Expert Systems Catching on at the Navy Finance Center

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Abstract

This paper discusses the evolution of the Expert System Program at the Navy Finance Center from its conception to its successful establishment. The management decisions and actions leading to a successful pilot project in Former Spouse Survivor Benefit Plan Adjudication, the training of domain experts to create their own expert systems, creating an environment that will promote the success of expert systems technology, and a cost benefit analysis of an expert system project are covered. The objective of this paper is to show how easily expert system technology can be introduced into the culture of an organization.

INTRODUCTION

How do you introduce expert systems into an organization without spending a great deal of time and money for research, development, and prototyping? How do you measure the expert system benefits in tangible and intangible savings? The Navy Finance Center's Systems Department came up with a four step process that drastically cut start-up time while keeping costs to a bare minimum. Better yet, less than a year after introducing the expert systems concept here, the first system has already achieved proven productivity gains, improved the quality of employee work-life, and inspired twenty additional expert system projects.

STEP ONE: SELL THE IDEA

The Systems Department began promoting the concept of expert systems during the summer of 1988. At that time, there was no in-house expertise, no budget, and no program. A video training program on Artificial Intelligence (AI) applications was obtained, and shown to Navy Finance Center managers to give them an appreciation of what the technology could and could not do. During this training, the Director of the Retired Pay Department realized that he had a problem that was perfectly suited to expert system development. Adjudication of Former Spouse Survivor Benefit Plan (FSSBP) cases, one of his most complex functions, was entirely dependent on a single subject matter expert, and that person was becoming increasingly swamped with a backlog of cases. His critical need in this area and the ready adaptability of AI technology to this type of problem, raised expert systems development to a high-priority project. The Director of the Retired Pay Department became the "Champion" of the FSSBP development effort.

STEP TWO: TAKE A TEAM APPROACH

From the beginning, the development of an expert system to meet the needs of the Retired Pay Department was a team project, involving not only departments of the Navy Finance Center, but the Air Force Logistics Center in Dayton, Ohio as well. The Air Force Logistics Center Artificial Intelligence Program Office provided a copy of the M.I expert system shell and a two week Knowledge
With this background, development was started in November 1988, with a scheduled completion date of March 3, 1989. One programmer from the data base administration area was assigned part-time as a Knowledge Engineer (expert system developer/programmer) to work with the FSSBP expert (Domain Expert) in Retired Pay to develop this system. Development of the system followed a prototyping methodology. The Knowledge Engineer delivered a system in progress to the Domain Expert at the beginning of each prototyping session. The Domain Expert was able to test the system throughout the development and by the time the knowledge base was complete, felt confident that all rules had been accurately captured. The knowledge base was essentially complete by the end of January 1989. The remaining month was spent making the system user friendly, writing a user's manual, and developing a training program for the adjudication staff.

The FSSBP system was designed to determine the eligibility of a member or former spouse or both to elect former spouse coverage under the Survivor Benefits Plan. The system directs a clerk to send a form letter(s), explains how to update the member's Retired Pay account, and how to compute FSSBP deductions. The explanation for each ineligibility determination contains a reference to the paragraph of the base statute or amendment that applies to the case. A printed copy of each consultation is produced that serves as documentation of the decision and is kept in the member's case jacket.

The system went into production on 7 March 1989. The backlog in FSSBP had grown to 380 cases by this time, but within a month had been reduced to less than 50 cases. Response time to answer a former spouse inquiry dropped from over four months to less than four weeks. With the work being handled by clerical employees, the need to hire additional high graded Military Pay Specialists to work the cases was eliminated. The clerical employees are pleased to be working more complex and interesting cases and the Domain Expert is delighted to get rid of his backlog and be able to concentrate on very difficult cases.

STEP THREE: SHARE THE SUCCESS

As soon as the FSSBP expert system was put into production, on 7 March 1989 a series of system demonstration briefings were begun to reinforce management awareness of the value of this technology. These briefings were carefully choreographed and included presentation of the concept and development by the knowledge engineer, demonstration of the product by the domain expert, and a summary of the benefits by the Retired Pay Department Director. This cast was capable of answering all questions and provided three distinct viewpoints of expert system usage. Based on the encouraging results, demand for this technology in other parts of the command became overwhelming. The Systems department staffed an Expert Systems Group, procured a site license for the M.I expert system shell, and brought in an instructor from the Air Force Logistics Command to train analysts and programmers (including the FSSBP Domain Expert) from all Navy Finance Center departments. New proposals for expert system development are coming in rapidly enough to ensure new projects are continuously available.

