Lessons Learned in the Development and Implementation of a Bilingual Nationally Accessible Knowledge-Based System

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Abstract. The lessons learned in the development and implementation of a knowledge-based system at Revenue Canada are presented. Numerous development decisions were made including determining how to capture and represent a large set of complex rules and selecting the appropriate system development methodology. In addition, many technical challenges were overcome such as providing a fully bilingual system, and storing incomplete waiver determinations. This paper will discuss these issues and their resolution. The paper concludes with the characteristics of a successful knowledge-based project based on the experiences of Revenue Canada.

1 Introduction

The Waiver on Withholding System (WOW) assists officers in Revenue Canada’s fifty-two Tax Service Offices (TSOs) in determining whether a waiver of withholding taxes should be granted. The Canadian Income Tax Act requires a withholding of tax from certain amounts paid to non-residents of Canada in respect of services rendered in Canada or to certain residents of Canada working abroad. If, however, a client can adequately demonstrate that the withholding taxes normally required are in excess of their ultimate Canadian tax liability, the Department may reduce the withholding tax accordingly [3].
WOW is the second component of the International Tax Advisory System (ITAS). The Residency Determination Advisor (RDA)\(^2\) is the first component of ITAS and is also the first knowledge-based system developed by Revenue Canada for use nationally. RDA assists with the determination of residency for tax purposes. Prior to the implementation of RDA, residency determinations could take anywhere from forty-five minutes to three hours. Using RDA, employees were able to reduce the time required to make residency determinations to an average of seven minutes [6].

The WOW project began in the Fall of 1993. The Systems Development Methodology employed was DMR Productivity Plus (P+). The Opportunity Evaluation phase analyzed the suitability of using knowledge-based technology and outlined the scope of the project. This phase was completed in February 1994 and resulted in the recommendation that development using knowledge-based technology proceed.

The Preliminary Analysis phase was completed in May 1994. Version I of WOW was delivered nationally in March of 1996. Version I utilized Virtual Storage Access Method (VSAM) files for storage. Version II was implemented in May 1997 and utilizes a DB2 Version 4.0 Database for enhanced search and retrieval capabilities.

Both versions of WOW were developed using Platinum's Aion Development System (AionDS). AionDS is an object-oriented knowledge-based system development tool. Application development took place using AionDS version 6.40 on a PC running Windows 3.1. The application was then ported to the mainframe. Production access to WOW is through the Customer Information Control System (CICS) Version 4.1.0 to AionDS Version 6.50 on a Multiple Virtual System (MVS) IBM mainframe platform.

WOW was developed as a joint partnership between the system development team and the user development team. The system development team consisted of a project leader/knowledge engineer, a knowledge base programmer, and a database designer. The user development team consisted of a functional project manager/domain expert, a full-time domain expert, and additional domain experts from across the country.

The benefits of the WOW System are:
- provides accurate, consistent and timely waiver determinations;
- distributes specific knowledge to all Tax Service Offices;
- accurately tracks waiver determinations on a national basis;
- ensures compliance with the Canadian Income Tax Act; and
- assists in the training of new officers.

\(^2\) Received the Federal Government Gold Medal Award in 1994 in the category of Renewing Services and Program Delivery as voted on by a panel of government and industry representatives [6].