

# Socio-Economic Impacts of Large Programs

## Health Care Case Study

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MITRE Sponsored Research

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

**MITRE**  
**Technology**  
**Program**

# Problem

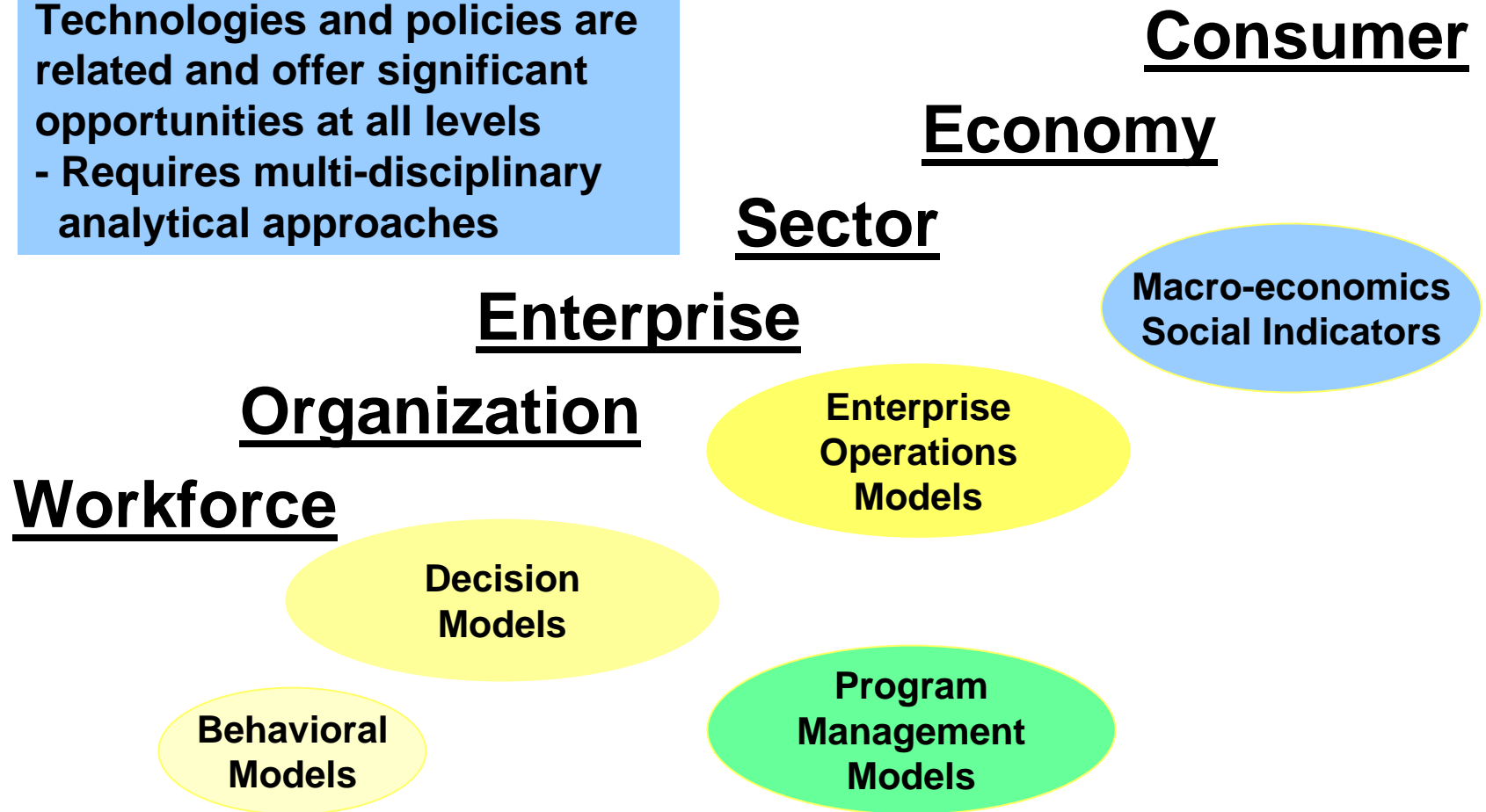
- **MITRE programs are of major national importance and have significant socio-economic impact**
  - Public health
  - National airspace planning
  - Financial management – IRS, FinCEN,..
  - Border protection
- **Recommendations must be based on a “big picture” view of the workforce, economy, and public**

