

Modeling and Simulation  
Body of Knowledge (BoK) Index  
Prototyping Effort Status Report

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Bill Waite, CMSP - The AEGIS Technologies Group

# Background

- Fall 2010 SIW paper discussed potential road ahead for the Index
- Index serves a set of pointers – not actual content
- Wiki approach recommended
- Proof of concept demonstration has been developed using wiki features within SharePoint

# Prototype Index Wiki Content (Lists)



**Topics**



**Lexicon  
(Vocabulary)**



**References**

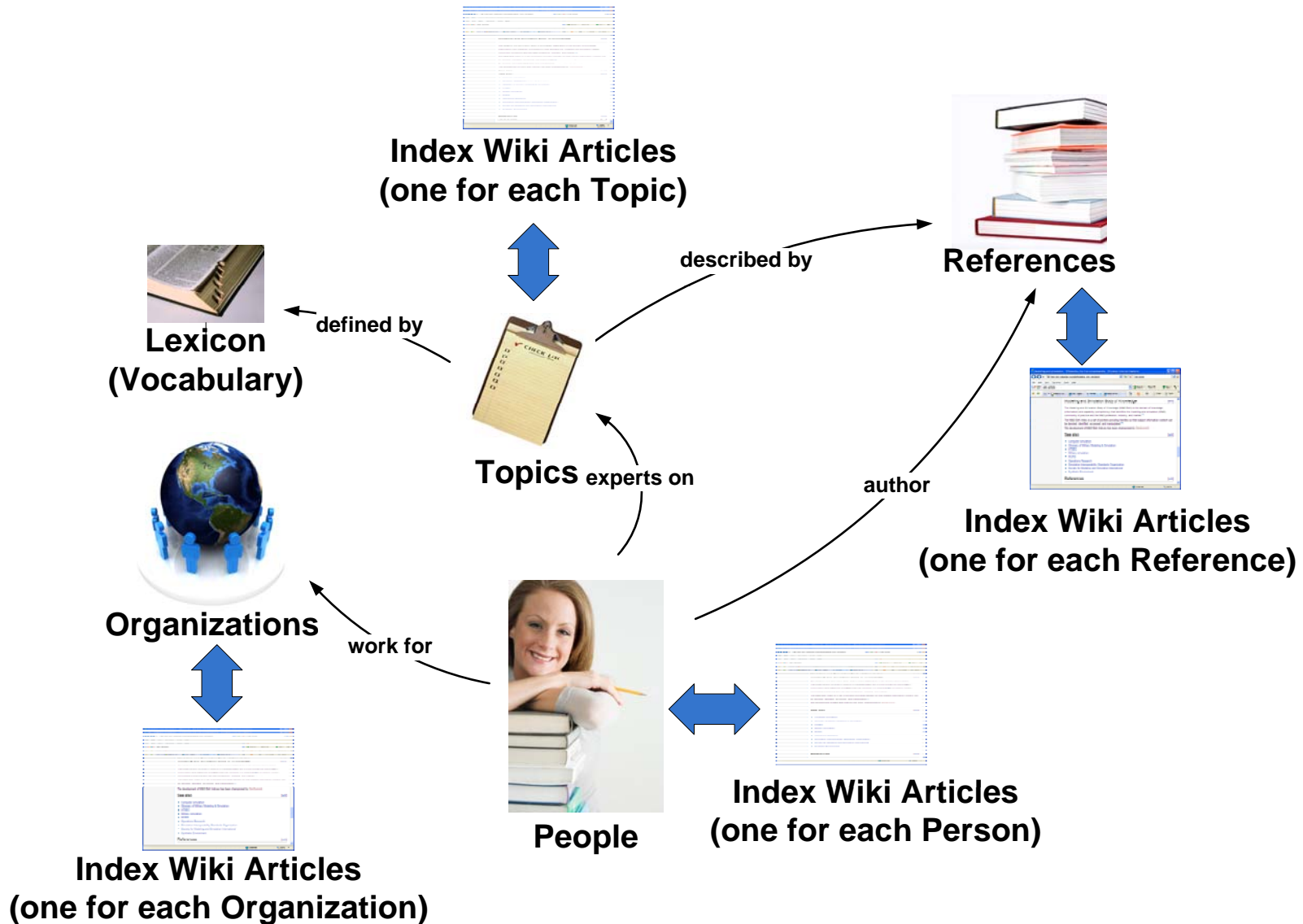


**People**



**Organizations**

# Relationships Between Information



# Prototype Index's Content

- Several lists from SimSummit BoK database
- Topics from CMSP Topic List provided by Dr. Mikel Petty
- Links prototyped for demonstration purposes

# Main Page

Body of Knowledge Project - Home - Windows Internet Explorer

https://bok.securespites.com/BoK%20Index%20Wiki%20Prototype/Home.iki

File Edit View Favorites Tools Help

Google Search More >> lacy

Body of Knowledge Project - Home

Body of Knowledge Project Welcome Lacy, Lee

Body of Knowledge Project This Site

Home Administration Sim-Summit BOK Sim-Summit Guidebook Publication Publications ProgramManagement Site Actions

Body of Knowledge Project > BoK Index Wiki Prototype > Home

Home Edit History Incoming Links

**Welcome to the Sim-Summit M&S BoK Index Wiki Prototype!**

You can add content to this page by clicking **Edit** at the top of this page, or you can learn more about wikis by clicking [How To Use This Wiki Library](#).

