

# **Designing Simulation-Based Learning Environments: Helping People Understand Complex Systems**

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# Overview

- **The Value of Simulators--Going Beyond Expert Model Building**
- **Design Considerations--The Interface**
  - Principles
  - Health Care Case Example
    - Background
    - Illustration of Design Principles for Interfaces
  - Media Company Case Example
  - Microfinance Example
- **Other Design Considerations**
  - The Model
  - Learning Experience
- **Importance and Principles of Design from the Ground Up**
- **“Watch Outs!” and Summary**

# Models...

- **Help Us**
  - Describe the Structure of Complex Systems
  - Understand Relationship Between Structure and Behavior
  - Ask “What if?” Questions Using a Consistent Framework
- **But It’s Hard to Convey Understanding of Complex Systems Through Static Means Like Power Point Presentations; Interactive Demos Are Better, But...**
- **Much of the Learning Still Remains in the Head of the Model Builder**
- **Managers Need a Means of Exploring the System Themselves and Constructing Their Own Understanding**
- **Simulators Utilize a Model, Interface, and Well-Thought Out Learning Experience to Give Them This Capability**

# Why a Simulator?--They Can:

- **Engage Decision Makers and**
  - **Let Them Test and Deepen Their Understanding by Experimenting with Their Own Strategies**
  - **Help to Convey Real Intuition About How the System Works**
  - **Enable Them to Understand of Strategic Implications of Their Actions Including Unintended Consequences**
  - **Appreciate the Importance of Systemic Thinking--In General and Especially About Their Own Problems**
  - **Develop Shared Understanding at Multiple Organizational Levels**
- **Remove the Model Builder as a Middleman--It's Not Necessary to Interpret "What the Model is Saying"**
- **Enable Experiential Learning Through a High Level of Engagement**

# Examples

- **Health Care Delivery and Community Health Status; Dealing with Change in Health Systems**
- **Newspapers Transitioning to the Internet**
- **Microfinance Institutions**
- **School Reform**
- **Simulators for Teaching Physics and Economics**
- **Port Operations and Effects of New Security Measures**

# Design Considerations--The Interface (1)

- **Allow for Gradual Introduction (e.g., by Using Pre-Configured Strategies)--To Avoid**
  - **Overwhelming Users with Choices**
  - **Video Game Behavior**
- **Consider Multiple Decision Sets with Different Choices**
- **Modular Approach for Different Audiences or as Part of Gradual Introduction**
- **If Appropriate, Make Decision Making More Real-World By Having Users Work Within Resource Constraints**
- **Design Decision Making in Ways That Support Desired Lessons--e.g., Role Playing to Show Consequences of Sub-optimizing, Opportunities to Make Collaborative Decisions**

# Design Considerations--The Interface (2)

- **Maintain Context, Be Able to Go Up and Down Between Overview and Detail**
- **Present Data in Multiple**
  - **Formats to Support Different Learning Styles**
  - **Hierarchical Levels--Drill Down Capability**
  - **Slices--System Components vs. Drivers of Performance Measures**
- **Present Data in a Way That Lets Users Move Between Analyzing Behavior in a Single Simulation and Comparing Among Simulations**
- **Identify Set of Focal Variables That**
  - **Together Give a Good Picture of the Health of the System**
  - **Provide a Basis for Objective Setting**
  - **Crystallize Comparisons Among Strategies**

## Design Considerations--The Interface (3)

- **Provide Information Support That's Easy to Get At--Status Reports, Help Screens; Avoid Manuals; Just-in-Time and On Demand as Needed**
- **Support Sensitivity Analyses to Help Learners**
  - **Better Understand the Dynamics**
  - **Not Get Hung Up on Whether Data is Right**
  - **Identify the Few Parameters that It's Important to Get Right**
  - **Appreciate Need for Robust Strategies**



# Health Care Case Example--Background

- **Health Care Changing Rapidly in Mid-1990's**
  - **Payment Shifting from Fee-for-Service to Capitation**
  - **Organization Structure Moving to Vertically Integrated Systems**
  - **Greatly Increased Competition**
  - **Horizontal Mergers**