**How do MITRE programs address the “public interest”?**

# Background

## ■ Multi-level drivers and impacts of enterprise transformation

Technologies and policies are related and offer significant opportunities at all levels  
- Requires multi-disciplinary analytical approaches



# Objective

- **Establish a Health Services Socio-Economic Analysis Laboratory**
  - Informatics program data
  - Health service process modules and library
  - Inter-industry and macro-economic data and model
  - Outcome data and models
- **Extend systems engineering methodology to new domains**
  - Couple technology, enterprise micro- and macro-economics
  - Inter-industry macro relationships
  - Public impacts; services, cost, outcomes, time
- **Strengthen academic collaborations and liaisons**
  - MIT, Lean Enterprise studies; and others
  - Harvard University, Kennedy School of Government
  - University of Maryland

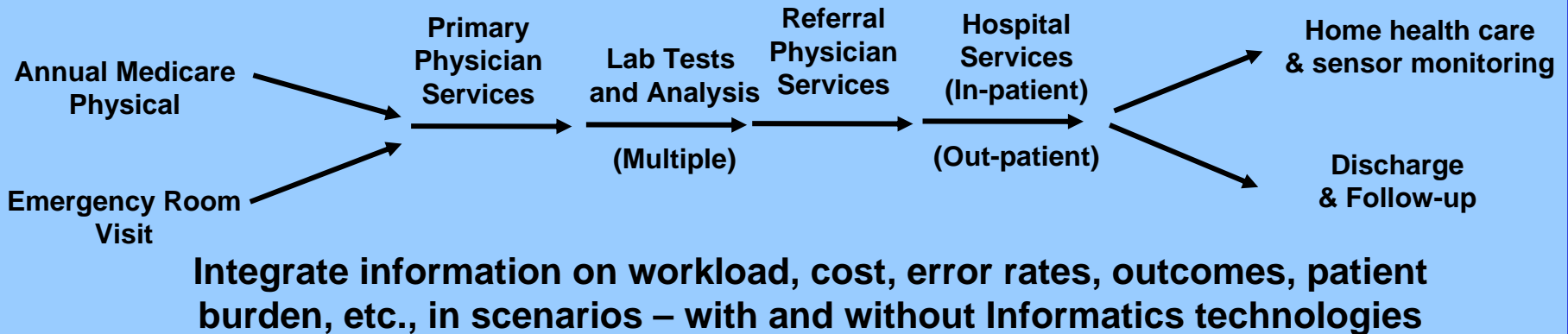
# Activities

- **Construct reference process models for selected health services**
  - Lean health care and public health processes, ISO-9000, etc.
- **Quantify: Impact of health informatics and electronic health records (EHR) on cost and quality of service**
  - Electronic medical records (EMR)
  - Computerized Physician Order Entry (CPOE)
  - Decision support systems (DSS)
  - Nationwide health Information network (NHIN), and
  - Home health monitoring sensors
- **Integrate health service process models with socio-economic models:**

Workforce; health enterprise; federal, state, and commercial; health care and public health sector of the economy

