

Exploring Synergies Between Knowledge Management and Case-Based Reasoning

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The state-of-the art in Knowledge Management (KM) is essentially that of Information Management. That is, most KM vendors and users are actually storing and accessing information, not managing or automating knowledge.

Knowledge is information transformed into capabilities for effective action. In effect, knowledge is action. – Philip C. Murray Editor-in-Chief, KM Briefs and KM Metazine

For our purposes, we distinguish between knowledge and information precisely as traditional AI distinguishes between procedural and declarative knowledge. In LISP, for example, a list can be both a data structure and program. It is the fact that LISP can evaluate a program data structure that makes an S expression procedural knowledge.

Knowledge is information that is executable in some automation (i.e., a knowledge-based system!). There is little point in calling information that can never in and of itself be executed “knowledge.” Accordingly, the fact that a dog is a mammal is information and only in some vacuous sense “knowledge.” Returning to Knowledge Management, the KM industry today is primarily concerned with storing business information. Information such as business policies, practices, trade secrets, products, service incidents and histories, competitive intelligence, patent portfolios is primarily stored in document management systems or relational databases. Most KM applications provide access to business information but do not execute information found in text or relational data repositories.

Beginning with customer support and field service, KM vendors began to codify certain kinds of knowledge in proprietary repositories (some of which are now relational databases). We call this information knowledge because the vendors also provide automation which interprets it, much like LISP can interpret list data structures as executable S expressions.

Concurrently, a number of “knowledge-based” (i.e., expert) systems were developed to provided sales decision support (i.e., sales automation) in various industries. As with the service applications, these sales automation systems execute knowledge stored in

databases.

Today, service and sales automation have merged into the Customer Relationship Management (CRM) industry. Although Knowledge Management as a whole does not focus on any particular industry, neither does KM focus on any particular business function. CRM on the other hand is clearly focused on the business functions of sales and support. Perhaps this focus explains why CRM is actually furthest along in implementing Knowledge Management. Unlike general KM, CRM is concerned with well-identified knowledge: marketing and engineering knowledge about selling and supporting product and service offerings. Parenthetically, the financial services industry is furthest ahead among industries (as opposed to business function as in CRM) with regard to Knowledge Management for similar reasons. Companies involved in credit and insurance are rife with identifiable business policies and practices and business rules vendors address this need with inference engines and, increasingly, rule authoring and management tools.

Of course, the leading CRM applications are case-based. By case-based we mean that they include case-retrieval and reasoning. Specifically, they reason using rules, albeit very simple rules in most cases. CRM vendors demonstrate the relevance of case-based reasoning (CBR) to KM by providing tools to manage files, documents, or records as cases in a database and knowledge about those cases (i.e., rules) that are automated by their rule engines in embedded applications, interactive decision support systems, or dynamic, promotional and self-service web sites.

In addition to CRM vendors, business rule vendors are also demonstrating their significance to Knowledge Management. The remaining question is what relevance does Knowledge Management have to CBR or what synergy can KM offer to CBR investigators? In our opinion, KM is CBR's best opportunity for demonstrating its potential value to business. Of course, there is no greater source of funding than commercial funding, although it does have its intellectual property limitations!

Given that the state-of-the-art in KM is Information Management (aside from CRM and Business Rules),

CBR is the best fit for incrementally improving the return on investment that business receives from KM. KM is completely synergistic with the indexing and retrieval technologies of CBR given its emphasis on storage of and access to information. KM is even synergistic with the machine learning capabilities that are being used and developed within the CBR community. Consider that data mining is frequently considered along with or as part of a company's knowledge management strategy.

CBR is also the best gentle introduction for turning Information Managers into Knowledge Engineers. CBR allows one to start with information storage and access and gradually develop comfort and competence with knowledge and reasoning technologies.

Aside from substantial opportunity, KM offers CBR daunting technical challenges. For example, since most managed knowledge consists of text, what knowledge can be extracted or induced from it? The sheer volume of business information characterized as knowledge raises significant issues for scalability, efficiency, architecture, reliability, and fault tolerance at the interaction of automation with repository. The sources of business knowledge that is to be managed are rarely programmers. Consequently, business knowledge expressed as rules is not organized procedurally. Furthermore, any collection of rules (including those used in CBRreasoning) will be incomplete and will probably include contradictions. All these and other realities stretch if not break the state-of-the-art in CBR.

These challenges explain why the commercial products that implement CBR for KM in CRM seem so limited and simple. Anything more complicated risks being inaccessible to its user community or impractical in its implementation.

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Biography: Paul Haley is the only entrepreneurial technologist who has been committed to developing commercial AI applications since before the emergence of the AI industry in the early eighties. He taught NASA engineers the rule-based language subsequently implemented in CLIPS. He developed and delivered DEC's renowned AI video training program. As Chief Scientist at Inference Corporation, Paul managed the development of and implementation of the Automated Reasoning Tool (ART). Currently Paul is president of The Haley Enterprise, a recognized leader in commercializing knowledge management and automation technology using rule- and case-based reasoning software. Products from The Haley Enterprise are embedded in a variety of commercial software packages and Web applications by many of the world's largest companies.