Towards a Knowledge-Aware Office Environment

Leslie Carr, Timothy Miles-Board, Gary Wills,
Arouna Woukeu, and Wendy Hall

Intelligence, Agents, Multimedia Group, University of Southampton, UK
{lac,tmb,gbw,aw1,wh}@ecs.soton.ac.uk

We report the latest efforts of the Writing in the Context of Knowledge (WiCK) project[1] in investigating the use of Semantic Web technologies in a business-type environment, where authors create and re-use knowledge-rich documents. To date, we have integrated an established commercial off-the-shelf office production environment with knowledge Web services to assist authors in carrying out tasks in a business writing scenario.

Scenario The task of writing a funding proposal is common in industrial and commercial environments; here, we consider a hypothetical funding proposal for a research project in an academic environment. The proposal is directed at the UK's Engineering and Physical Sciences Research Council (EPSRC), which has a well-defined procedure for submitting, reviewing, and selecting proposals for funding, and provides a standard form (the Je-SRP1) and comprehensive guidance notes on how to fill out the form, create the supplementary documentation (Case for Support), and submit it for consideration.

In order to properly model the Je-SRP1 form and Case for Support documents and the knowledge they contain, we define the following ontologies: *Research Ontology* stakeholders and activities participating in research — the researchers, their publications, research interests, conferences and journals; *Project Ontology* the activity of undertaking work — the ideas of work package, budget, personnel, milestones *etc.*; *Proposal Ontology* the objectives, beneficiaries, funding call, programme of activity *etc.*; *Subject Ontology* the area in which we wish to conduct research, the problems that we wish to address and the methods, systems and approaches which have been described in the literature.

Approach Filling in the Je-SRP1 form is mainly a matter of choosing appropriate instances against the above ontologies from the knowledge-base. Creating the Case for Support document is more involved, however, as the author is required to construct a text, rather than enter data into clearly labelled spaces on a form. However the guidance notes indicate very clearly the kind of information that is expected in each part of the document. For example, *Provide a summary of the results and conclusions of recent work in the technological/scientific area which is covered by the research proposal...*: a simple query of the knowledge-base would provide a list of potentially relevant papers, but a more advanced reasoning agent would be required in order to assist the author in evaluating their relative significance.

[1] http://wick.ecs.soton.ac.uk/

WiCKOffice Our development efforts to date have produced WiCKOffice, a Microsoft Office-based environment in which several services are available to authors. These services utilise knowledge managed by two knowledge-bases: the AKT Triplestore[2], which in this scenario provides a suitable Research ontology for our purposes, and a WiCK Triplestore which hosts the Project, Proposal, and Subject ontologies.

Knowledge Fill-In and *Knowledge Recall* services are motivated by the need to provide timely and convenient access to knowledge, which would otherwise have to be manually "looked up" on the institutional intranet. The Knowledge Fill-In service assists the author in filling in the Je-SRP1 form. For example, the author is able to specify the (partial) name of the Principal Investigator and instruct the service to retrieve appropriate instances from the knowledge-base and fill in all the related fields on the form.

The author interacts with the Knowledge Recall service through the Microsoft Smart Tag interface. Recognised terms from the knowledge-base are highlighted in the document as the author types; by clicking on a recognised term, the author can access associated 'actions'. Our custom WiCKOffice Smart Tag makes different actions available according the author's current position in the Case for Support document. For example, if the author types "Wendy Hall" in the *Previous Research* section, options to insert a "potted" summary or browse Wendy Hall's previous research history are shown; typing "Wendy Hall" in the *References* section enables Wendy Hall's most recent/relevant publications to be automatically identified and inserted without having to resort to a manual search.

A third service, the *In-Line Guidelines* service, assists the writing process itself by providing direct access to the EPSRC guidance notes via the Microsoft Office Assistant interface. Two further services are currently under development: an *Augmented Experience* service provides the author with access to the "institutional memory" of previous research proposals, thereby augmenting their experience of writing proposals; an *Assisted Writing* service attempts to assist the author in making higher-level decisions about relevant content to include in the proposal by suggesting appropriate instances from the Subject ontology (for example, relevant projects, papers, resources).

Conclusion In the context of a business writing scenario, WiCKOffice demonstrates that with a suitable set of ontologies and a supportive knowledge-aware environment, an author can be assisted in producing knowledge-rich documents. The knowledge-augmented document can then be intelligently processed in further ways, for example by the proposed Assisted Writing service. The completed documents are then used to update the knowledge-bases, asserting the new facts that the author has created.

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[2] `http://triplestore.aktors.org/`