTED OR MARKETED                               21
AVG
COST OF SUCCESSFUL NEW MAINFRAME OR MINI                     630,757.59
AVG
COST OF SUCCESSFUL ENHANCED MAINFRAME OR MINI                159,120.70
AVG
COST OF UNSUCCESSFUL NEW MAINFRAME OR MINI                   123,812.50
AVG
COST OF UNSUCCESSFUL ENHANCED MAINFRAME OR MINI               42,307.69
AVG
% NEW MAINFRAME TECHNICALLY INFEASIBLE                             0.03
AVG
% ENHANCED MAINFRAMES TECHNICALLY INFEASIBLE                       0.01
AVG
% MAINFRAMES DISCONTINUED                                          0.10
AVG
% ENHANCEMENTS DISCONTINUED                                        0.06
AVG
UNSUCCESSFUL MAINFRAME
COSTS AS % SUCCESSFUL                                              0.32
AVG
UNSUCCESSFUL ENHANCED
MAINFRAME COSTS AS % SUCCESSFUL                                    0.39
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MAINFRAMES                                            0.08
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL ENHANCEMENTS                                          0.11
```

```
                    MAINFRAME STATISTICS

ANNUAL SOFTWARE REV                                   OVER $10 M
TOTAL RESPONSES WITH MAINFRAMES                               17
AVG
YEARS CONSTRUCING SOFTWARE                                    13
AVG
MAINFRAMES OR MINIS FOUND INFEASIBLE                           2
AVG
ENHANCEMENTS FOUND INFEASIBLE                                  1
AVG
UNSUCCESSFUL MAINFRAMES,MINIS                                  2
AVG
UNSUCCESSFUL ENHANCEMENTS                                      1
AVG
TOTAL MAINFRAMES/MINIS STARTED OR MARKETED                    73
AVG
TOTAL ENHANCEMENTS STARTED OR MARKETED                       301
AVG
COST OF SUCCESSFUL NEW MAINFRAME OR MINI              729,411.96
AVG
COST OF SUCCESSFUL ENHANCED MAINFRAME OR MINI          97,857.25
AVG
COST OF UNSUCCESSFUL NEW MAINFRAME OR MINI            361,777.78
AVG
COST OF UNSUCCESSFUL ENHANCED MAINFRAME OR MINI        41,142.87
AVG
% NEW MAINFRAME TECHNICALLY INFEASIBLE                      0.04
AVG
% ENHANCED MAINFRAMES TECHNICALLY INFEASIBLE                0.03
AVG
% MAINFRAMES DISCONTINUED                                   0.09
AVG
% ENHANCEMENTS DISCONTINUED                                 0.01
AVG
UNSUCCESSFUL MAINFRAME
COSTS AS % SUCCESSFUL                                       0.33
AVG
UNSUCCESSFUL ENHANCED
MAINFRAME COSTS AS % SUCCESSFUL                             0.36
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL MAINFRAMES                                     0.07
AVG
PCT SPENT CONSTRUCTING
UNSUCCESSFUL ENHANCEMENTS                                   0.04
```

MAINFRAME/MINI
SOFTWARE

```
Failure Rate (%)
        100% +         3
             I
             I
      .8-.99 +
             I
             I
      .5-.79 +         4       1       1
             I
             I
     .25-.49 +         3       4
             I
             I
      .1-.24 +                 6       2       3
             I
             I
     .05-.09 +
             I
             I
     .01-.04 +                                                 1
             I
             I
           0 +        44       6       1       3        1
             I
             I
             +
             I+--------+-------+-------+-------+-------+-------+
                               6-10           21-50         500-2500
                       1-5            11-20          51-500
```

TOTAL NUMBER OF PACKAGES

ENHANCEMENTS