The following benefits were publicized to both management and staff in a series of briefings, group discussions and employee newspaper articles. The system produced saved operational costs, avoided future operational costs and had numerous intangible benefits. The backlog was reduced and the response time to answer a former spouse inquiry dropped to less than four weeks. The FSSBP system ensured that legal requirements were met and were
consistently applied. The clerical employees learned additional skills, such as reading legal documents, worked more complex and interesting cases and had increased job satisfaction. This was the first PC based application for the clerks. The PC user interface is much more friendly than the mainframe interface and nearly all of the clerks were eager to begin using the PC. The system shifted the work from the expert to clerical employees thus eliminating the need to hire, train, and develop another "Expert". The Domain Expert is now able to take vacations and not work on Saturdays. The risk of him being unavailable is reduced. The Expert could now work on the extremely complex cases and other parts of the FSSBP Expert System Project. A planned enhancement to the system is to handle the adjudication of election changes, in addition to determining election eligibility. The Domain Expert has now assumed the duties of maintaining the FSSBP Expert System and in his spare time is developing a new expert system to help compute Social Security Offsets.

STEP FOUR: SHARE THE TECHNOLOGY

Sharing the success of the first expert system project led to a large demand for expert systems by operational management. To satisfy this demand, an instructor from the Air Force Logistics Command AI Program Office was brought in and a two week long in-house training course in knowledge engineering and M.I programming was provided to twenty functional user personnel. Each of the trainees was required to bring a project to class that would benefit the operations of the Navy Finance Center. The projects ranged from five day efforts to two month projects. In an effort to provide the new knowledge engineers with an environment in which they could succeed, a technical support team was formed in the systems department. However, most knowledge engineers were able to bring up their systems with minimal technical assistance.

Expert Systems in Production:
*Deceased Account Settlement -- Assist clerical personnel in closing a deceased Navy member's payroll account.

*LAN Troubleshooting -- Help technical person determine the cause of LAN failure.

*Zenith-24B Hardware Diagnostics -- Aid end user to diagnose PC problems.

*Successor Check adjudication -- Lead clerical personnel through process of determining when to send out a new check for one that has been reported lost.

*Dual Compensation Determination -- Determine when a retired Navy member who is working is exempt from dual compensation and pay cap deductions.

A month after completion of the class, an Expert Systems Users Group was formed at NAVFINCEN. The group is open to knowledge engineers, domain experts, and interested management. The goals of the group are to share the successes, transfer procedural and technical information, and lead the development of Expert System Quality Standards. Each expert system completed at NAVFINCEN gets demonstrated at a users group meeting. This ensures that the knowledge engineers know what is going on with expert systems and aids them in the selection, development, and design of new systems.

THE BOTTOM LINE

Former Spouse Survivor Benefit Plan Cost Benefit Analysis:

DEVELOPMENT COSTS:
1 Knowledge Engineer (4 months half-time) .......... $7,230
1 Domain Expert (4 months half-time) .......... $5,453
1 Site license for the Expert System Shell .......... $5,000
TOTAL COSTS .................................. $17,683
BENEFITS: (annual)
Reduction in need for overtime... $2,800
Elimination of need to hire two Military Pay Specialists... $56,086
TOTAL..........................$58,886

SAVINGS:
YEAR 1 ($58,886-$17683)........$41,203
CONTINUING ANNUAL SAVINGS........$58,886

TANGIBLE BENEFITS:
1) Reduction of backlog from 380 cases to less than 40 cases.
2) Improvement in turn-around time from over 4 months to two weeks or less.
3) Audit trail, due to print out of consultation.

INTANGIBLE BENEFITS:
1) Risk reduction. If the only expert becomes unavailable, processing can continue.
2) Consistent application of Former Spouse Survivor Benefit Plan laws.
3) Improved job satisfaction for both the Military Pay Specialist and Adjudicators.
4) More Timely Management Information on Backlogs
5) Additional Information -- Case Status
6) Legal Requirements Standardized
7) Processing Standardized
8) Image improved with Customers

Note: The savings for the first year would be higher if the cost of the M.AI software were amortized over many projects, rather than included in the cost of this first project.

CONCLUSIONS

The keys to success in the Navy Finance Center's expert system program are management awareness, project selection, and project team composition. The video training was enough to convince NAVFINCEN management of the potential benefits of expert systems but a project champion must be courted from the upper management of the users organization. The "Champion" is capable of convincing end user management of the benefits of the new technology. His voice is much more convincing than a technician's. User and expert system management then chose projects that were suitable, feasible and stood a good chance of becoming successful expert systems. Project teams consist of two or three people, a Knowledge Engineer and one or two Domain Experts. Project teams worked together in prototyping sessions and knowledge acquisition sessions. This makes projects easy to manage and ensures that expert system development rather than project management is the primary project team activity.