Ontology in Knowledge Management and Decision Support (OKMDS)

Making Better Strategic Decisions,

by Asking If It Is Going To Get Better or Worse
- the SOFI Method
and the System to Implement it

13-Dec-2007

TedGordon, PeterYim, AdamCheyer, DeniseBedford, PatCassidy, KenBaclawski, DuaneNickull & JerryGlenn

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Abstract

- Simply ask "If It Is Going To Get Better or Worse", and then just go with the decision that would get things better for us! This almost seems intuitively obvious ... until we delve seriously into the issue, and start wondering ...

  - *what are the pertinent factors that would affect whether it is going to get better or worse?*

  - *are these factors independent of one another?*

  - *how far back should we look? how far out should we project?*

  - *"better or worse" for whom, anyway?*

  - *how can we even reach these people?*

  - *who should we ask? ... the experts? or ask as many people as we can?*

  - *do we have data? enough? ... how much is enough anyway?*

  - *how about "too much data" into too many formats - how can we handle these massive amount of data? ... numeric, linguistic, multimedia, structured, unstructured, ...*

  - *are the inputs or answers binary? deterministic? stochastic?*

  - *... the list of questions go on and on.*

- ... This team is on the R&D to cast the SOFI work into a collaborative open knowledge system that brings to bear some of the best legacies passed on to us, as well as state-of-the-art approaches in information management and technology, knowledge management, quantitative analysis, qualitative analysis, service oriented architecture, web 2.0, Delphi, as well as semantic technologies. The use of ontologies and ontological engineering will be central to their approach in the next phase of the work, that will enable their tapping into virtual communities and disparate systems to come up with the collective intelligence to provide strategic decision support.

- see: http://ontolog.cim3.net/cgi-bin/wiki.pl?ConferenceCall_2007_12_13#nid15SG

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Outline

- Introduction

- Futures Research, Normative Futures, Delphi & SOFI

- Core Concepts, Values & the SOFI System Mission

- Phase-1 SOFI System implementation

- Driving the Next Phase with ontology engineering:

  - Quantitative Decision Support

  - toward semantic interoperability through a foundational ontology

  - a collaborative knowledge environment

- Architecting a co-evolving human-machine system for collective intelligence

- Making Better Strategic Decisions – applications, scenarios and the potentials of a SOFI system

- Q & A – discussion

Introducing our Panel & Contributors *

- **TedGordon (MP/WFUNA),**

- **AdamCheyer (SRI),**

- **DeniseBedford (WorldBank),**

- **PatCassidy (MICRA)**

- **KenBaclawski (Northeastern U.),**

- **DuaneNickull (OASIS, UN/CEFACT, Adobe),**

- **JerryGlenn (MP/WFUNA) &**

- **PeterYim (Ontolog, CIM3)**

* *This is an open collaborative effort. All contributors are acting on their own individual capacities. Affiliations stated above are for identification purposes only.*

The Millennium Project – MP / WFUNA

- The Millennium Project of WFUNA is ...

  - a global participatory futures research think tank of futurists, scholars, business planners, and policy makers who work for international organizations, governments, corporations, NGOs, and universities ... its operation started in 1996 after 3 years of feasibility study

  - operating as a network of ~30 globally located nodes

  - under the auspices of the World Federation of United Nations Associations (WFUNA)

  - with contribution in both content and methodology
    - has been publishing the "State of the Future" report (in a variety of languages), annually since 1997
    - "Futures Research Methodologies" 1999 & 2003
    - numerous special studies & project ... *of which SOFI is one*

- *MP/WFUNA should not be confused with the UN/Millennium Project - 2002~2006, headed by Jeffery Sachs, which was commissioned to develop a concrete action plan for the world to achieve the Millennium Development Goals (MDG).*

Millennium Project Nodes...

are groups of individuals and institutions that connect global and local views in:

The Millennium Project

Helsinki
Montréal/Kingston   London   Berlin
                     Paris   Moscow
                               Prague
Silicon Valley   Washington, DC   Rome   Baku   Seoul
                                    Tel Aviv   Tehran   Tokyo
Mexico City   Cairo   Istanbul   Beijing
                        Kuwait   New Delhi
                                  Madurai
Caracas   Cyber Node

Lima
        Sao Paulo
Santiago
        Buenos Aires   Johannesburg   Brisbane/
                                        Sydney

Nodes identify participants, translate questionnaires and reports, and conduct interviews, special research, workshops, symposiums, and advanced training.

State of the Future Index – SOFI

- The State of the Future Index (SOFI) is a quantitative time series that indicates the changing state of the future and shows whether conditions promise to get better or worse.

- Originally proposed by Ted Gordon and implemented as a Lotus spreadsheet

- description of the method and its first applications in the State of the Future 2001 where a "World SOFI" was published

- To date, besides an annual World SOFI, the Index is also being compiled by countries like Turkey, China, South Korea, South Africa, Venezuela and other Latin American Countries

Full Implementation of a SOFI System

- started in 2002, the intent was to build on the previous research of the Millennium Project, including the spreadsheet model, algorithm and collection of data, and progressively develop it into an Internet based futures study and analysis tool supported over an open knowledge system

- Develop and deploy a community infrastructure so that the SOFI System can become a platform through which we can engage and harness both socio-economic research as well as technology input from broad communities of contributors

Futures Research, Normative Futures, Delphi & SOFI

Ted Gordon, The Millennium Project / WFUNA

Purposes of Futures Research

- *To help understand what could be, what might be, and what ought to be.*

- *To discover and understand threats and opportunities.*

- *To develop more creative strategies and evaluate proposed actions.*

- *To create and share normative visions*

- *The value of futures research lies less in its forecasting accuracy, than in its use in identifying and assessing new possibilities*

Philosophical Assumptions

- *The future can be shaped by policy*

- *There is a range of possible futures*

- *Policy consequences can be systematically explored*

- *Exact foreknowledge is not possible, but probabilities can be assessed*

- *There is a component of the future that is unknowable*

- *The mind uses "what if" outcome scenarios*

Key Current Methods

- **Taxonomy**
  - **Normative vs. exploratory**
  - **Quantitative vs. qualitative**

- **Common techniques**
  - **Time Series**
  - **Delphi**
  - **Scenarios**
  - **Modeling**
  - **Monitoring**

Frontiers

- *Methods*
  - *Trend Impact Analysis*
  - *SOFI*
  - *RTDelphi*
  - *Scenarios using expert groups*
  - *Robust decision making*

- *Concepts*
  - *Reducing the unknown*
  - *A new decision science*

Time Series: Trend Impact Analysis

Infant Mortality Rate	**Very long term, low cost contraceptives.**
	China and India becomes 50% urbanized
	Social marketing improves health practices
	Standard vaccinations of all children
	Improved maternal healthcare, nutrition
	Literacy rate of women reaches 85%
	Number of poor people grows
	Drop in number of people without safe water

Time Series: Trend Impact Analysis

Infant Mortality; Deaths per 1,000 Live Births
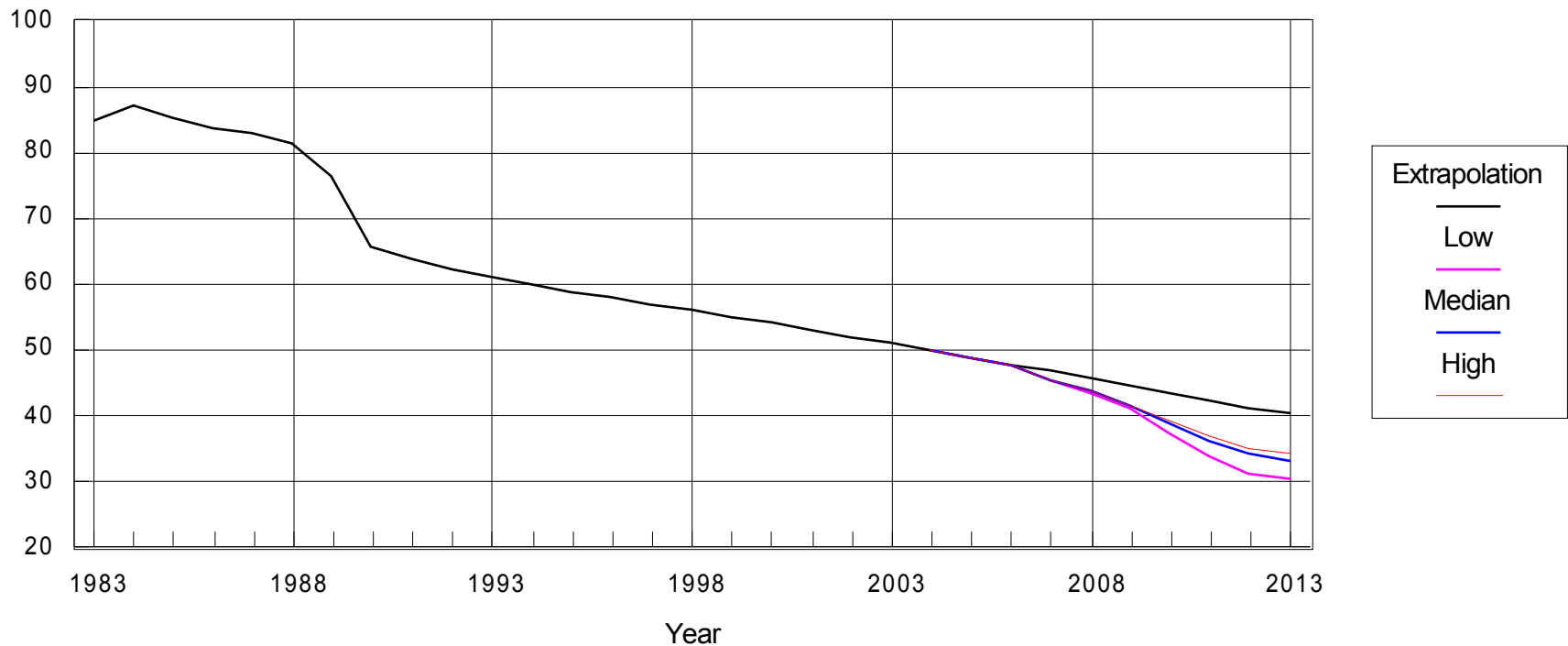
Delphi

- *Conference room problems*

- *Now the "classic" means for combining expert opinions*

  Anonymity

  Feedback

- *The RAND 1964 S&T Study*

Real Time Delphi

1 **Infant mortality (deaths per 1,000 births)**
World (1983)= 89.1
World (2005)= 50.0
Spain (2003)= 4
Liberia (2003)= 157
Link go

