Chapter 7
An Agile and Modular Approach for Developing Ontologies

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ABSTRACT
Ontologies are used to represent human knowledge in a machine-understandable format. Knowledge exists in all domains and the proper capture and utilization of the knowledge is very important. Many ontology engineering methodologies are available for the development of ontologies. However, they suffer from their heavy weight nature and make the development process tedious. In addition, the resulting ontologies are monolithic ontologies and are not easy to reuse. Therefore, an agile and modular method is proposed to develop ontologies. The ease of use of the method is tested by a group of 68 inexperienced ontology engineers who compare it with Ontology 101 by developing ontologies in the e-Government domain using both methods.

INTRODUCTION
With knowledge being considered as a key asset, knowledge management principles are now being adopted by many countries. Knowledge management research focuses on developing concepts, methods and tools to support human knowledge (Jurisdisca et al., 2004). With respect to this, ontologies have been developed in the field of computer science to be able to represent the human knowledge so that machines can be used to interpret this knowledge. Computer systems, which use this knowledge for decision making, can then be developed. Ontology is a term borrowed from philosophy where ontology means a doctrine about existence in which general foundations, principles of existence, its structure and laws are studied. Gruber (1999) defines ‘ontology’ as ‘a formal, explicit specification of a shared conceptualization’, and definitions in Gruberian spirit are
still accepted by most ontological engineers. This
definition is based on the idea of conceptualization i.e. a simplified version of the real world
that we want to represent. They provide a shared
and common understanding of a domain that can
be communicated across people and application
systems.

In these recent years, much work has been done
with regards to the development of ontologies for
e-Government (Salhofer et al., 2009; Hinkelmann
et al., 2010; Dombu et al., 2011). Different proj-
ects have been initiated in many countries and
e-Government ontologies have been developed.
However, small island developing states (SIDS)
still lag behind in this field, Mauritius being one
of them. In Mauritius, the field of Knowledge
Management and Engineering is still in its infancy
and the IT industry is more geared towards software
development. However, to cope with this situa-
tion, a module in ontology development is being
proposed in the IT curriculum at University of
Mauritius. However, while working on ontology
projects, it has been seen that final year students,
face a lot of difficulty when they are requested
to use ontology engineering methodologies or
ontology development methods like Ontology
Development 101. Some of the reasons were as
follows: the heavy-weight nature of the ontology
engineering methodologies, high learning curve
associated to the development methodologies and
the method and the reluctance of Domain Experts
to participate. Therefore, these problems motivated
the need for a new approach to the development of
ontologies and this is how the Agile and Modular
Method for Ontology Development (AMOD) was
developed. This method is based on two concepts
namely agile software development and ontology
modules.

Agile methodologies (Vijayasarathy & Turk,
2008) use iterative and incremental approach to
software development which is performed by a

traditional heavyweight software development
methodologies. They are particularly helpful
when requirements are not very well defined at
the beginning of the project. Through the differ-
ent iterations and releases, high quality software
which also meets the client’s requirements are
developed in a cost effective and timely manner.

Extreme Programming (Beck, 2000) is perhaps the
best known and most widely used agile method.
It takes an ‘extreme’ approach to iterative devel-

dopment. Here, the developer prioritizes what to
do first on the basis of client requirements. This
approach can be used to develop domain ontolo-
gies, whereby the Domain Expert becomes part
of the development team and with the Knowledge
Engineerboth embark on the development process.
The ontology is developed into phases based on
the different user stories.

The second concept is, modular ontologies,
which is inspired by software modules. Ontol-
ogy modularisation is the process of defining a
module which is the subset of the main ontology
(Doran, 2009). The aim of developing a module
is to make the ontology smaller so that it can be
used for a particular application. A large ontol-
ogy is not easy to understand and use and as such
the use of module simplifies the task of those
developing intelligent systems. Ontology modules
being smaller also promote re-use and increases
understandability. The concept of modules is used
in the proposed development ontology, with the
difference that instead of extracting modules, dif-
ferent modules are merged together to form the
final domain ontology. Each module is developed
bearing in mind the different applications that can
be developed using these ontologies.

These two concepts are investigated upon and
integrated together to produce a method for ontol-
yogy development as will be seen in the different
sections of this chapter. Up-to now, they have
been considered separately. We merge these two
concepts to develop the proposed method in this
chapter. The different steps of the method are
discussed in this chapter as well as the valida-