The Sim-Summit M&S BoK Index Wiki (SMSBIW) prototype demonstrates how concepts from the Sim-Summit M&S BoK database developed by Aegis Technologies can be presented using a wiki. As an index, the wiki contains links to actual content. The root level categories of index links in this wiki are:

- [Organizations/Sites](#)
- [People](#)
- [Perspectives](#)
- [References](#)
- [Topics \(exhaustive list\)](#)
- [CMSPTopics \(CMSP list\)](#)
- [Vocabulary](#)

Click on any of these hyperlinked items for more information.

Last modified at 8/18/2011 8:39 AM by Lacy, Lee

Done Internet 100%

# Organizations List Page

The screenshot shows a Windows Internet Explorer browser window displaying the 'Organizations' page of the Body of Knowledge Project. The browser's address bar shows the URL: <https://bok.securesites.com/BoK%20Index%20Wiki%20Prototype/Organizations>. The browser's search bar contains the text 'wiki article'. The browser's menu bar includes 'File', 'Edit', 'View', 'Favorites', 'Tools', and 'Help'. The browser's toolbar includes a search bar with the Google logo, a search button, and a 'More >>' link. The browser's status bar shows 'Done' and 'Internet'.

The website's header includes the 'Body of Knowledge Project' logo and the text 'Welcome Lacy, Lee'. The website's navigation menu includes 'Home', 'Administration', 'Sim-Summit BOK', 'Sim-Summit', 'Guidebook Publication', 'Publications', 'ProgramManagement', and 'Site Actions'. The website's breadcrumb trail is 'Body of Knowledge Project > BoK Index Wiki Prototype > Organizations'. The website's main content area is titled 'Organizations' and includes a sub-header 'Wiki Home > Organizations'. The main content area contains the text 'This list identifies M&S-related organizations:' and lists the following organizations:

- Corporations:
  - The Aegis Technologies Group, Inc.
  - Dynamics Research Corporation (DRC)
- Universities:
  - Virginia Tech
  - University of Combra
  - California State University, Chico
  - Georgia Tech
  - University of Central Florida (UCF)

The page also includes a sidebar with 'View All Site Content' and sections for 'Surveys', 'Documents', and 'Lists'. The 'Documents' section lists various documents, including 'Advisory Board Context Briefing', 'Guide Book', 'MSBOK Database', 'BOK Ref Library', 'General and Administrative (G&A)', 'Administrators Library', 'Document Drop Site', 'e-mail correspondence', and 'BoK Index Wiki Prototype'. The page footer shows 'Last modified at 1/31/2011 11:50 AM by Lacy, Lee'.

# Organization Wiki Page

The screenshot shows a Windows Internet Explorer browser window titled "Body of Knowledge Project - Aegis - Windows Internet Explorer". The address bar contains the URL "https://bok.securesites.com/BoK%20Index%20Wiki%20Prototype" and the search term "wiki article". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". A Google search bar is visible below the menu bar. The browser's address bar shows "Body of Knowledge Project - Aegis" and various navigation icons. The main content area displays the "Body of Knowledge Project" logo and a navigation menu with items: "Home", "Administration", "Sim-Summit BOK", "Sim-Summit", "Guidebook Publication", "Publications", "ProgramManagement", and "Site Actions". The page title is "Aegis" and the breadcrumb trail is "Body of Knowledge Project > BoK Index Wiki Prototype > Aegis". The page content includes a "Wiki Home > Organizations > Aegis" link, a heading "The AEGIS Technologies Group, Inc.", a paragraph describing the company, a website link "http://www.aegistg.com/", and a mention of "Bill Waite" as Chairman and Chief Technical Officer. The page was last modified on 1/31/2011 at 11:54 AM by Lacy, Lee. The browser's status bar shows "Done", "Internet", and "100%".

Body of Knowledge Project - Aegis - Windows Internet Explorer

https://bok.securesites.com/BoK%20Index%20Wiki%20Prototype

wiki article

File Edit View Favorites Tools Help

Google Search More >> llacy

Body of Knowledge Project - Aegis

Body of Knowledge Project

Welcome Lacy, Lee

Body of Knowledge Project

This Site

Home Administration Sim-Summit BOK Sim-Summit Guidebook Publication Publications ProgramManagement Site Actions

Body of Knowledge Project > BoK Index Wiki Prototype > Aegis

Aegis

Edit History Incoming Links

Wiki Home > Organizations > Aegis

**The AEGIS Technologies Group, Inc.**

AEGIS Technologies is a privately held small business headquartered in Huntsville, Alabama, USA, that provides advanced technology and expert consulting services to industries throughout the world. AEGIS specializes in modeling & simulation (M&S) and micro/nanoscale technology development. The company's M&S products and services include simulation software and training simulators; geospatial databases; 3D models; war fighter exercise support; systems engineering and analysis; verification, validation, and accreditation (VV&A); test and evaluation support; and HWIL simulation. AEGIS' Nanogenesis Division excels in advancing cutting edge micro and nanoscale technologies from concept to deployment with applications ranging from defense to energy to biotechnology.