Best plausible value in 2016?
YOUR ANSWER :
The average group answer: 23.4
Respondents: 7
DIFFERENT THAN THE AVERAGE
Reasons click here
GO:
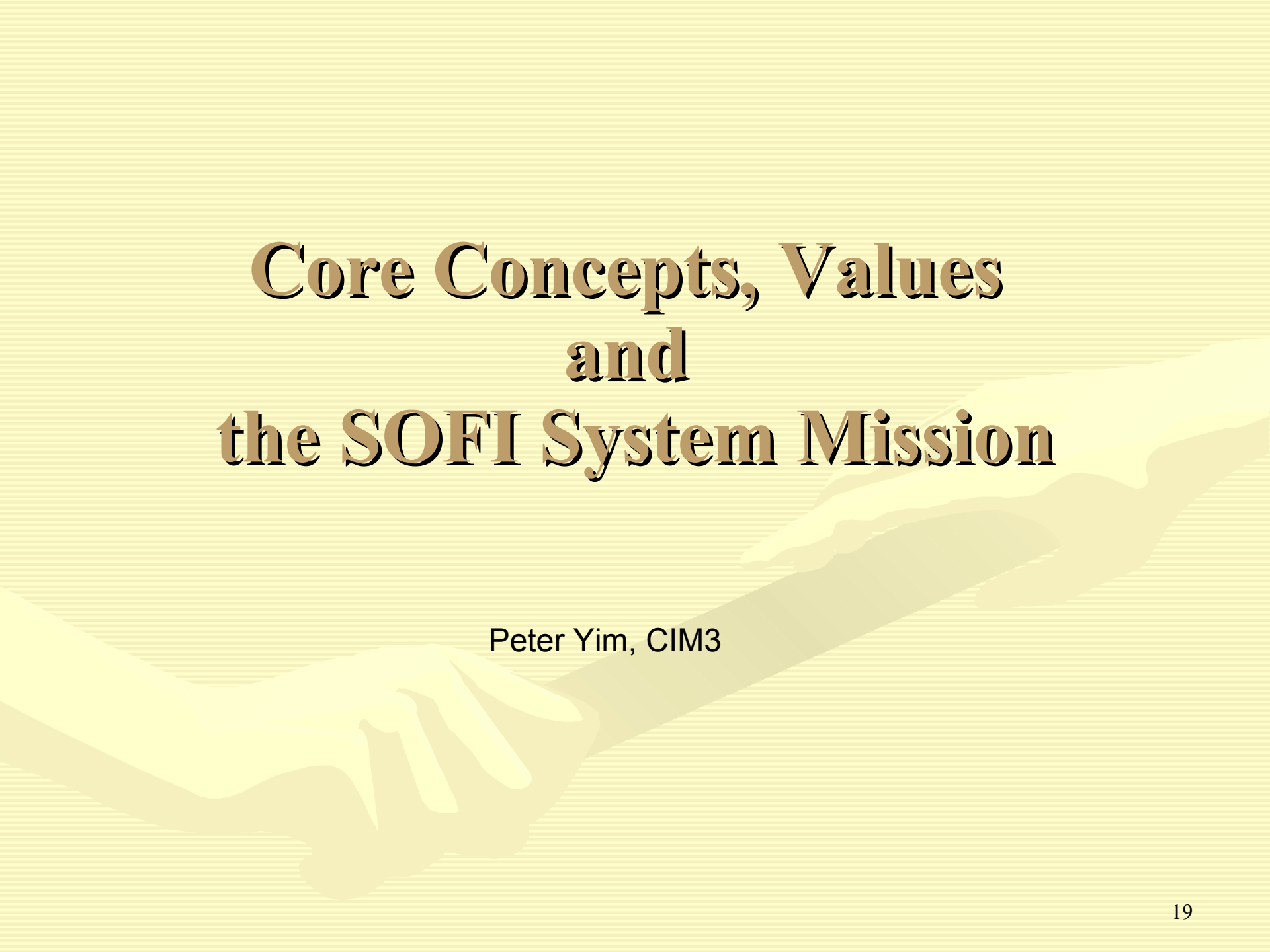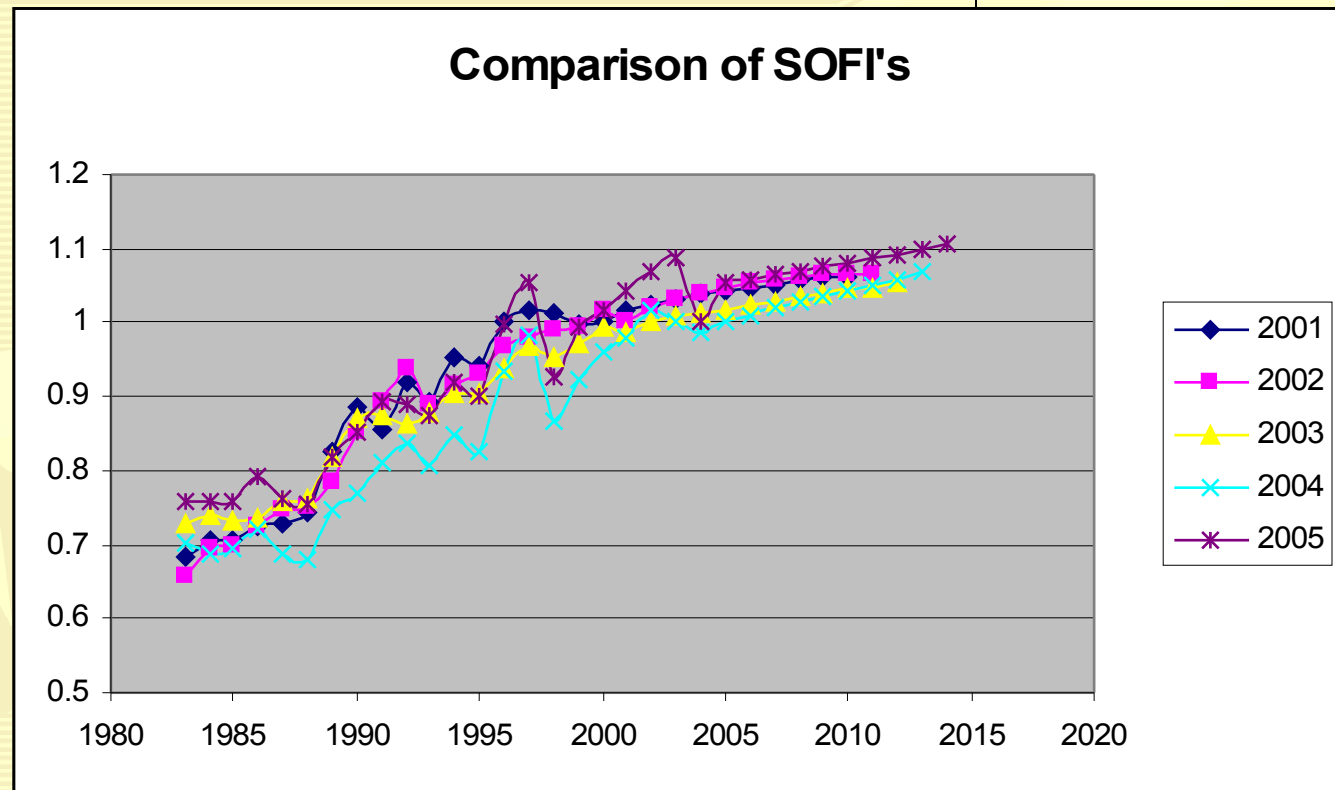
Global SOFI 2006:
20 Variables

Example of SOFI (State of the Future Index) variables:
- *Infant mortality*
- *Food availability*
- *GNP per capita*
- *Access to fresh water*
- *CO_2 emissions*
- *Literacy*
- *Wars*
- *AIDS deaths*
- *Terrorist attacks*
- *Debt ratio*
- *Unemployment*
- *Calories per capita*
- *Health care*
- *Forest lands*
- *Rich poor gap*
- *…*

Comparison of SOFI's

Legend:
- 2001
- 2002
- 2003
- 2004
- 2005

Core Concepts, Values and the SOFI System Mission

Peter Yim, CIM3

Core Concepts & Values
driving this work

- The SOFI Methodology

- The "Bootstrap" Paradigm

- Building a knowledge environment to serve a wide variety of applications

- Collaboration among participants and stakeholders in the form of virtual communities.

- The notion of "Openness"

- Driving interoperability through ontology engineering

- Integrating through a service oriented architecture

- Tapping into a collective intelligence for decision support

Phase-1 SOFI System implementation

Adam Cheyer (SRI), Peter Yim (CIM3), et al.

Phase-1 SOFI System implementation

- Goals
  - Move SOFI creation from a single developer working alone on a spreadsheet to one that involves a community working together on the Internet
  - Build an interactive, collaborative, web-based portal for exploring, analyzing, and extending SOFI data and for discussing SOFI-related issues
- Volunteer, open source development effort
  - Adam Cheyer, Darren Haas, Eric Garlick, John Bear, Jonathan Cheyer (technical lead and architect), Kurt Conrad, Lisa Colvin, Mary Keitelman, Bo Newman and Peter Yim (project director)
- Strong group of advisors
  - SOFI Advisors: Jerome C. Glenn, John. J. Gottsman, Theodore J. Gordon
  - Architectural Advisors: Douglas C. Engelbart, David Leibs, Hal Hildebrand
- Timeline
  - Kickoff 11/2002, Phase 1 completion: 6/2003