# Highlight

**An activity-based discrete-event simulation of health care delivery across inter-related health services**



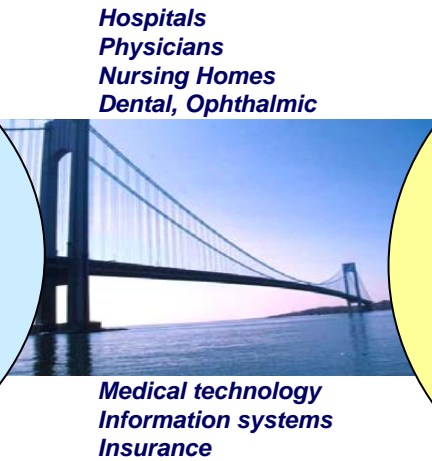
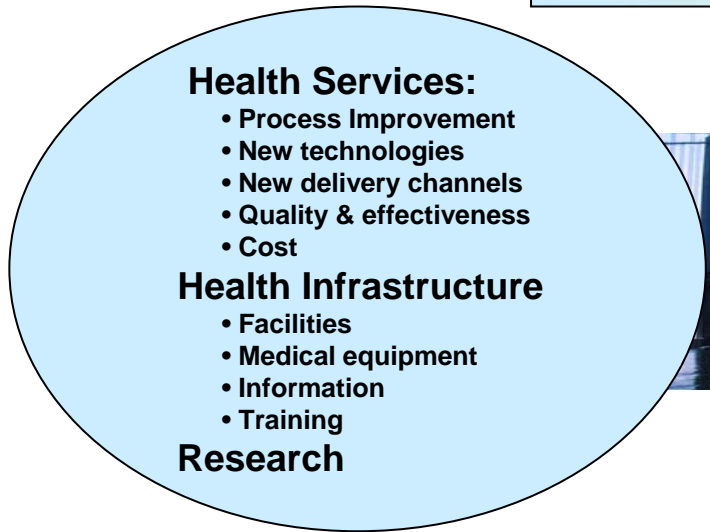
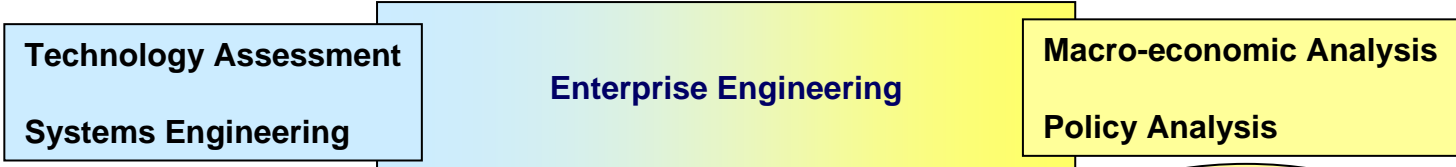
## Input parameters:

- Patient health status, demographics
- Specific diagnosis, treatment, follow-up thread
- Informatics technologies employed
- Reimbursement and regulatory policies
- Resources required for each activity

## Model results:

- Cost of health services
- Patient time required
- Utilization of resources
- Resource-based relative value scale

# Demonstration



## Tools and Methods:

- Process and agent-based models
- Performance Engineering
  - Lean health care processes
- Quality and effectiveness models  
Architecture

- Input-Output and Inter-Industry Models
- University of Maryland
  - Harvard
  - IMPLAN, RIMS Regional Models