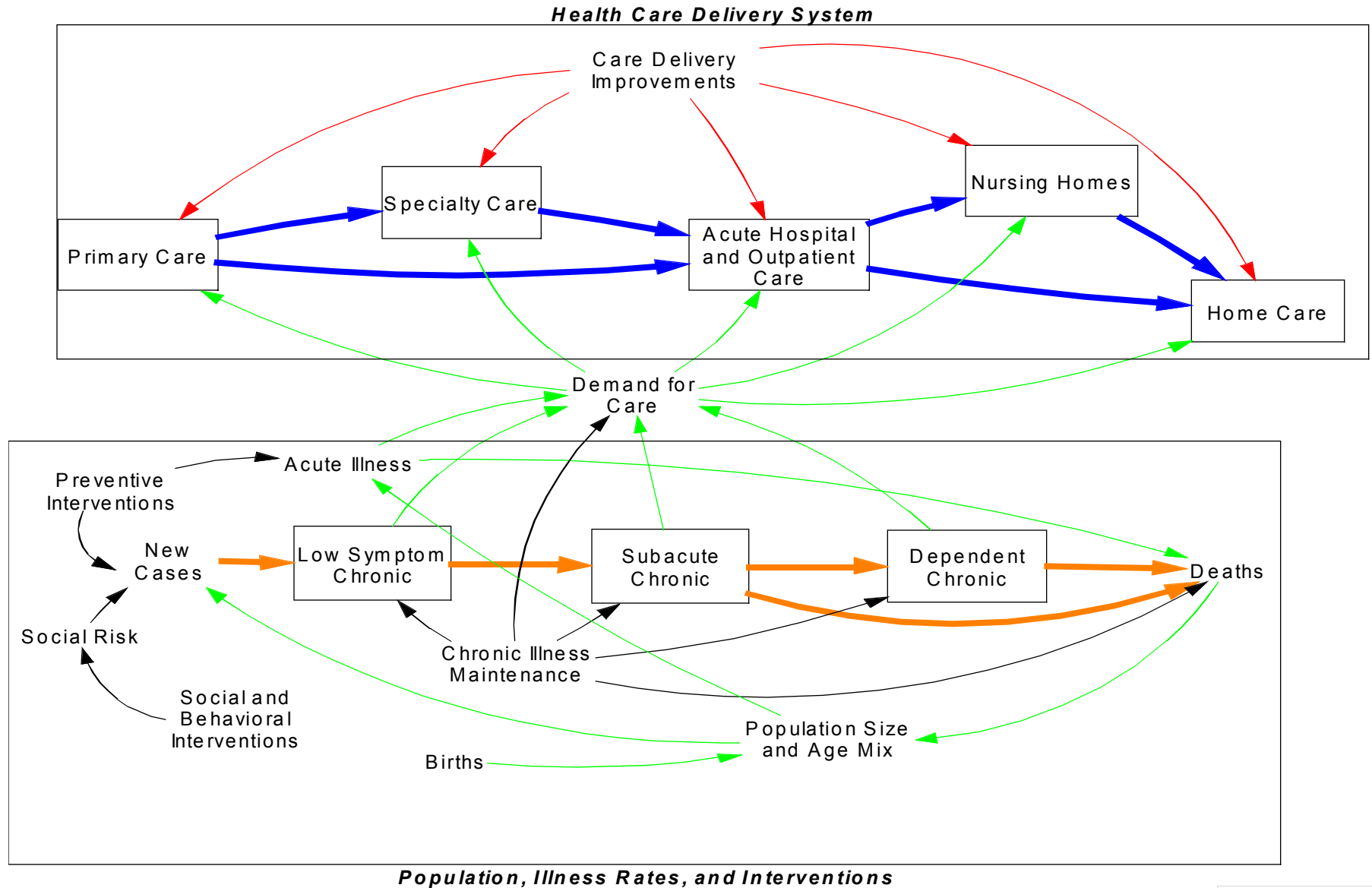
**Managers Needed to Understand How to Manage Differently and a “Practice Field” to Reduce Risk to Their Organizations**

- **Overall Objectives--Improve:**
  - **Understanding, Set Stage for Strategic Planning**
  - **Strategic Thinking e.g., See the Importance of Making Investments Over Time Rather Than Fire Fighting**
  - **Systems Thinking Skills--Overcome Departmental Stovepipe Mentality and Focus on Own Roles; Appreciate Big Picture**
- **Opportunity to Shape New Ways of Working Together--Neutral Turf Created by Hypothetical Situation**

# Health Care Case Example--Process

- **Consortium of About a Dozen Health Care Organizations, Diverse Membership, but Shared Common Challenges**
  - **Staffs and Stakeholders with Range of Backgrounds**
  - **Pressure for Concentrated Experience**
  - **Need for a Neutral Experience, Not Favor Particular Group**
- **Each Member Sent Team of Six to Initial Meetings, Smaller Design Team Later to Complete Development**
- **Started with Open Process for Eliciting Ideas and Concerns**
- **Early Prototyping Drew Rich Feedback Including Complete Redesign of One Module**
- **Learned Valuable “How Not-To’s”**

# Modular Design...Work with Subsystems or Whole System












# Pre-Configured Strategies Allow for Gradual Introduction

Health Care Delivery System Search

Year: 1997 **Select Strategies for Comparison**

Strategy: TEST Mode: Individual Provider

**Click on a Strategy to load it:**

-  1- Do Nothing
-  2- Do Nothing Under Harsh Market Conditions
-  3- Insurer and Providers are Adversaries; Reduced Premiums
-  4- Insurer Collaborates with Providers by Absorbing Losses; Reduced Premiums
-  5- Individual Provider Best Efforts
-  6- Individual Provider Best Efforts Plus Demand Management
-  7- Individual Provider Best Efforts Plus Premiums Set to Market
-  8- Creation of Network Pool to Reallocate Funds Among Providers; Premiums=Cost Plus 5%
-  9- Creation of Network Pool to Reallocate Funds and Make Network Investments; Premiums=Cost Plus 5%

**Loaded Strategies**

NOTE: On results screens, you will see data for Loaded Strategy #1.