SOFI Architecture

SOFI Architecture Diagram
Collaborative Model

SOFI Architecture

SOFI Architecture Diagram
Collaborative Model

Phase 2

24
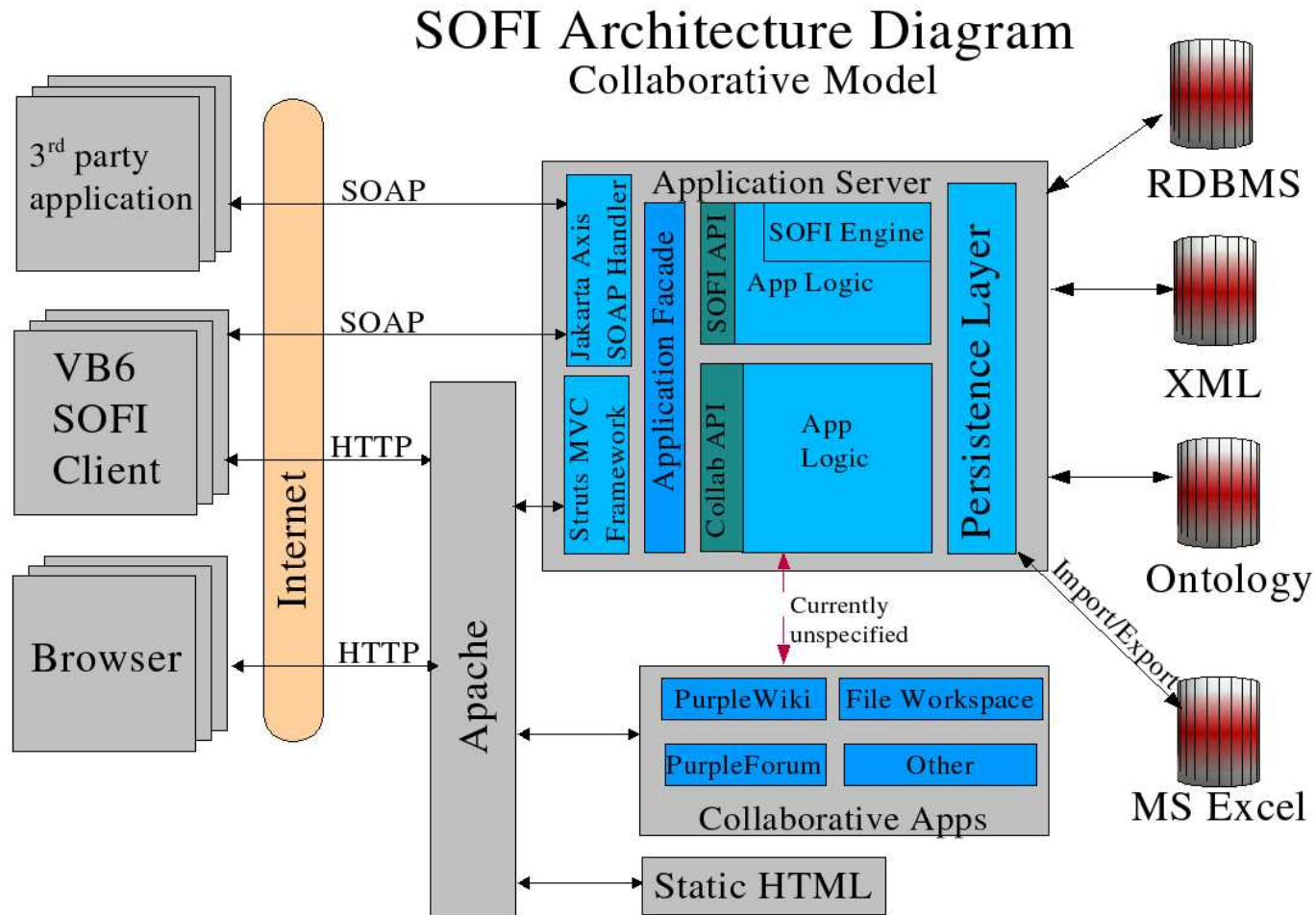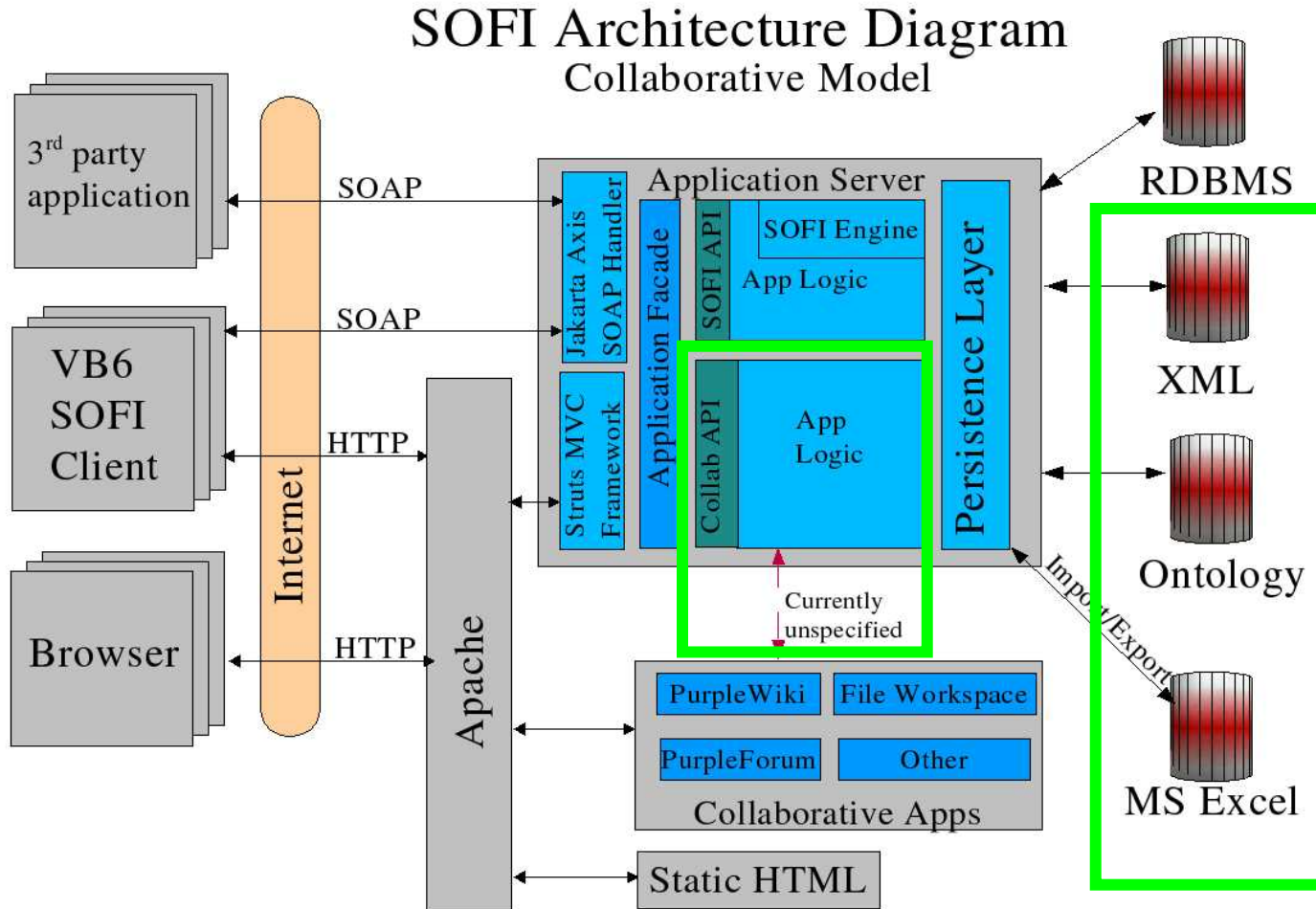
SOFI Architectural Components

- Scaleable Java-based Web Server (J2EE: Struts MVC)
  - Session management, business logic, persistance layer, user interface
- SOFI Engine
  - SOFI Algorithm aggregates forecasts of variables
  - Trend Impact Analysis (TIA) accounts for impacts of future events in the variable forecasts
- SOAP-based Web-Service APIs
- Thick Client Option for Interactive Graphs
  - Embedded Web browser
  - Multiple window view with interactive spreadsheets, charts, graphs

Collaboration Platform

- CIM3 Collaborative Platform supports:
  - an archived e-mail/discussion forum
  - a community wiki (which is a website that is both writable as well as browsable)
  - a document repository / file-sharing workspace, and
  - support for full-text search and fine-grain (paragraph-level) access to shared content.
  - Synchronous collaboration features
    - voice conferencing,
    - screen/application sharing,
    - instant messaging, and
    - real-time chat session
- Based on open software and standards

The User Interface

The Next Phase ...
driving the SOFI System
with semantics
and ontology engineering

A Brief Inclusive Characterization of Ontologies (in Computer Science & Engineering)

- Ontologies are used to support sharable and reusable representations of knowledge
    - An early definition of Ontology: "a specification of a conceptualization" (Gruber, 1994)
- Nevertheless, the sheer range of current work in ontologies:
    - Including taxonomies, thesauri, topic maps, conceptual models, and formal ontologies specified in various logical languages
    - Raises the possibility of ontologies being developed without a common understanding of their definition, implementation and applications
- Our objective:
    - To provide a framework that ensures that we can support diversity without divergence
    - So that we can maintain sharability and reusability among the different approaches to ontologies

Source: OntologySummit2007 Symposium / Obrst-Gruninger / 2007.04.24

From OntologySummit 2007 –
Ontology Dimensions: Semantic & Pragmatic

- We propose a set of dimensions that can be used to distinguish among different approaches
  - **Semantic**
  - **Pragmatic**
- Semantic Dimensions: These constrain how a given approach specifies the meaning of the terms
  - **Degree of Structure and Formality**
  - **Expressiveness of the Knowledge Representation Language**
  - **Representational granularity**
- Pragmatic Dimensions: These cover the context in which the ontology is designed and used
  - **Intended Use**
  - **Role of Automated Reasoning**
  - **Descriptive vs. Prescriptive**
  - **Design Methodology**
  - **Governance**

