THE USE OF AN ALTERNATIVE SOURCE OF EXPERTISE FOR THE DEVELOPMENT OF MICRO-COMPUTER EXPERT SYSTEMS

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To date, most expert systems have been created by knowledge engineers working with several experts in knowledge acquisition sessions designed to elicit these experts' knowledge and relevant decision processes. In contrast to this typical expert systems methodology, this paper describes how we developed a microcomputer-based expert system using an alternative source of expertise termed “canned expertise” to solve constructive stock ownership problems. The resulting microcomputer expert system, TaXpert, offers solutions to tax professionals who must answer constructive stock ownership questions under the rules of 60 sections of the Internal Revenue Code. Based on our experience with TaXpert, we believe that for a significant number of expert systems development projects, canned expertise can effectively replace (or supplement) actual experts for knowledge acquisition and system validation activities.

In recent years, expert systems have been developed to contend with the ever increasing complexity of business problems and the difficulty in solving them. These systems, which capture the expertise used in decision making, are generally created by knowledge engineers working with several experts in knowledge acquisition sessions to elicit the expert’s knowledge and relevant decision processes. Once the expert system is developed, the usual methodology is to validate the system by comparing the system’s decisions to those of a panel of experts.

In contrast to this typical expert systems methodology, the research reported in this paper suggests that, when appropriate, developers might use an alternative source of expertise, termed “canned expertise.” A methodology involving canned expertise uses written materials embodying the knowledge of experts and their decisions. When treatises or other explanations of the rules governing a knowledge domain and reports of decisions or examples of applying the rules exist, canned expertise might be used in lieu of the usual development methodology. Further, for a significant number of expert systems development projects, canned expertise can effectively replace (or supplement) actual experts for knowledge acquisition and system validation activities.
Generally, this alternative canned-expertise approach is limited to domains governed by a set of well-structured, written rules, which because of the complexity of the problem, are difficult to apply correctly. This type of setting is common in the application of the law (Susskind, 1989), especially tax law, where both a hierarchy of rules involving substantial complexity and a corresponding set of extensive written interpretations frequently exist. Microcomputer-based expert systems may be quite attractive to tax professionals, therefore, because such applications allow them to solve tax problems more efficiently in the face of an increasingly complex practice environment caused by recurring changes in the tax law.

Accordingly, the purpose of this paper is to describe how we developed a microcomputer-based expert system using canned expertise to solve constructive stock ownership attribution problems. The resulting expert system, TaXpert, offers solutions to tax professionals who must answer constructive stock ownership questions under the rules of 60 sections of the Internal Revenue Code (I.R.C.). Tax professionals, who are the intended users of our expert system, are presumed to know which section of the I.R.C. is applicable to their tax question, to be aware of that section’s direct or indirect reference to constructive stock ownership, and to be capable of recognizing that the correct assessment of constructive stock ownership may have important implications for answering their tax question.

The remainder of this paper provides details of our methodology in developing TaXpert, especially the use of an alternative source of expertise to determine and implement the fundamental forms of constructive stock ownership. Conclusions about the advantages of developing microcomputer-based expert systems in this manner are also offered. Appended to the paper is a brief explanation of TaXpert’s rule domain (Appendix A) and a sample consultation (Appendix B).

**Development Methodology**

The following steps, adapted from the generalized methodology for expert systems development outlined by Ribar (1988), were used to extract knowledge from written authority (i.e., the canned expertise), and then to translate this knowledge into the rules of TaXpert:

1. Discover the fundamental forms of attribution.
2. Identify the potential factors in solving the fundamental forms of attribution problems.
3. Build a prototype for each fundamental form of attribution.
4. Test and refine the prototype by applying it to successively more complex levels of owner-entities relationships.

**Discovering the Fundamental Forms of Attribution**

Although the I.R.C. references attribution in several places, only a few sections contain specific rules for attribution. To identify the relevant I.R.C. sections, the LEXIS computerized legal data base available from Mead Data was queried. To help understand and interpret the I.R.C. sections identified by LEXIS, the related regulations and tax treatises such as Mertens (1988), Bittker and Eustice (1987), and the Bureau of National Affairs (1986) were obtained to study the appropriate material.

Our study of these canned expertise materials confirmed a general conclusion about tax

*Construcyive stock ownership involves the indirect (constructive instead of actual) ownership of corporate stock. Attribution of stock occurs when a related individual or entity is deemed to own it constructively. Within the I.R.C., these rules generally exist to keep taxpayers from circumventing the intent of a provision by dealing through related parties, including multitiered networks of owner-entity relationships.

**Typically, tax professionals have a working knowledge of the I.R.C. Certain tax professionals, however, because of their background and day-to-day task environment, specialize in certain areas of the tax law such as corporate tax. In essence, TaXpert is an expert system substitute for one type of specialist.
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