```
Failure Rate (%)
       100% +        1
            I
            I
     .8-.99 +
            I
            I
     .5-.79 +
            I
            I
    .25-.49 +                                1
            I
            I
     .1-.24 +
            I
            I
    .05-.09 +                        1       1
            I
            I
    .01-.04 +                                                2
            I
            I
          0 +        27      2       4       2       2       2       2
            I
            I
            +
            I+-------+-------+-------+-------+-------+-------+-------+-------+
                             6-10           21-50         100-499
                     1-5            11-20          51-99         500-3000

                            TOTAL NUMBER OF PACKAGES
```

MICROCOMPUTER SOFTWARE

```
Failure Rate (%)

        100%+       1
            I
            I
    .8-.99  +               1
            I
            I
    .5-.79  +       3
            I
            I
   .25-.49  +       3       1       2       1               1
            I
            I
    .1-.24  +                               1       1
            I
            I
   .05-.09  +
            I
            I
   .01-.04  +                                       1       1
            I
            I
         0  +       36      2       2       3
            I
            I
            +
            I+------+-------+-------+-------+-------+-------+
                            6-10            25-49           100-300
                    1-5             11-24           50-99

                         TOTAL NUMBER OF PACKAGES
```

RESPONDENT PROFILE

Questionnaires Received	123
Not used due to uncorrectable errors	7
Not applicable (no software)	7
Total responses used	109

Number of Years Constructing Software:

Unknown	1	2	3	4	5	6-9	10	Over 10
1	9	12	13	6	15	20	7	26

Annual Worldwide Software Revenues:

LT $1m	$1-10m	$10-25m	$25-50m	Over $50m
45	46	8	4	6

REVENUE
(millions)

	1-2	3-5	6-9	10-14	15 or more
over $50				1	5
$25-50			1	2	1
$10-25		1	2	4	1
$1-10	5	18	9	11	2
Less than $1	16	15	6	7	1

YEARS CONTRUCTING SOFTWARE

- **Answer as accurately as possible, but if exact figures are unavailable your best estimate will suffice.**
- **When answering questions 3, 8 & 9 do not include those projects which did not get beyond the planning stage.**

1. Number of years your company has been constructing software products_____

2. Annual worldwide software products revenues:

Less than $1 Million	____	$25-50 Million	____
$1-10 Million	____	Over $50 Million	____
$10-25 Million	____		

IN THE LAST 5 YEARS...	Mainframe/Mini Products		Micro Products
	New Products	Enhancements	New Products
3. How many software products were you unable to complete because they were found to be technically infeasible?	________	________	________
4. How many completed software products were discontinued prior to cost recovery because of inadequate sales?	________	________	________
5. Total number of products started or marketed during this five year period?	________	________	________

Estimate the average amount your company spends...(use dollar amounts if possible, otherwise estimate staff time)	Mainframe/Mini Products	Micro Products
6. Constructing a successful new product (i.e., one that at least recovers its costs)	$________	$________
7. Constructing a successful enhancement (i.e., one that at least recovers its costs)	$________	$________
8. Working on a new product which proves unsuccessful (i.e., does not recover its costs)	$________	$________
9. Working on an enhancement which proves unsuccessful (i.e., does not recover its costs)	$________	$________

	MAINFRAME	MINI	MICRO
10. What types of software does your company construct? (circle all that apply)	languages systems applications tools	languages systems applications tools	languages systems applications tools education games
11. In which categories has your company had unsuccessful software products? (circle all that apply)	languages systems applications tools	languages systems applications tools	languages systems applications tools education games

The Association of Data Processing Service Organizations (ADAPSO) is sponsoring the attached survey to assist the American Institute of Certified Public Accountants (AICPA) Task Force on Accounting for the Development and Sale of Computer Software. It has been designed to provide the Task Force with needed data on the nature and success rate of software product construction.

The summarized responses from this survey are likely to have a significant impact on the ability to capitalize software in the future. Therefore it is in your interest to complete this questionnaire accurately and return it to ADAPSO as soon as possible.

We would appreciate your response by September 14th; the Task Force needs preliminary figures the following week. Your survey will not be identified in any way, so the confidentiality of your response is assured.

Any questions can be directed toward:

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