Source: OntologySummit2007 Symposium / Obrst-Gruninger / 2007.04.24

Quantitative Decision Support

Ken Baclawski, Northeastern University

Decision Analysis

- Important part of policy and development processes.
- Formal annotation of decisions and their analyses can have many benefits.
  - Integration with the process
  - Recognition of need to reconsider when circumstances evolve
  - Decisions can be delayed
  - Decisions can be reused for other situations
- An annotated decision is called a **rationale**
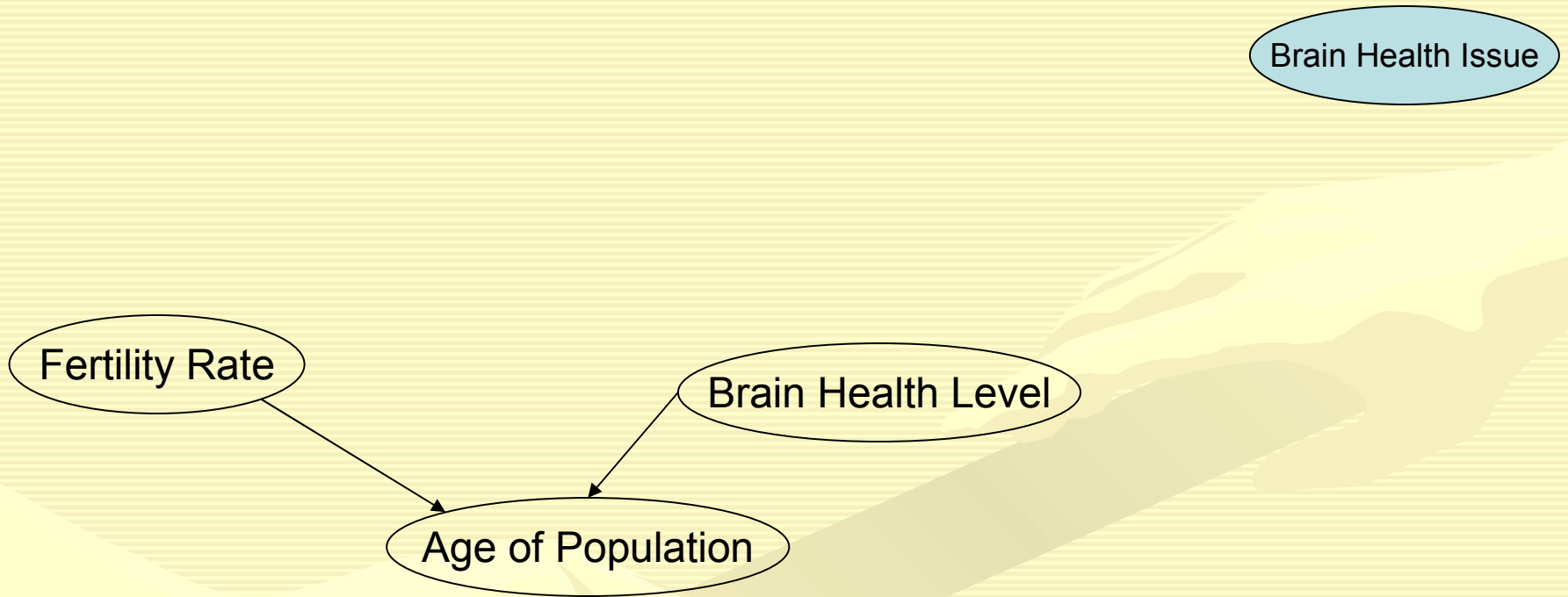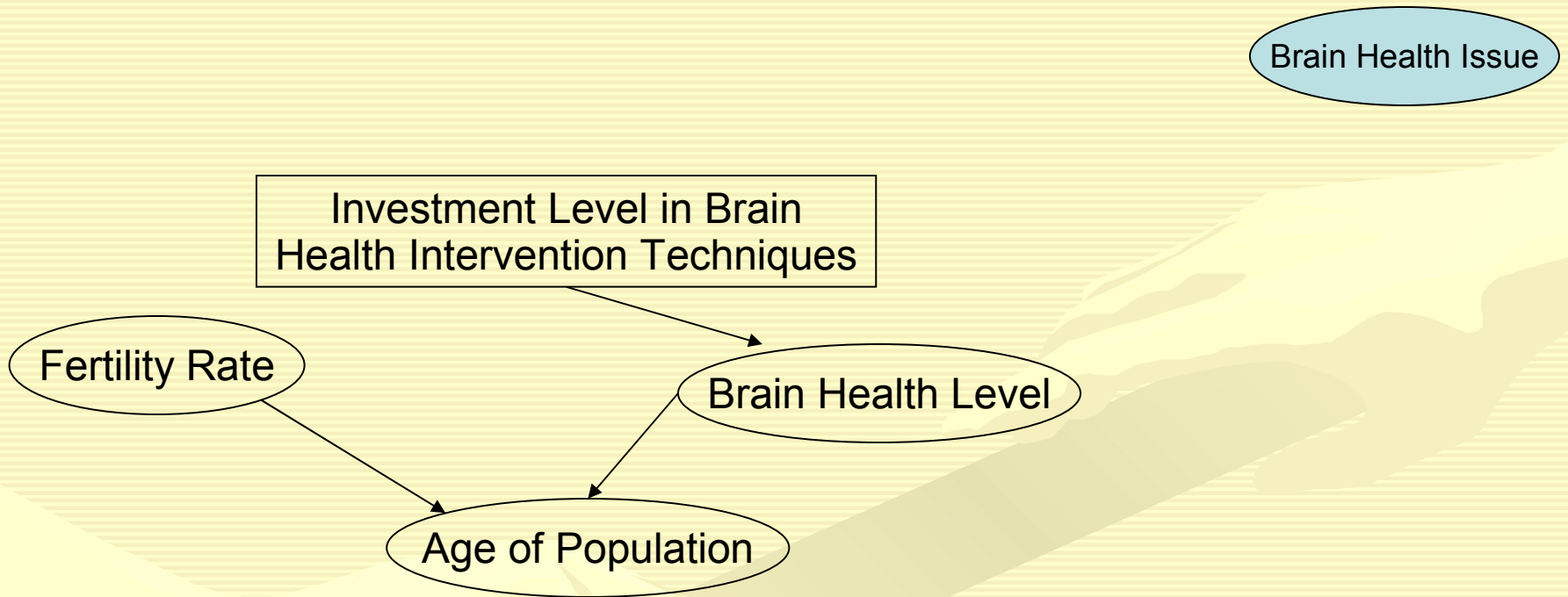
Rationale Ontology
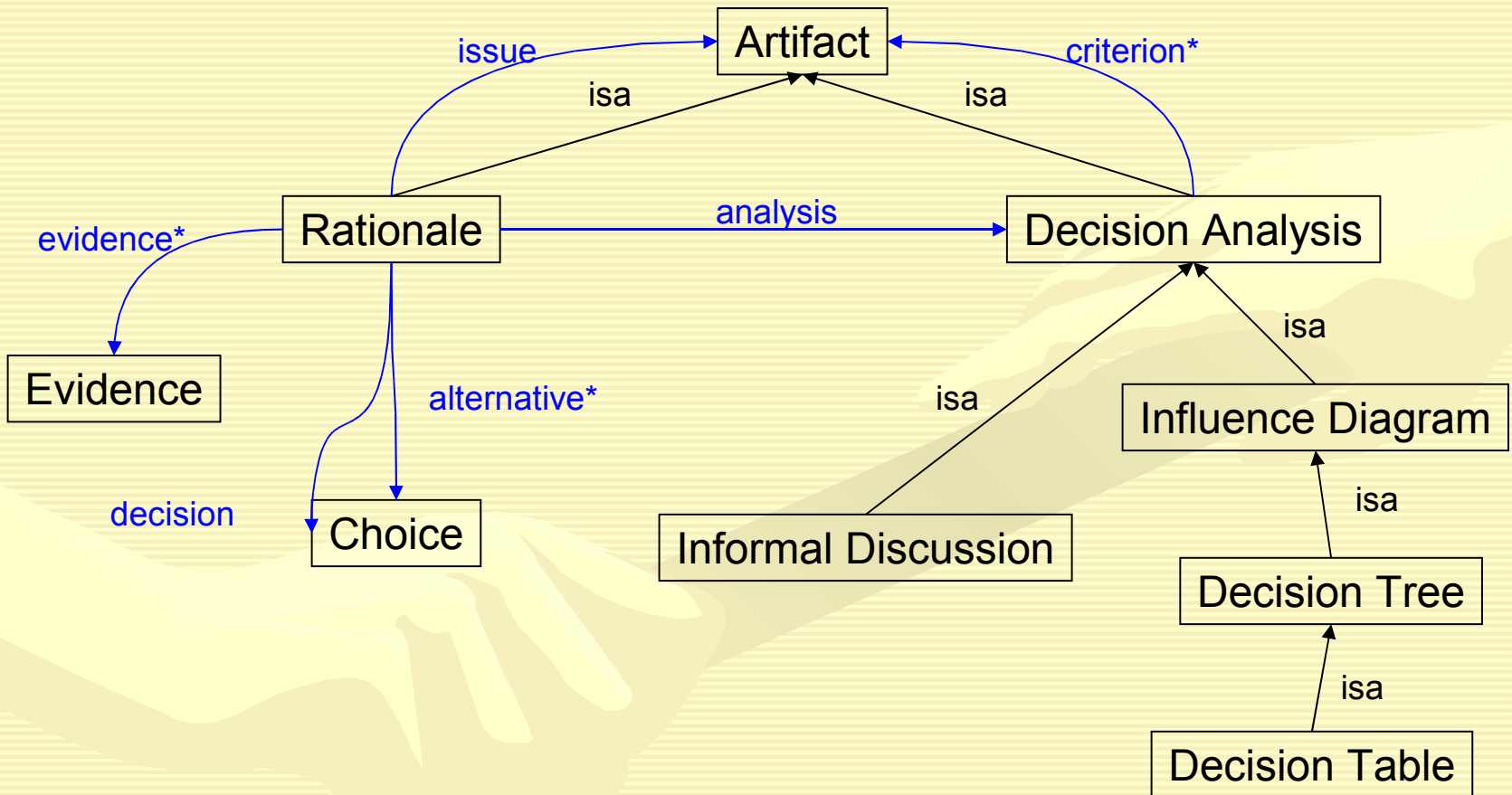
Process Model
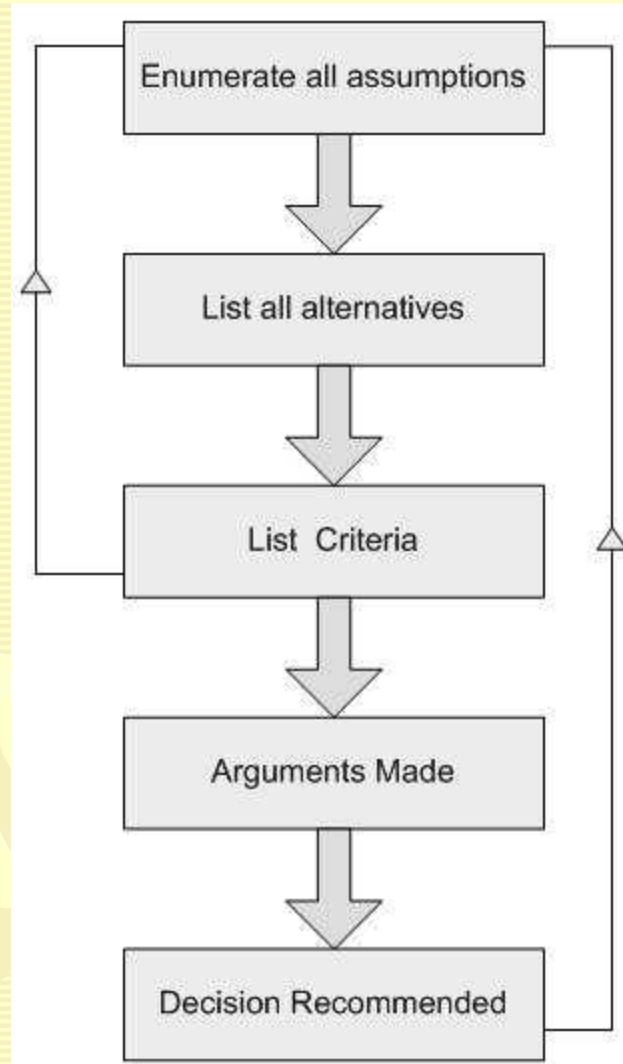
Policy Decision Example

Brain Health Issue

Policy Decision Example
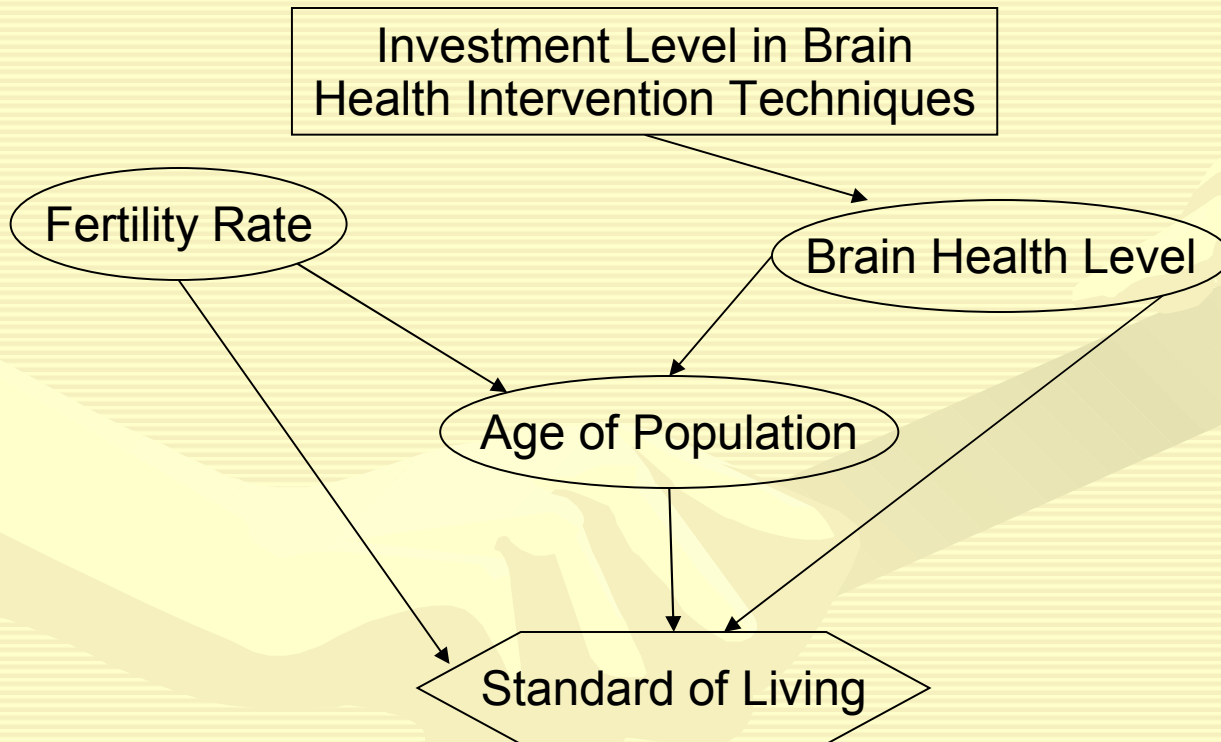
Brain Health Issue