Their website can be accessed at: <http://www.aegistg.com/>

Bill Waite is their Chairman and Chief Technical Officer

Last modified at 1/31/2011 11:54 AM by Lacy, Lee

Done Internet 100%



# People List Page

The screenshot shows a Windows Internet Explorer browser window titled "Body of Knowledge Project - People". The address bar displays the URL "https://bok.securespsites.com/Bok%20Index%". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". Below the menu bar is a Google search bar and a navigation bar with "Body of Knowledge Project - People" as the active page. The main content area shows the "Body of Knowledge Project" logo and a navigation menu with items like "Home", "Administration", "Sim-Summit BOK", "Sim-Summit", "Guidebook Publication", "Publications", and "ProgramManagement". The page title is "Body of Knowledge Project > BoK Index Wiki Prototype > People". The main heading is "People", and the sub-heading is "People involved in M&S include:". Below this, a list of people is displayed:

- First Last Email Work # Ext Cell #
- Larry Alexander
- Mokhtar Amalou mokhtar.amalou@sympatico.ca
- Vince Amico amico@cs.ucf.edu
- Dee Andrews
- William Andrews
- Susan Archer
- Mike Bailey baileymp@tecom.usmc.mil (703) 784-2653
- Fernando Barros

The browser's status bar at the bottom shows "Done", "Internet", and "100%".

# Person Wiki Page

The screenshot shows a Windows Internet Explorer browser window with the following details:

- Browser Title:** Body of Knowledge Project - Mikel Petty - Windows Internet Explorer
- Address Bar:** <https://bok.securespites.com/BoK%20Index%20Wiki%20Proto>
- Search Bar:** Google search bar with a search button and a dropdown menu.
- Navigation Bar:** Home, Administration, Sim-Summit BOK, Sim-Summit, Guidebook Publication, Publications, ProgramManagement, Site Actions.
- Breadcrumbs:** Body of Knowledge Project > BoK Index Wiki Prototype > Mikel Petty
- Page Title:** Mikel Petty
- Page Content:**
  - Home > People > Mikel Petty
  - Dr. Mikel Petty is the Director of the Center for Modeling, Simulation, and Analysis at the University of Alabama in Huntsville
  - He is a Research Professor for Computer Science and Industrial and Systems Engineering and Engineering Management
  - His address is:  
301 Sparkman Drive, Shelby Center 144  
Huntsville AL 35899
  - Email: [pettym@uah.edu](mailto:pettym@uah.edu)
  - Telephone: 256-824-4368
  - Web: <http://cmsa.uah.edu>
  - Last modified at 8/18/2011 9:06 AM by Lacy, Lee
- Left Sidebar:**
  - View All Site Content
  - Surveys**
    - March Webinar Survey
  - Documents**
    - Advisory Board Context Briefing
    - Guide Book
    - Guide Book Wiki
    - MSBOK Database
    - BOK Ref Library
    - General and Administrative (G&A)
    - Administrators Library
    - Document Drop Site
    - e-mail correspondence
    - BoK Index Wiki Prototype
- Page Actions:** Edit | History | Incoming Links

# References List Page

Body of Knowledge Project - References - Windows Internet Explorer

https://bok.securespsites.com/BoK%20Index%20Wiki%20Prototype

File Edit View Favorites Tools Help

Google Search

Body of Knowledge Project - References

Welcome Lacy, Lee

Body of Knowledge Project

This Site

Home Administration Sim-Summit BOK Sim-Summit Guidebook Publication Publications ProgramManagement Site Actions

Body of Knowledge Project > BoK Index Wiki Prototype > References

## References

Edit | History | Incoming Links

View All Site Content

### Surveys

- March Webinar Survey

### Documents

- Advisory Board Context Briefing
- Guide Book
- Guide Book Wiki
- MSBOK Database
- BOK Ref Library
- General and Administrative (G&A)
- Administrators Library
- Document Drop Site
- e-mail correspondence
- BoK Index Wiki Prototype

### Lists

- Announcements

Wiki Home > References

References are authoritative items that provide background on topics.

