

MethoDex :

A Methodology for Expert Systems Development

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Abstract:

A framework that can help users, experts and data processing personnel to be effectively involved in the development of Expert Systems is proposed and discussed. The approach taken is to evaluate the two most basic approaches used in industry today, namely, the usage of a standard methodology (SDLC) which is also used for the development of general business systems, and the well-known Knowledge Engineering Cycle approach. The proposed methodology for Expert Systems development (MethoDex) is designed to consist of a three-layered framework: activities, procedures and resources. MethoDex has been developed within a life assurance industry environment (Liberty Life Association of Africa Limited) and has already proved itself as a valuable framework for the successful development of Expert Systems within a commercial environment.

1 Introduction

It is a fact that today Expert Systems (ESs) is a fast growing and developing information technology. The programming of knowledge to create commercial applications has been made feasible with the introduction of many types of knowledge representation tools, of which the "Shell" is probably the best known. A major reason for the acceptance of this technology can be attributed to the relative ease of use that the early commercial "Shells" exhibited and their non-procedural way of representing knowledge, mostly in terms of rules. Examples are VpExpert, Level5, Exsys and Personal Consultant Plus.

Early identified knowledge representation schemes (such as rules) proved to be not functional for all types of knowledge problems ¹. This fact, combined with the realization that the building of ESs is moving out of the AI Labs into the normal corporate systems development areas, ² have led to systems development and management problems ³.

There are many references to the development and management of ESs, but they are either specific to a particular Expert System (ES) application ⁴ or simply address the Knowledge Engineering design and development life cycle ⁵. In most

cases these references include the advocating of prototyping ⁶ and in many others a strong procedural approach ⁷ is adopted. However, very little reference to a general systems development life cycle of an "Expert System", or knowledge-based application, exists. This fact highlights the current nature of the project management of ESs and adds to the confusion and difficulty in the practical implementation thereof. Without a clear view and guidelines of how to manage and develop ESs, this predicament will continue, much to the detriment of the acceptance and growth of this technology.

The building of an ES has many facets, of which the engineering of knowledge is one. In principle the KE Cycle model ⁵ is used as a guideline to the Knowledge Engineering process (the analysis, design, development and testing of knowledge or expertise). Knowledge Engineering can be done in many ways and is in many instances dependent on the complexity of the expertise to be represented. To represent expertise, the KE Cycle can be used successfully. In this instance the Knowledge Engineering process is based specifically on a prototyping process model as opposed to a function or data process model ⁸.

However, to base the overall methodology for development of an ES, from ES inception to ES maintenance, on the KE cycle or KE cycle in combination with the above-mentioned process models, is incomplete. It does not provide a comprehensive solution to the problems and complexities involved in the development of ESs. The first main reason for this is that certain specific activities that mark the formal initiation and finalization of a project are disregarded. The second main reason is that the KE cycle model assumes abstraction as the project development progresses. It is applied in the same way on the macro and micro level for activities and tasks. For example, Analysis (Identification and Conceptualization in the KE cycle) can imply analysis of:

- a) a single expertise entity (a fact or object),
- b) knowledge (eg. a rule) or even knowledge base structuring, or
- c) the total project from a management and Knowledge Engineering point of view.

Procedures in this approach thus do not refer to a series of specific steps and can over emphasize the abstract concepts inherent in the KE cycle.

The use of a conventional Systems Development Life Cycle (SDLC) approach for the development of ESs, also has shortcomings. The main shortcoming is that in a conventional SDLC the underlying basis is the programming of procedures; in an ES the underlying basis is the programming of knowledge.

This situation account for many ES project management problems. Management has to manage an ES project using a combination of the above approaches. This is the basis for the methodology *Methodex* as proposed later in this paper.

2 DESIRED COMPONENTS IN THE EXPERT SYSTEMS DEVELOPMENT LIFE CYCLE.

Based on the Knowledge Engineering model and using a bottom up approach, the authors identified the following primitives needed in the ESs development life cycle:

1. The KE cycle, which is based on a prototyping process model, used to produce