Fertility Rate

Brain Health Level

Age of Population

Policy Decision Example

Brain Health Issue

Investment Level in Brain
Health Intervention Techniques

Fertility Rate

Brain Health Level

Age of Population

Policy Decision Example

Brain Health Issue

Investment Level in Brain Health Intervention Techniques

Fertility Rate

Brain Health Level

Age of Population

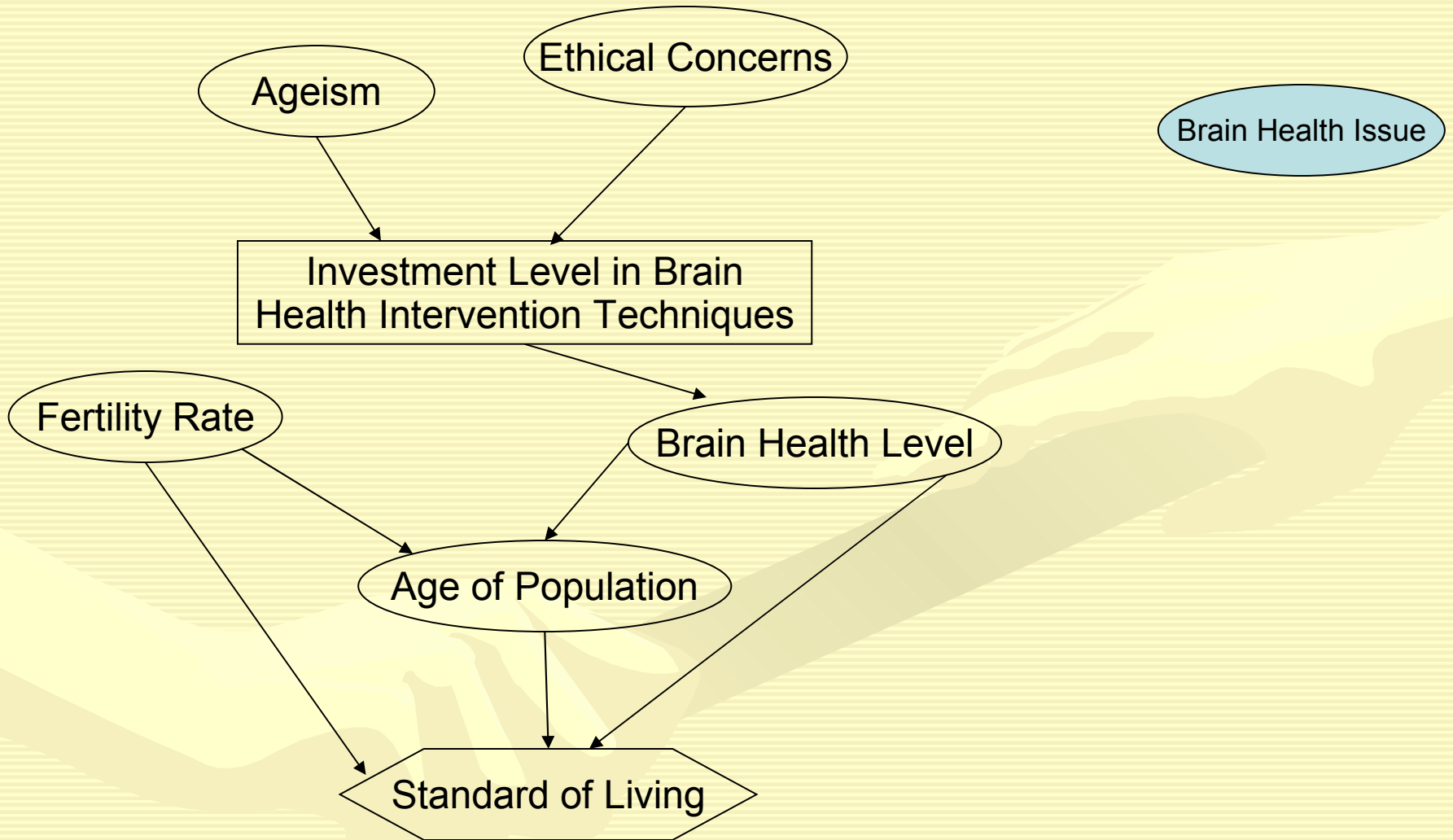Standard of Living

Policy Decision Example

Policy Decision Example

Policy Decision Example
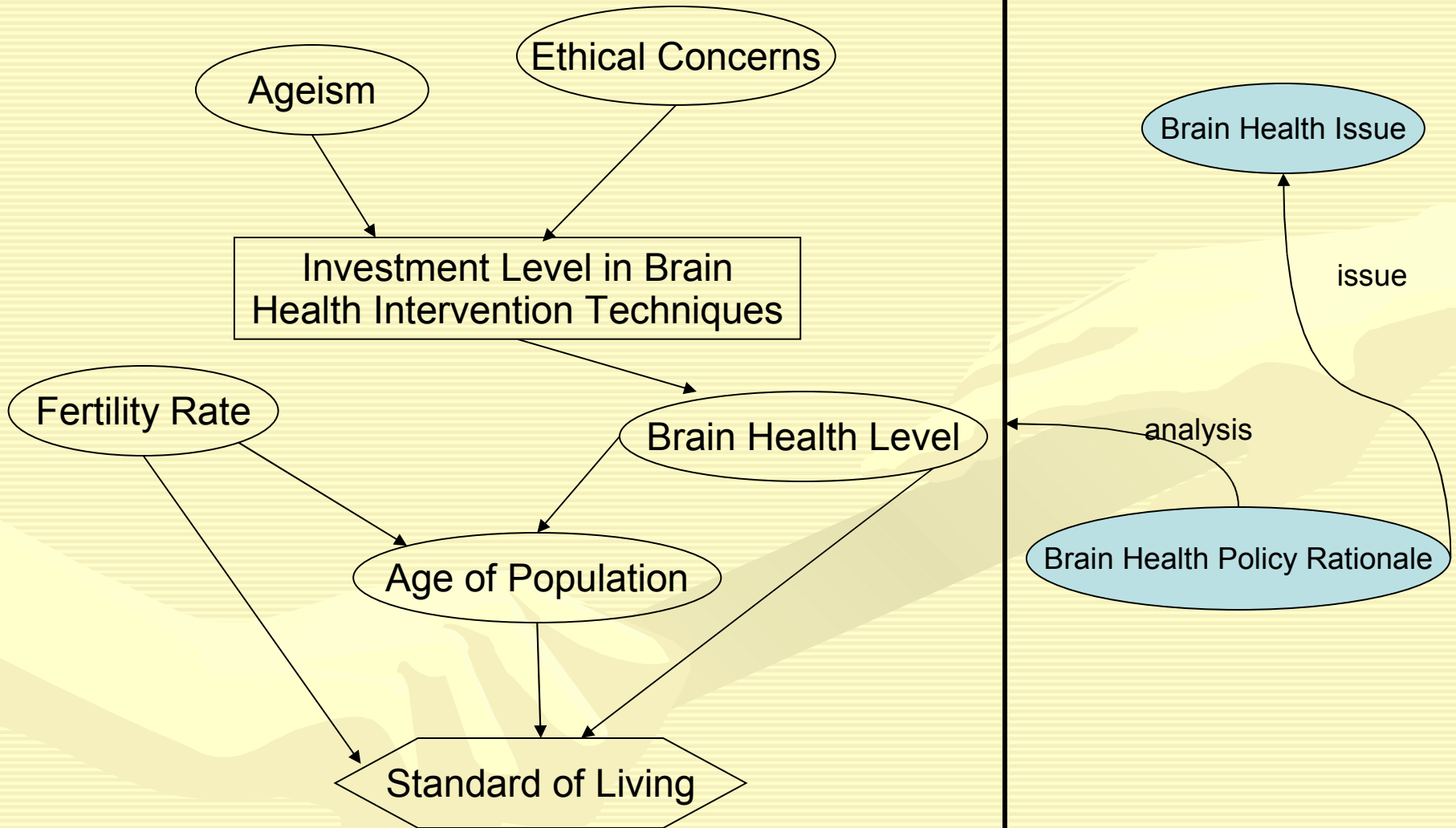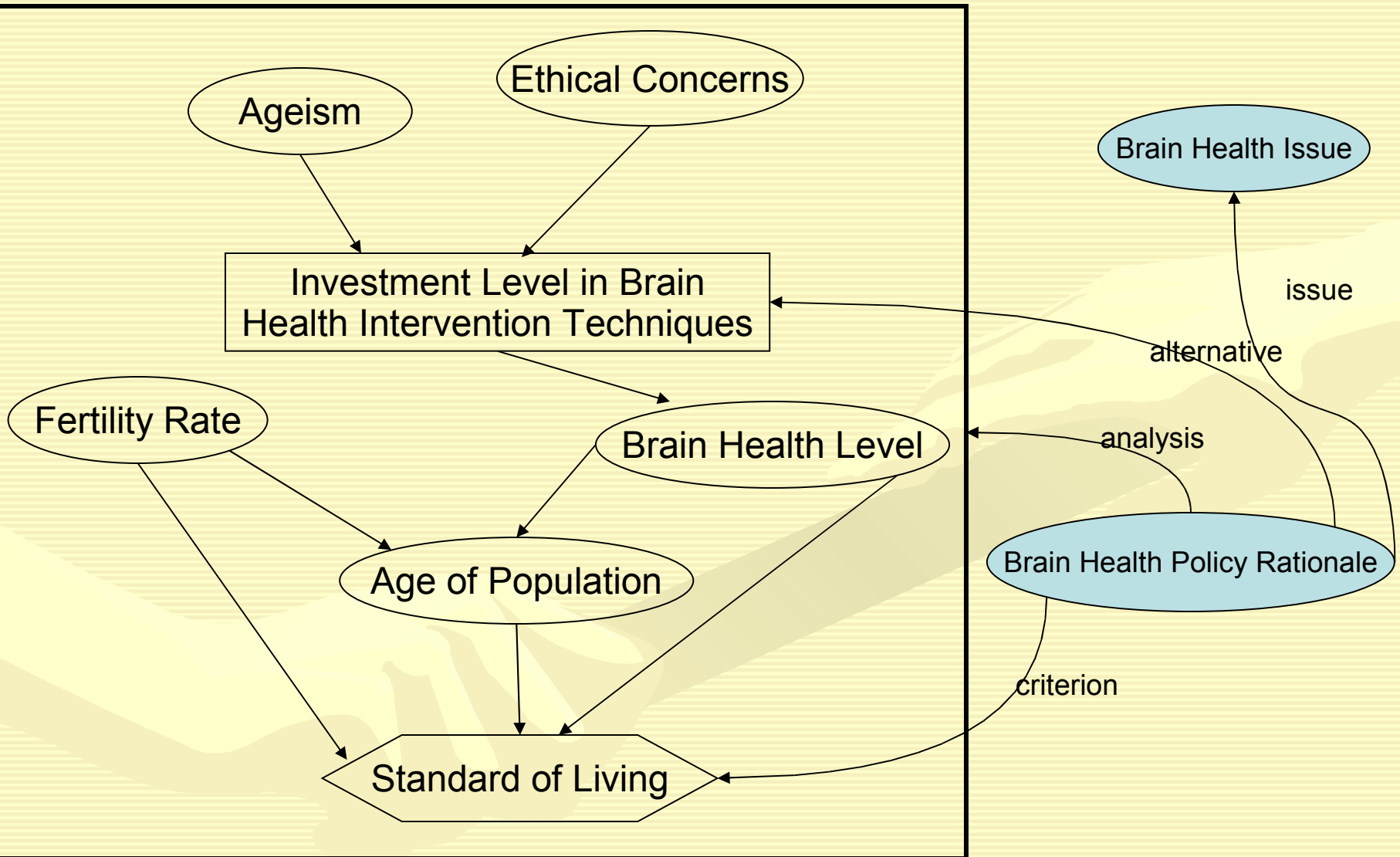
Policy Decision Example

Policy Decision Example

Toward semantic interoperability through a foundational ontology

Dr. Patrick Cassidy, MICRA

What is a "Defining Vocabulary"?