The current list of references in the wiki are:

- McLean, C.R. (2008) "A Taxonomy of Homeland Security Modeling, Simulation, and Training Standards"
- AFRL/HEA - Air Force Research Laboratory Mesa - Research Site Tech Demonstrations Videos and Mission Overview
- \_, Harvard business review on decision making
- \_, Proceedings of the Industrial & Business Simulation Symposium
- \_, Embedding Simulation Education into the Engineering Management Body of Knowledge
- \_, Tradeoffs
- \_, Harvard business review on strategies for growth
- \_, Simulation Interoperability Workshow
- \_, Harvard business review on measuring corporate performance
- \_, Object Oriented Simulation
- \_, Recommendations - DMSO Composable M&S Workshop
- \_, Navy's Task force EXEL - Navy/Marines News Story
- \_, International Conference on Grand Challenges for Modeling and Simulation
- \_, Modelling and Simulation: A Tool for the Next Millennium

Internet 100%

# Reference Wiki Page

The screenshot shows a Windows Internet Explorer browser window titled "Body of Knowledge Project - Mcle2008". The address bar contains the URL "https://bok.securespsites.com/BoK%20Index%20Wiki%20Prototype" and the search bar contains "wiki article". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". Below the menu bar is a Google search bar and a navigation bar with "Body of Knowledge Project - Mcle2008" and various icons. The main content area displays the "Body of Knowledge Project" header with a navigation menu: "Home", "Administration", "Sim-Summit BOK", "Sim-Summit", "Guidebook Publication", "Publications", "ProgramManagement", and "Site Actions". The page title is "Mcle2008" and the breadcrumb trail is "Body of Knowledge Project > BoK Index Wiki Prototype > Mcle2008". A left sidebar contains sections for "View All Site Content", "Surveys" (with "March Webinar Survey"), "Documents" (with "Advisory Board Context Briefing", "Guide Book", "Guide Book Wiki", "MSBOK Database", "BOK Ref Library", "General and Administrative (G&A)", "Administrators Library", "Document Drop Site", "e-mail correspondence", and "BoK Index Wiki Prototype"), and "Lists" (with "Announcements"). The main content area shows the article details for "Mcle2008":  
[Wiki Home](#) > [References](#) > [Mcle2008](#)  
Author(s): Charles R. McLean, et al  
Title: "A Taxonomy of Homeland..."  
Keywords: Security Modeling, taxonomy, classification,...  
Abstract: These applications can be used to evaluate vulnerabilities in the nation's critical infrastructure as well as engineer security systems to respond to those vulnerabilities. They can also be used to train participants in the National Incident Management System and ...  
Last modified at 1/31/2011 12:09 PM by Lacy, Lee  
The article title "Mcle2008" is highlighted in orange, and the "Edit", "History", and "Incoming Links" buttons are also highlighted in orange. The browser's status bar at the bottom shows "Done", "Internet", and "100%".

# Topics List (CMSP)

Body of Knowledge Project - CMSP Topics - Windows Internet Explorer

https://bok.securespites.com/BoK%20Index%20Wiki%20Prototype

File Edit View Favorites Tools Help

Google Search More >> lacy

Body of Knowledge Project - CMSP Topics

Welcome Lacy, Lee

Body of Knowledge Project This Site

Home Administration Sim-Summit BOK Sim-Summit Guidebook Publication Publications ProgramManagement Site Actions

Body of Knowledge Project > BoK Index Wiki Prototype > CMSP Topics

**CMSPTopics** Edit History Incoming Links

View All Site Content

**Surveys**

- March Webinar Survey

**Documents**

- Advisory Board Context Briefing
- Guide Book
- Guide Book Wiki
- MSBOK Database
- BOK Ref Library
- General and Administrative (G&A)
- Administrators Library
- Document Drop Site
- e-mail correspondence
- BoK Index Wiki Prototype

**Lists**

- Announcements

Wiki Home > CMSP Topics

Topic Index for the CMSP:

Adapted and extended from the SimSummit M&S Body of Knowledge Index

Author: [M. Petty](#)

Contributions: D. Gross, G. Reed, P. Rowe, W. Tucker, W. Waite

1. Concepts and context
  - 1.1 Fundamental terms and concepts
  - 1.2 Categories and paradigms
  - 1.3 History of M&S
2. Applications of M&S
  - 2.1 Training

Done Internet 100%

# Vocabulary List

The screenshot shows a Windows Internet Explorer browser window titled "Body of Knowledge Project - Vocabulary". The address bar contains the URL "https://bok.securesites.com/BoK%20Index%20Wiki%20Prototype/Vocabulary.aspx" and the search bar contains "wiki article". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". The page content includes a navigation menu with "Sim-Summit BOK", "Sim-Summit", "Guidebook Publication", "Publications", and "ProgramManagement". The breadcrumb trail is "Body of Knowledge Project > BoK Index Wiki Prototype > Vocabulary". The main heading is "Vocabulary", and a sub-link "Wiki Home > Vocabulary" is visible. The text states "The following terms are defined with authoritative definitions:" and lists three terms with their definitions:

"man in the loop" simulation	A class of simulation applications, usually associated with training applications, that require
(pseudo)-random number generator	any one of a number of available computer utility programs employed often within simulation number "seed," (2) are not actually random but meet appropriate tests
3-D	Three-dimensional, refers to the visual display that exhibits breadth, height and thickness or height and breadth