- Macro-economic Models  
Social Indicators

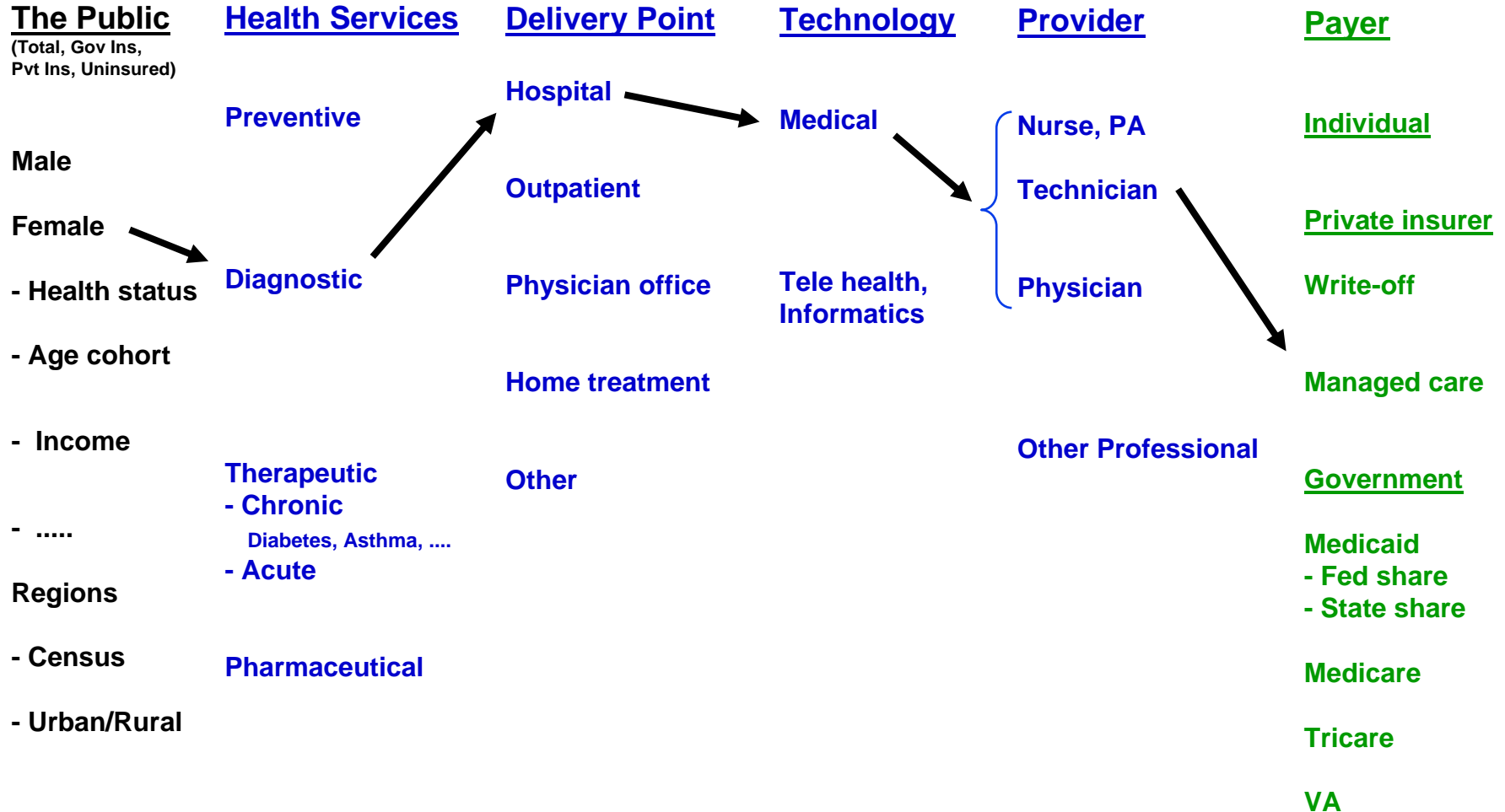
\* General analytical approach suggested by Profs. Herb Simon, CMU, and Tjalling Koopmans, Yale

# Impact

- **An improved and integrated capability to plan and analyze major health care and public health technology and policy programs (e.g., Informatics) encompassing:**
  - Health service cost and quality
  - Health care financial flows
    - Individual
    - Private sector
    - Medicare and Medicaid
  - Demographics
  - Quality and outcomes
  - Impacts on international competitiveness for sectors of the economy
- **Manufacturing**
- **Agriculture**
- **Services**

# Future Plans

## A Comprehensive Health Services Information Repository:



# Backup Charts

# Lean Health Care Process Improvements

- **EHR Summary, The Value of health Care Information Exchange and Interoperability, Health Affairs, Jan 2005**
  - \$78 billion/year total cost savings with full implementation
  - \$32 billion/year avoided costs in independent lab testing
    - 9-20% in redundant testing
    - 14% reduction in all testing
  - \$300 billion roll-out costs, then \$20 billion/year operations cost
- **Lean Health Care Summaries**
  - R. Gerard and M. Hafer, Lean Enterprise Transformation in Health Care, MIT LAI Conference, March 2005.
  - C. Jimmerson, D. Weber, and D. K. Sobek, Reducing Waste and Errors: Piloting Lean Principles at IHC, Draft paper for the Joint Commission Journal on Quality and Safety, June 2004.
- **ISO-9000 Summary, Wilkes-Barre General Hospital**  
<http://www.citizensvoice.com/site/news.cfm?newsid=13057596>
  - Deficient hospital systems continue to cause 85 percent of malpractice cases and 30 to 60 cents of every health care dollar is "wasted on the costs of poor quality."
  - Initiatives include
    - introducing ISO 9000 in the blood bank, to ensure patients receive the right blood type
    - a new \$1.5 million medication administration checking system to reduce cost and medical error rate
  - Medical errors in hospitals cause ~200,000 deaths/yr
  - \$2.9 billion in nation-wide Medicare costs to treat results of errors