- For lexicographers, a controlled list of words which are the only words allowed to be used in creating definitions (e.g. in LDOCE).
  - **makes definitions easier to understand, especially for learners of a language (like dumb computers)**
- For Ontologists, the "Conceptual Defining Vocabulary" (CDV) is the set of basic concepts (and their ontological representations) which are necessary and sufficient to specify the meanings of all other concepts (or terms) by combinations of the basic concepts – **a special type of "Foundation Ontology".**

How Will a Conceptual Defining vocabulary Enable Semantic Interoperability?

- Any two ontologies developed by specifying the meanings of terms or ontology elements (types, relations, functions, rules) as combinations of the foundation ontology elements can automatically create a common merged ontology by sharing specifications of ontology elements that are not in the starting common ontology.

- **The inferences that both systems derive from the same data will then be identical.**

What Is The Advantage of a "Conceptual Defining Vocabulary"?

- Keep the Foundation Ontology as small as possible, to maximize chances of getting agreement among a large user audience.

- Focus on the elements that are essential to support the most basic components of human-level understanding.

- Provide all of the elements that are required to support interoperability, and achieve relative stability quickly.
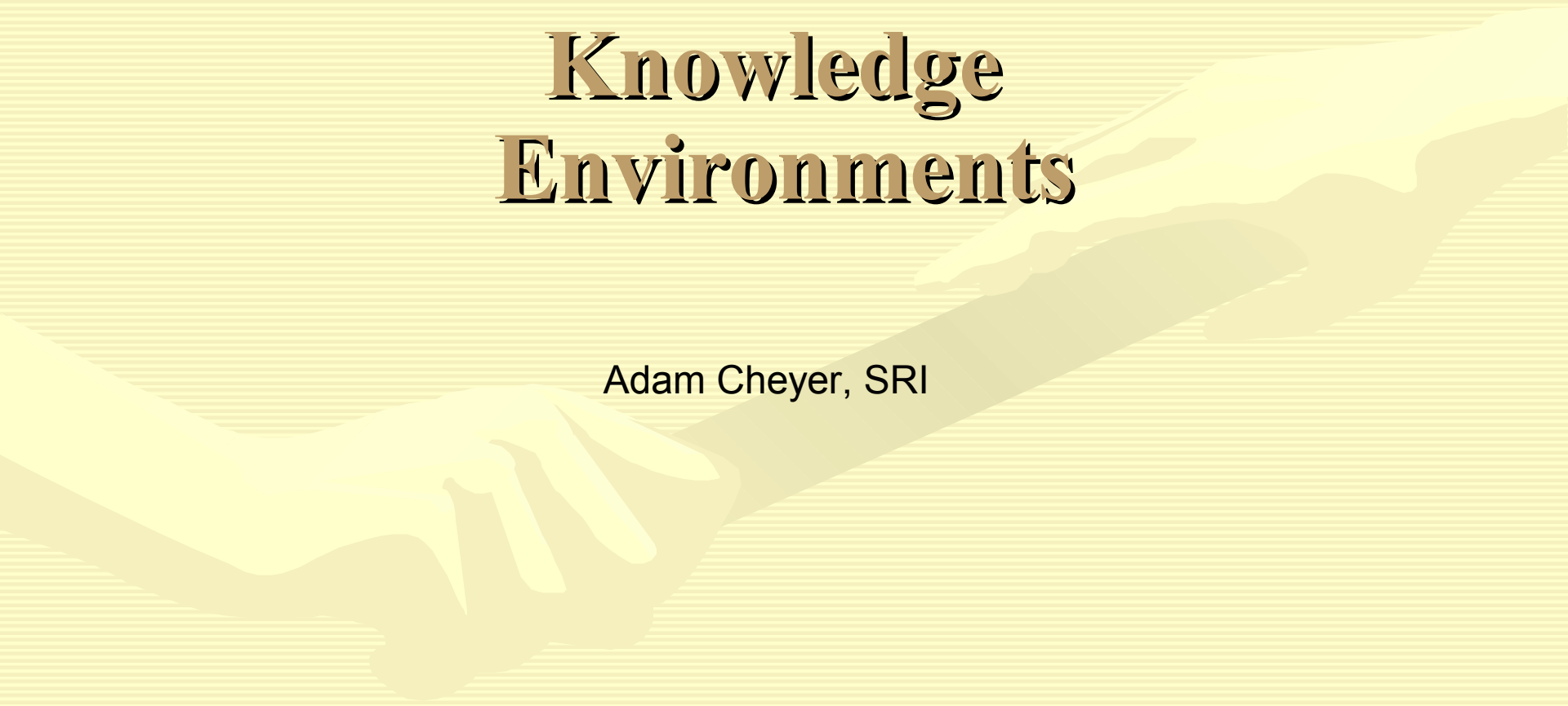
How Large is the Conceptual Defining Vocabulary?

- Longman's Dictionary of Contemporary English (LDOCE) uses about 2000 root words, some of which are used in more than one sense. With morphological variants (plurals, past tenses), there are over 9000 words.

- For the conceptual defining vocabulary, probably at least 4000 senses will be needed.

- The vocabulary will probably grow over time.

- But as more fields are defined via the conceptual defining vocabulary, each new field should require a smaller percentage of new primitives to be added to the foundation ontology to support the specification of novel concepts.

- The rate at which the need for new primitives will grow will be determined by actual experience.

How Does the CDV Differ from other "Upper Ontologies"?

(1) Primary focus is on the most basic concepts, to maximize agreement and usability

(2) This focus is achieved by concentrating on representing the concepts labeled by the words of the linguistic defining vocabulary, with tight integration of the ontology and linguistic vocabulary.

(3) The first demonstration application would be to enable a basic child's-level ability to use the English language. Until that is achieved, more specialized applications are unlikely to approach human-level understanding of concepts.

Collaborative Knowledge Environments

Adam Cheyer, SRI

Understand the trends

1. All Media Becomes Digital
2. Structured: Disconnected
   → Semantically Organized
3. Unstructured: Editor
   → Collaborative
4. Unstructured & Structured
   → Merge
5. Social Networking Takes Off
6. Personalization becomes Ubiquitous
7. Public & Private Content
   → Merge
8. Usable access is Key
9. Applications Are Similarly Transformed
10. Intelligent learning software leverages and organizes information

From "The Evolution of Information -10 prediction for the next 10 years"

Adam Cheyer, 2004

Collaborative Structuring

- Collaborative Tagging: finding content quickly
- Topic Maps: subject-centered navigation
- Structured Argumentation: synthesizing discussions
- Process Wikis: references, permissions, execution
- Ontologies: normalization, inference, reasoning, query
  - Data
  - Services

Illustrative Collaborative Environments

- Tagomizer
  - Topic-map driven organization and sharing of bookmarks and content

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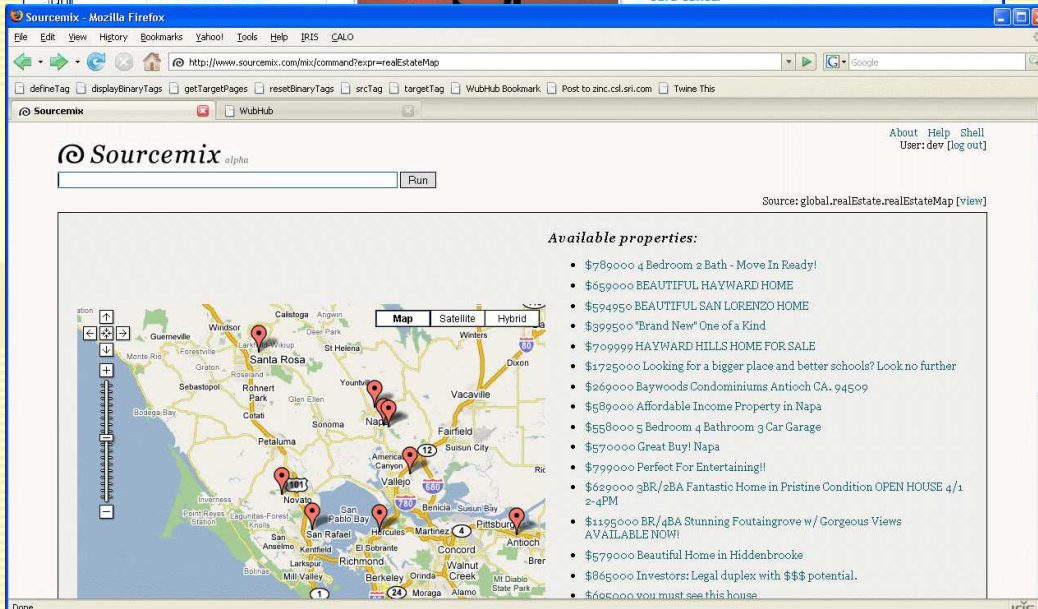
- **Tagomizer**
  - Topic-map driven organization and sharing of bookmarks and content

- **Change.org**
  - Social, personalized, multimedia conversations about a topic web of world-changing issues

- **Sourcemix**
  - Social, tagged, structured content (programming)
  - "Spaces" and permissions

Architecting a co-evolving human-machine system for collective intelligence

Peter Yim (CIM3), Duane Nickull (Adobe), Adam Cheyer (SRI), et al.

The next phase of the SOFI-System

- we implement a platform where researchers can do both quantitative and qualitative analysis and forecast by invoking available historic data/information/knowledge (especially when they interact among themselves) – numeric, textual & other media; structured & unstructured; openly available on the Internet or privately held (when given the access); ... and anything in between

- we design an open architecture whereby all the data, information, knowledge, tools, user input, analysis results, etc. can plug-in and be elicited as "services"

- we employ "ontologies" that will allow these "services" to be invoked (discovered and employed) without their having to be hard-wired (i.e. designed with pre-determined API's)

- we employ "ontologies" as a next level of abstraction to optimize human-machine and machine-machine processes, to the greatest extent that science and technology allows

- we explore the incorporation of an ontology-driven Bayesian Network algorithm to further enhance the current SOFI analysis and algorithm

- we create an 'open environment' (maybe, 'ecology' is more appropriate) where users, researchers, experts and developers may continuously access, contribute content, build, add capabilities and improve on (co-evolve) this SOFI System

- we envision this as a continuously improving augmented (human-machine) analysis & decision support "service" (system) for researchers, decision makers and policy makers

The 'traditional' Client-Server System

Client

Server
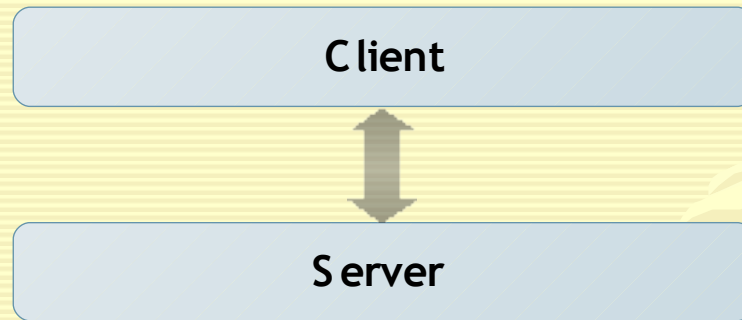
Abstract Model for Web 2.0

Abstract **Model** for connecting and integrating capabilities and users

Users
Client Applications/Runtimes
Connectivity/Reachability
Services
Capabilities