# Fall 2010 Presentation Backup Slides

# A Realistic Roadmap for Developing a Modeling and Simulation Body of Knowledge (BoK) Index

Lee W. Lacy, Ph.D., CMSP - DRC



David C. Gross, Ph.D., CMSP - Lockheed Martin

Tuncer Ören, Ph.D. - School of Information Technology and  
Engineering of the University of Ottawa

Bill Waite, CMSP - The AEGIS Technologies Group

September 22, 2010



# Presentation Outline

- Background
  - Body of Knowledge (BoK) Concept
  - BoK Indices
- Desired BoK Features
- Desired BoK Index Features
- Reality Check
- Proposed Approach
- Summary



# M&S BoK Concept

BoK = “structured knowledge that is used by members of a discipline to guide their practice or work” (Oren, 2006)

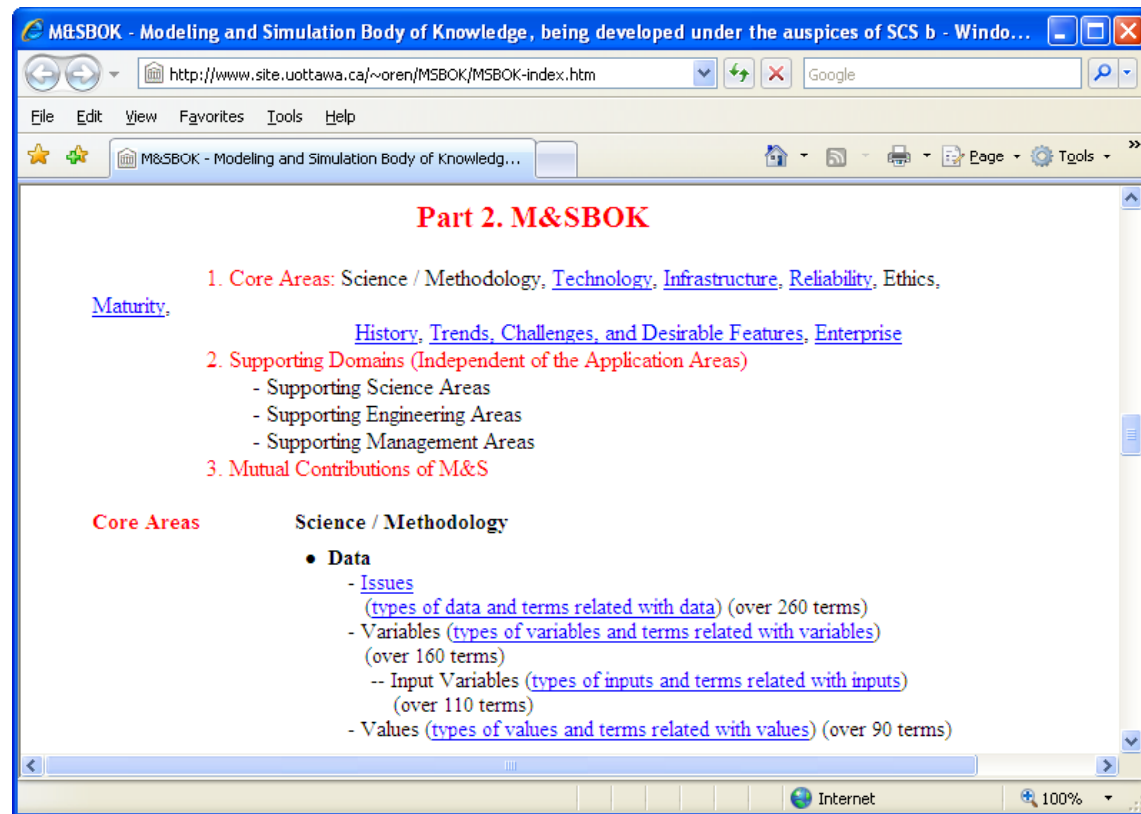
M&S BoK = “the domain of knowledge (information) and capability (competency) that serves to provide identity to the M&S community-of-practice...and subsequently the M&S profession, industry, and market” (Waite, 2004)

Motivation

# BoK Index / Indices

BoK Index = “a set of pointers providing ‘handles’ whereby the subject information content may be denoted, identified, accessed and manipulated.” (Waite, 2004)

Views of BoK  
supported by  
software  
applications



The screenshot shows a web browser window titled "M&SBOK - Modeling and Simulation Body of Knowledge, being developed under the auspices of SCS b - Windo...". The address bar shows the URL "http://www.site.uottawa.ca/~oren/MSBOK/MSBOK-index.htm". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". The page content is titled "Part 2. M&SBOK" and lists three main sections:

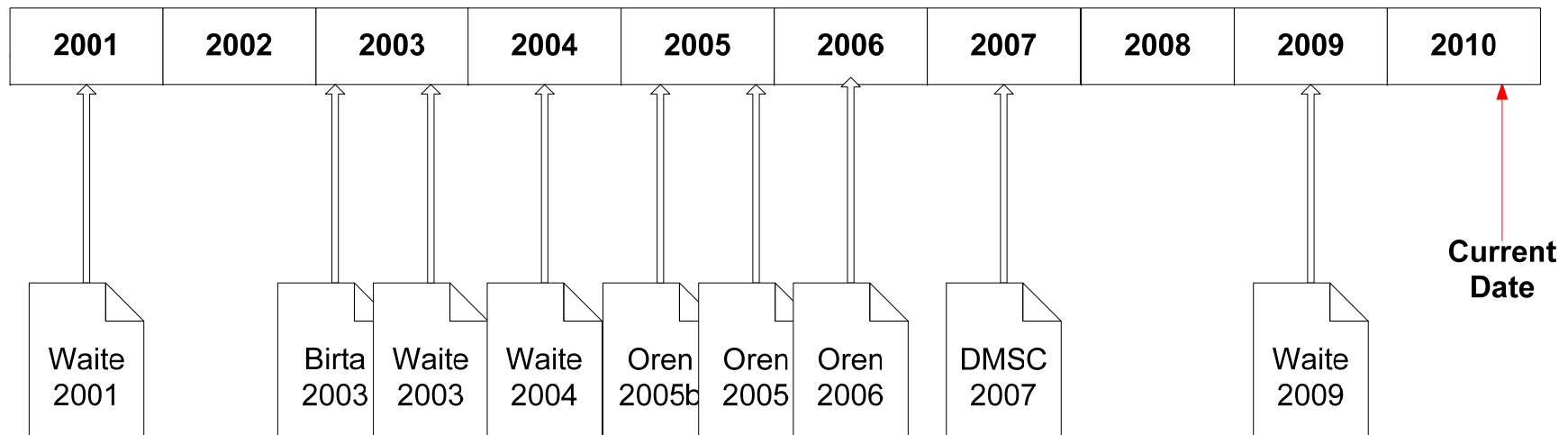
1. Core Areas: Science / Methodology, [Technology](#), [Infrastructure](#), [Reliability](#), Ethics, [Maturity](#), [History](#), [Trends](#), [Challenges](#), and [Desirable Features](#), [Enterprise](#)
2. Supporting Domains (Independent of the Application Areas)
  - Supporting Science Areas
  - Supporting Engineering Areas
  - Supporting Management Areas
3. Mutual Contributions of M&S

Under the heading "Core Areas", the "Science / Methodology" section is expanded to show a list of data-related terms:

- Data
  - [Issues](#) ([types of data and terms related with data](#)) (over 260 terms)
  - Variables ([types of variables and terms related with variables](#)) (over 160 terms)
    - Input Variables ([types of inputs and terms related with inputs](#)) (over 110 terms)
  - Values ([types of values and terms related with values](#)) (over 90 terms)

# Background

Rich heritage of earlier papers documenting M&S BoK ideas



# Desired BoK Features

- Authoritative, comprehensive, discriminative, and useful.
- Readily accessible, both physically and intellectually.
- Traceable to specific data, information, and knowledge artifacts.
- A “living” source of information that adapts to new developments in the discipline.
- Distinct from and clearly related to other relevant disciplines.
- Owned by a knowledgeable set of experts.
- Provide a “comprehensive and integrative view of the discipline”

# Desired BoK Index Features

- Supporting a variety of users within the M&S Community of Practice (CoP)
- Identifying and providing access to BoK topics/content
- Providing metadata management to support provenance of BoK content
- Providing configuration managed views to content that changes over time

# Reality Check

## •Content

- already exists in many BoKs
- isn't necessarily consistent
  - constantly changing [7].
  - development is expensive and time consuming.

## •User

- Vastly different user groups must be supported

## •Scope

- Modeling & Simulation domain is extensive

## •Organization

- Organization and functional point of views are different
- Multiple perspectives are recognized
- Everyone won't agree on the same organization of content.

## •Resources

- Limited resources
- No obvious source of funding.
- Activity should be “user driven, broadly collaborative, persistent, and productive”