Patterns of interaction

SOA →
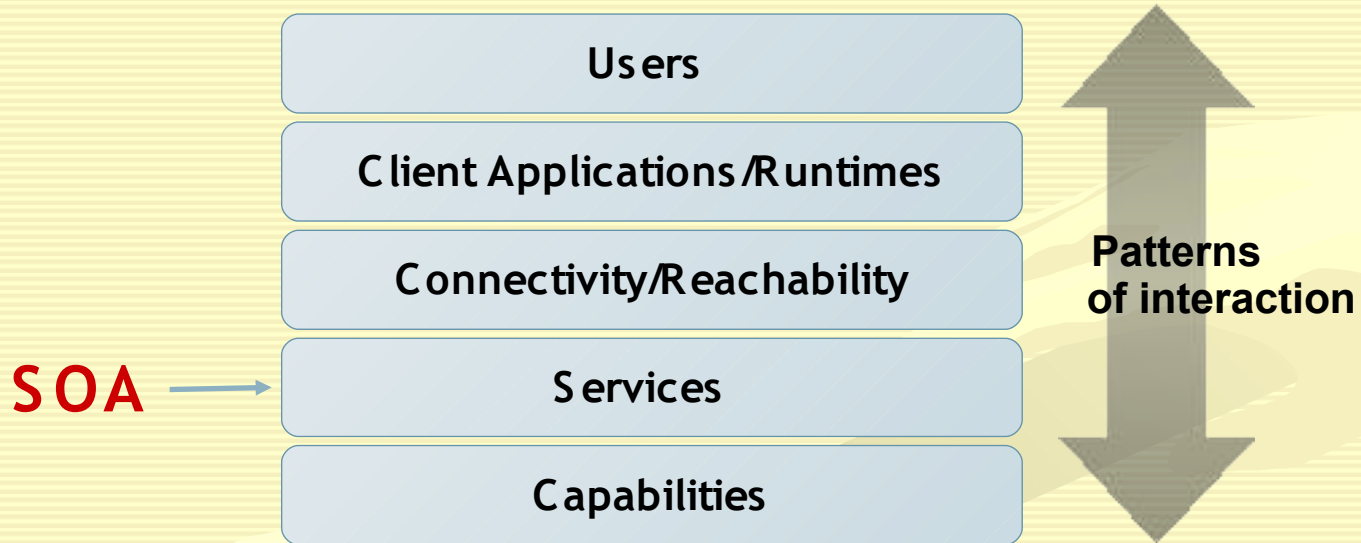
"Don't treat software as an artifact, but as a process of engagement with your users."

- Tim O'Reilly

Web 2.0 Application – Conceptual Architecture

Design, Development & Governance Tools

Controller

Client Application Tier

| Data/State Management | Security Container/Model | Virtual Machine | Rendering & Media |

Communication Services

Standard Technologies & Protocols

- Consistent object & event models
- Consistent architectural models

Service Invocation Layer

Service Tier

| Registry-Repository | Service Container | Core Services | Business Rules/ Workflow |

Service Provider Interface

Resource Tier

| EIS | Databases | Directories | ECM Repository | Message Queues | Legacy Systems |

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Core Model for SOA
(defined in OASIS SOA RM TC)

Visibility

Execution context

Service description

Service

Real world effect

Interaction

Contract & Policy
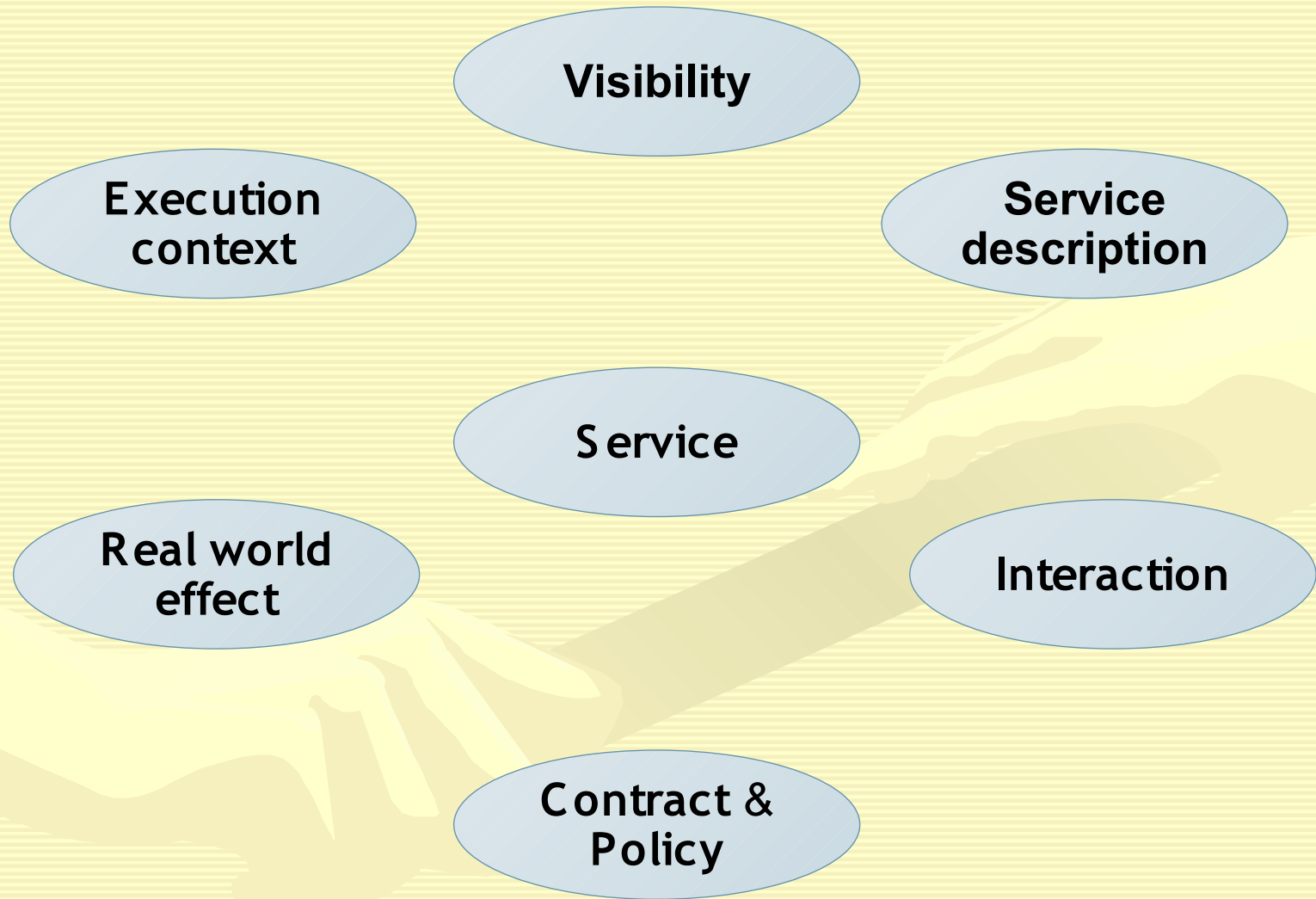
One candidate architecture for the next phase SOFI System implementation ...
(as proposed by DuaneNickull et al.)

REST	Acrobat	AIR	Flex	AJAX	Other?	Flash	Browsers	Client Application Tier
Rt			Fx	Aj	WS*			

HTTP/S, Sockets, AMF, RTMP, SOAP, WS*, REST, ...

Service description

Service Policy
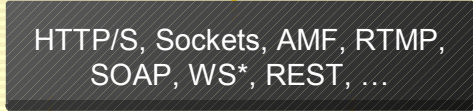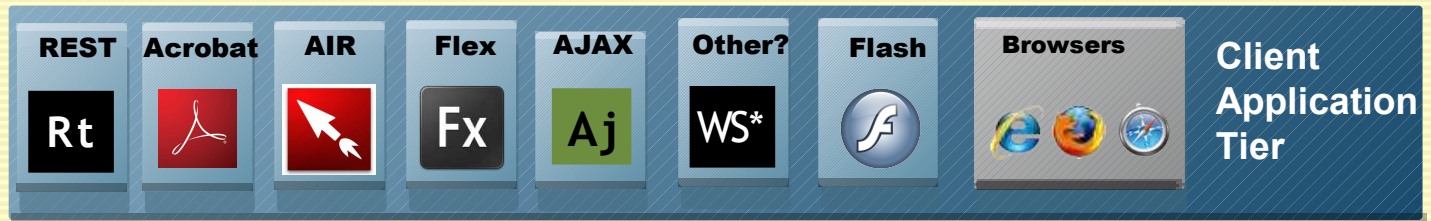
SOFI Service Tier:

Built on the core tenets and axioms of SOA as defined by the OASIS RM for SOA. Data is pulled from multiple sources, manipulated and made available via the service invocation layer for a multitude of clients.

Service Invocation Layer

Ontology, Semantics, algorithm rules

Registry   Service Container

SOFI Data Service Provider Interface

SOFI Core Engine

SOFI Data Sources	Databases	Directories	ECM Repository	Message Queues	Legacy Systems
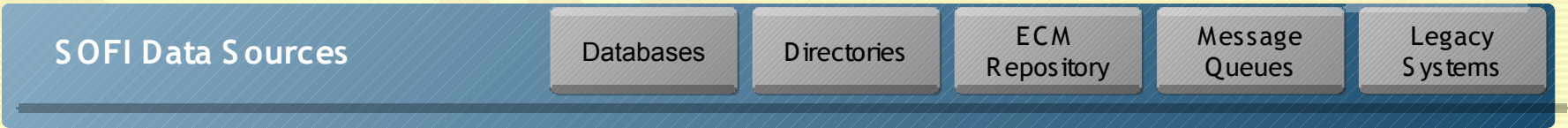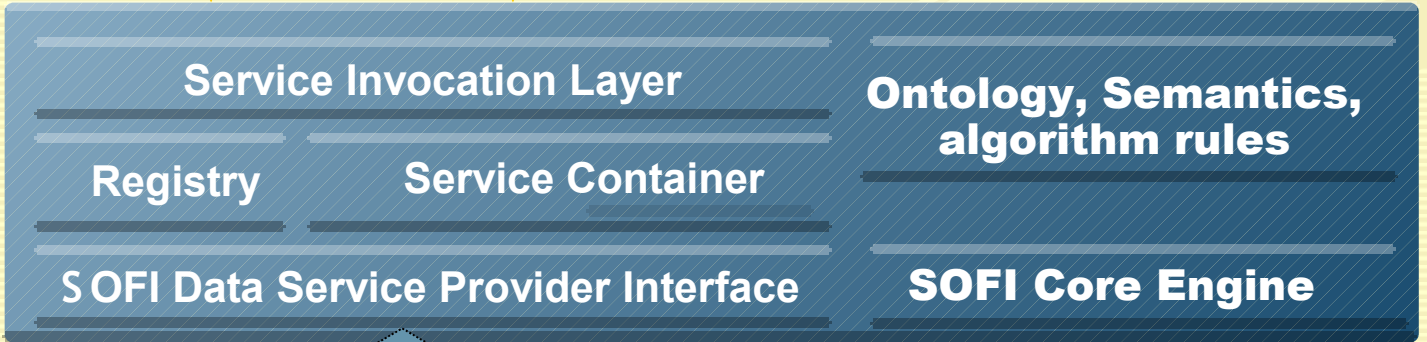
SOFI – based on the Reference Model for SOA