# Waite (2003) Approach

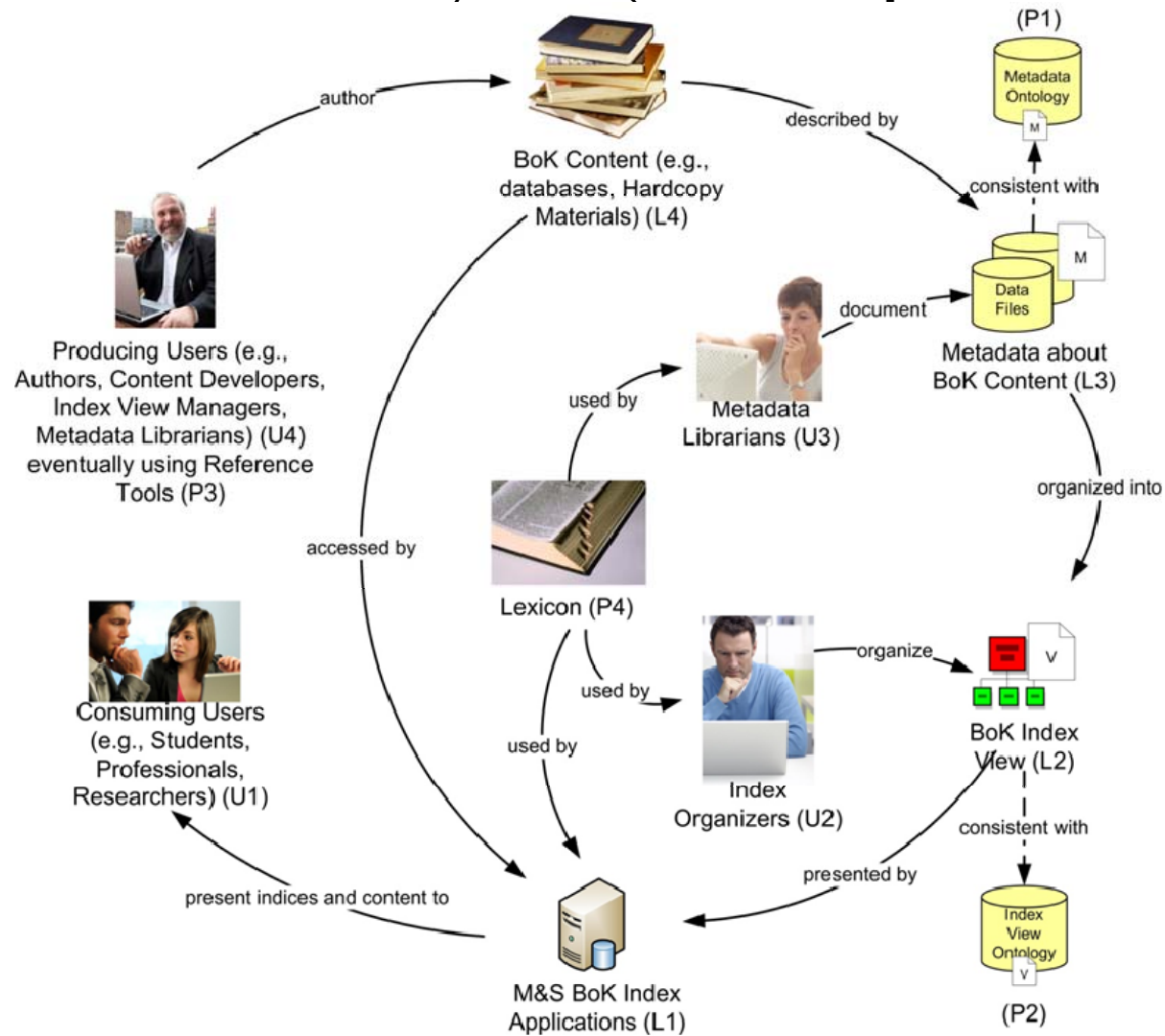
1. Identify users and uses
2. Create a conceptual model
3. Elicit requirements
4. Determine resources required/available
5. Identify objectives, goals, and metrics
6. Identify the Products to be developed
7. Identify Risks
8. Develop design and consider design constraints
9. Implement according to a schedule
10. Verify, Validate, and Accredite the results

# 1. Users

User Type	Tasks Performed
End Users	Access M&S BoK Index to find information
BoK Index Developers	Create and Maintain BoK Indices consistent with a perspective
Metadata Librarians	Identify and Harvest M&S BoK Information Artifacts
Content Developers	Create M&S BoK Information Artifacts



# 2. Content Lifecycle (Conceptual Model)



# 3. Requirements Categories

- User-related
- Workflow-related
- Content
- Operating Model

## 4. Resources

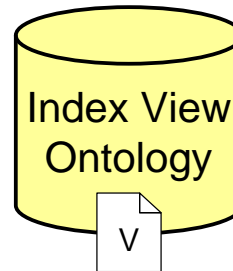
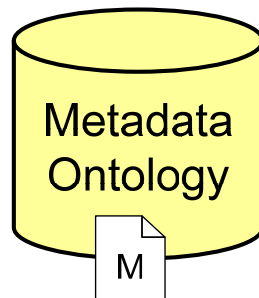
- Formal project basis unlikely
- Recommend maximum utilization of voluntary participation
- It isn't easy or free to successfully engage volunteers
- Volunteer efforts need to incentivize contributions in some manner
- Successful grass roots efforts have done this chiefly through peer recognition

## 5. Goals

- Impractical to specify time-related objectives due to lack of control over funding
- Realistic timeline might involve three phases: Crawl (calendar year 2011), Walk (2012), and Run (2013+).
- Small team to develop and deploy the “crawl” products as quickly as possible
- Expand the involvement basis by exposing it to many subject matter experts and inviting their contributions.