Ontology Spectrum: Application

Expressivity

Concept (referent) - based → **Ontology** — strong → *Logical Theory*

weak

Conceptual Model

Term - based

Thesaurus

Taxonomy

More Expressive Semantic Models Enable More Complex Applications

Categorization, Simple Search & Navigation, Simple Indexing	**Synonyms, Enhanced Search (Improved Recall) & Navigation, Cross Indexing**	**Enterprise Modeling (system, service, data), Question-Answering (Improved Precision), Querying, SW Services**	**Real World Domain Modeling, Semantic Search (using concepts, properties, relations, rules), Machine Interpretability (M2M, M2H semantic interoperability), Automated Reasoning, SW Services**

Application

Source: Leo Obrst, MITRE Jul.2007

Making Better Strategic Decisions – applications, scenarios and the potentials of a SOFI system

Ted Gordon, MP/WFUNA

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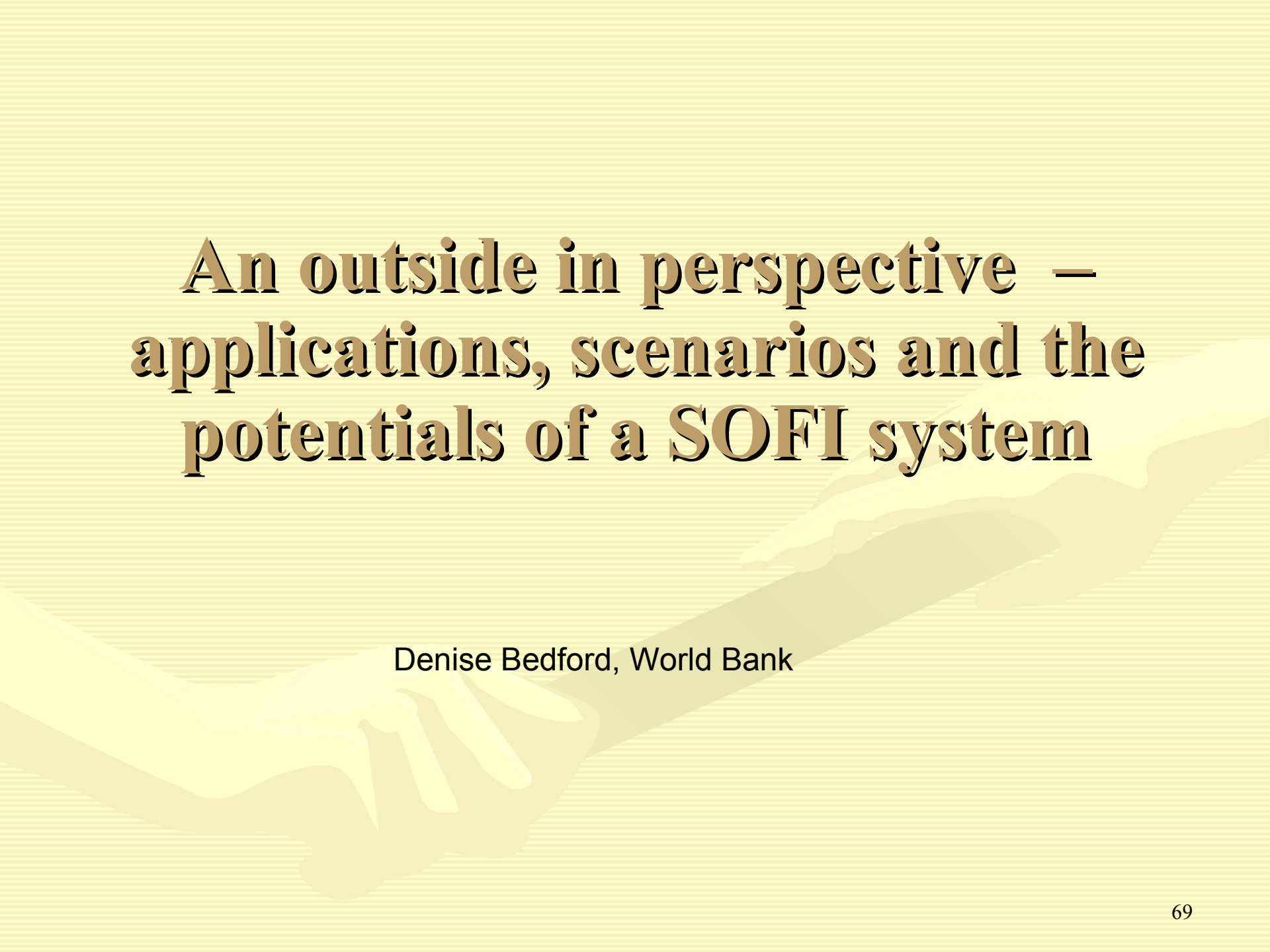
What Goes Into a Decision?

- *Three questions:*
  - *What is possible?*
  - *What is likely?*
  - *What is desirable?*
- *Futures research helps with*
  - *Identifying goals*
  - *Assessing prospective policies*
  - *Quantifying risks*
- *Futures research does not help much with*
  - *Reducing the unknowable*
  - *Psychological factors*
  - *Moral and ethical factors*

A New Decision Science

- *Futures research; foresight; FTA*

- *Intuition, imagination: experience, subtle clues*

- *Psychology; personal utility functions*

- *Balance of risks and rewards*

- *Experiments and analogy*

- *Understanding innate illogic of human thinking*

- *Moral courage*

An outside in perspective – applications, scenarios and the potentials of a SOFI system

Denise Bedford, World Bank

Practical Considerations

- Reiterating an earlier idea…
  - "The value of futures research lies… in its use in identifying and assessing new possibilities"

- Futures research helps people to:
  - identify alternatives – the cornerstone of economic thinking and forecasting
  - Alternative scenarios are built upon our knowledge of factors which influence the future
  - Human mind is powerful, but its capacity is limited in terms of tracking multiple paths – enough time, enough people
  - Also challenging to find a context in which multiple domain experts can share ideas about a possible future, discuss, test and rethink

- Futures research provides a practical, manageable method for better understanding and thinking through the results of modifying those factors that will influence the future

Challenge of Modeling the Future

- How to identify the factors that influence the future?

    - Semantic technologies can help us with this one but we need to have validation (ranking, voting, etc.) by the experts

- How to model the influence that those factors will have on the future?

    - Data mining methods predicated on high quality, reliable data which have been explicitly and commonly defined across institutions
    - Infant mortality, under 5 mortality, < 5 mortality, under five mortality, child mortality

Guinea – Second poverty reduction strategy paper and joint IDA-IMF staff advisory note

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Abstract: This Joint Staff Advisory Note (JSAN) reviews the second Poverty Reduction Strategy Paper (PRSP II) covering the period 2007-10 prepared by the Government of Guinea. The objectives of the PRSP I1 aim at recapturing ground lost over the past five years so that the Millennium Development Goals (MDGs) can be reached. The strategy has three pillars: (i) improving governance; (ii) accelerating growth and increasing employment opportunities; and (iii) improving access to basic services. It covers many important economic, institutional, and structural reforms as well as mechanisms to reinforce the democratic process. Some of the objectives quantified appear overly ambitious, given Guinea's still fragile situation and weak implementation capacity. The staffs therefore recommend that in the annual reviews of PRS implementation, refining and updating the objectives in light of implementation experience should be given careful attention. Such updates will be supported by the government preparing longer term sectoral development strategies that would strengthen the link between the current PRS and achievement of the MDGs. This JSAN presents the views of IMF and World Bank staffs on priority areas for strengthening PRSP II as it is implemented in the next years with particular attention to three core elements: (a) poverty diagnosis; (b) targets, indicators, and monitoring; and (c) priorities for government action.

Key Concepts Identified in this Strategy Paper – Rich Factor Information

Keywords:

access to education, access to health care, Acquired Immunodeficiency Syndrome, adult literacy, adult population, Agricultural Development, basic social services, capacity building, child mortality, childbearing, chronic malnutrition, civil society actors, civil society organizations, clean water, community development, cultural values, democracy, development planning, Development Policy, development strategies, disadvantaged areas, discrimination, discrimination against women, diseases, drinking water, drugs, economic growth, Economic Integration, economic productivity, education of children, educational services, employment creation, employment opportunities, employment promotion, energy consumption, Environmental Impact, epidemic, existing capacity, extreme poverty, female genital mutilation, fight against poverty, financial constraints, food production, food security, gap between girls, gender equality, gender equity, good governance, health care, health care services, health care system, health centers, health sector, health services, health workers, HIV, hospital, household assets, household survey, Human Capacity, Human Development, Human Development Index, Human Immunodeficiency Virus, human rights, illiteracy, illiterate persons, illnesses, Incidence of poverty, income, income inequality, infant, Infant mortality, influx of refugees, Information System, institutional capacity, intensive prevention, investment in education, Journalists, labor force, labor market, land ownership, level of poverty, live births, living conditions, living standards, local communities, local community, Local Development, macroeconomic stability, malaria, malnourished children, maternal mortality rate, maternal mortality rates, measles, midwife, midwives, Millennium Development Goals, Ministry of Education, mortality levels, mortality rate, Mother, natal care, National Capacity, National Capacity-Building, National Council, National Development, national government, National Interest, national level, national priorities, natural environment, natural resource, natural resource management, natural resources, nourishment, number of people, nurse, nurses, Oil Equivalent, Orphans, pandemic, participatory process, peace, Petroleum Exporting Countries, place of residence, political instability, political parties, poor, Poor Countries, poor households, poor individuals, poor people, poor persons, poor populations, population census, population density, poverty analysis, Poverty Assessment, poverty data, poverty impact, poverty indicators, poverty levels, poverty line, poverty map, Poverty mapping, poverty profile, poverty rates, Poverty Reduction, Poverty Reduction Strategy, Poverty Reduction Strategy Paper, prenatal care, primary education, primary school, procreation, progress, Public Health, public service, public services, public spending, public transportation, Public Works, purchasing power, quality education, quality of services, Radio, reducing maternal mortality, remote places, rule of law, rural, rural areas, Rural Development, Rural Electrification, rural exodus, rural phenomenon, rural poor, rural poverty, rural roads, sanitation, school levels, secondary school, secondary school level, service delivery, service provision, situation of women, social burdens, Social Council, social development, social policies, Social Security, Social Services, social tensions, societal level, source of drinking water, structural reforms, sustainable growth, targeting, technical assistance, transportation, tuberculosis, unemployment, unions, urban areas, urban centers, Urban Development, urban infrastructure, Urban poverty, urbanization, Vocational Training, women of childbearing age, working conditions, World Health Organization, young people

Again, with the SOFI-System ...

- we implement a platform where researchers can do both quantitative and qualitative analysis and forecast by invoking available historic data/information/knowledge (especially when they interact among themselves) – numeric, textual & other media; structured & unstructured; openly available on the Internet or privately held (when given the access); ... and anything in between

- we design an open architecture whereby all the data, information, knowledge, tools, user input, analysis results, etc. can plug-in and be elicited as "services"

- we employ "ontologies" that will allow these "services" to be invoked (discovered and employed) without their having to be hard-wired (i.e. designed with pre-determined API's)

- we employ "ontologies" as a next level of abstraction to optimize human-machine and machine-machine processes, to the greatest extent that science and technology allows

- we explore the incorporation of an ontology-driven Bayesian Network algorithm to further enhance the current SOFI analysis and algorithm

- we create an 'open environment' (maybe, 'ecology' is more appropriate) where users, researchers, experts and developers may continuously access, contribute content, build, add capabilities and improve on (co-evolve) this SOFI System

- we envision this as a continuously improving augmented (human-machine) analysis & decision support "service" (system) for researchers, decision makers and policy makers

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Q & A
and
Discussion