## 6. Products

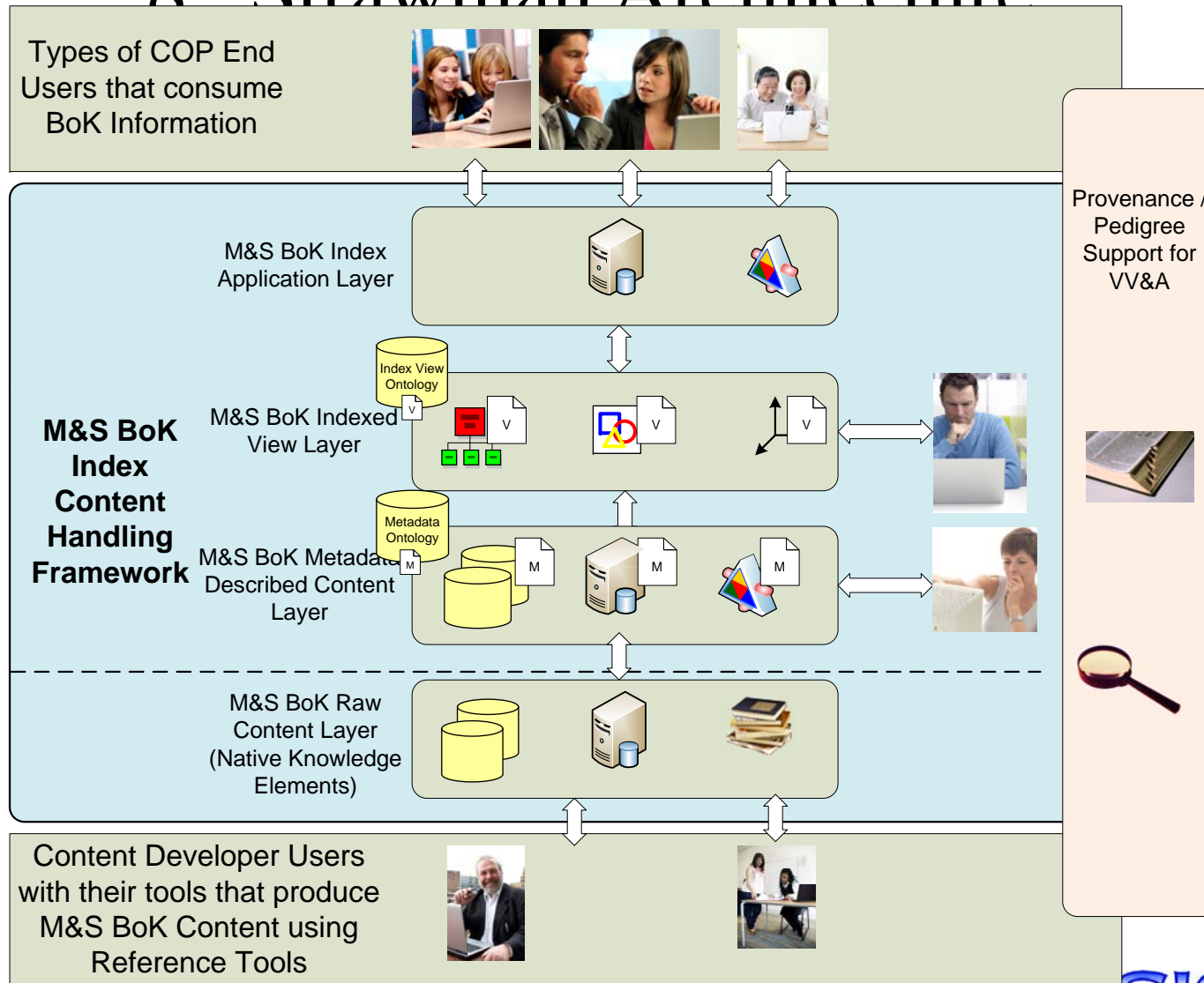
Product	Description	Phase
Metadata Ontology	Describes information used to describe BoK information artifacts	Crawl
Index View Ontology	Describes views of the actual BoK information artifacts.	Crawl
Reference tools	Tools to manipulate the information artifacts.	Run
Lexicon	The terms and their definitions used in the field, built per good lexicographer practice (i.e., from use not theory)	Walk



# 7. Risk Identification and Mitigation

Risk	Mitigation
Volunteer labor doesn't materialize	Utilize small team to field initial product and open prototypes to criticism.
Lack of Adoption	Seek buy-in to concept from stakeholders and hold accountable. Treat CMSP revision as first adopter.
Late to market: CMSP Revision Adopted before 1 <sup>st</sup> M&S BoK Index	Resolve this "chicken and egg" problem by ensuring direct correspondence between 1 <sup>st</sup> M&S BoK and CMSP Revision, whichever comes first.

# 8 Strawman Architecture



# 9. Implementation Plan / Roadmap

- Focus “why?”
- Audience “who?”
- Policies and Procedures
- Supporting Lexicon
- Developers “how?”
- Referenced Content “what?”
- Content Maturity
- Information Technology Infrastructure
- Validation
- Governance
- Metadata Records
- Index Views

# Summary

- BoK Content Exists
- BoK Indices Needed supported by a software application
- Should support multiple views
- Process has been documented and begun
- Strawman architecture for supporting IT applications has been proposed
- Iterative refinement and continued volunteer support required