1. TEST
2. INDIV1
- 3.
- 4.

# Role Playing Helps Teach Lessons About Collaboration

Health Care Delivery System

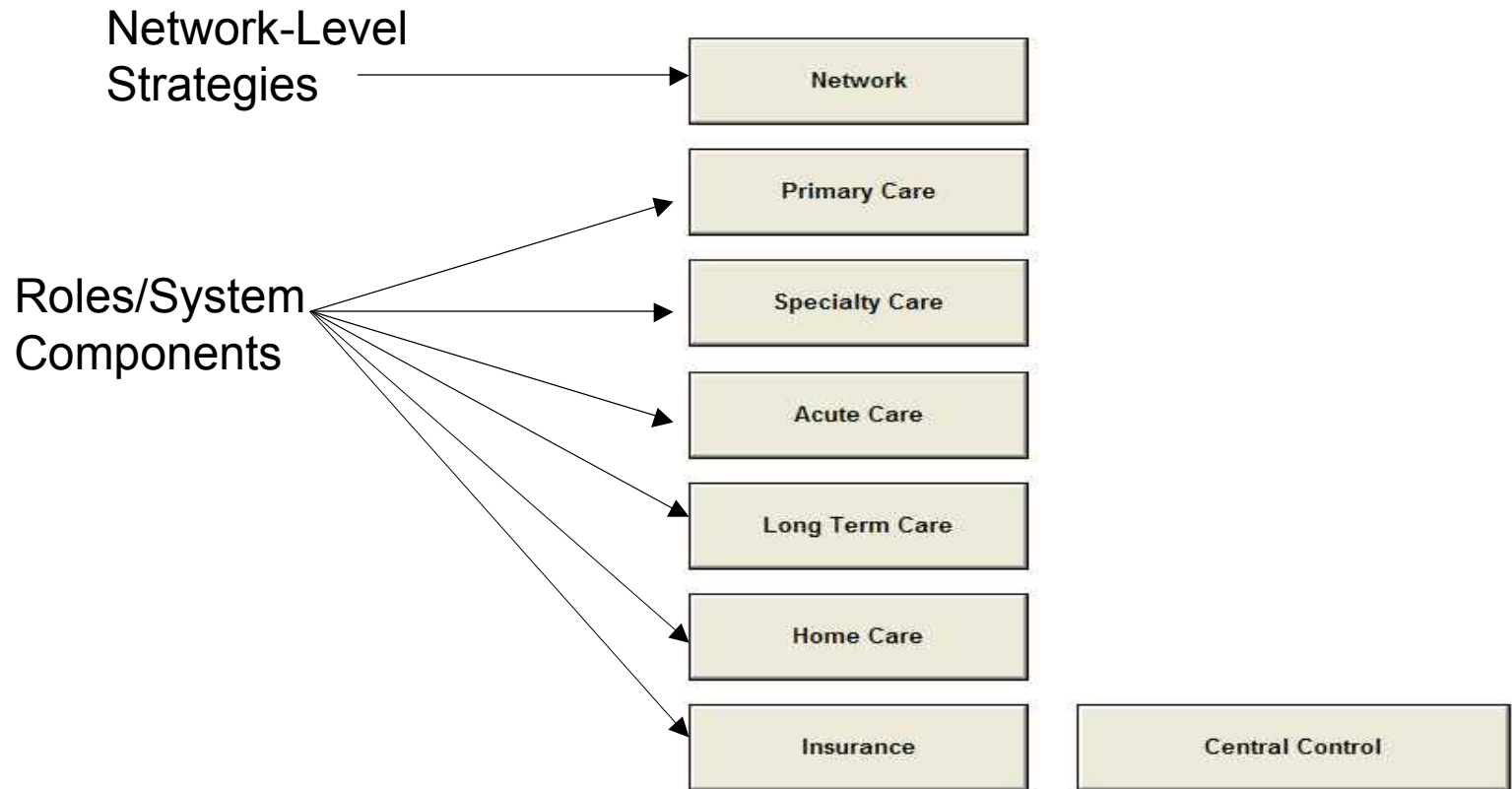
Year: 1997

Strategy: TEST

Core Decisions

Mode: Individual Provider

Select from the following:



start

Inbox - Outlook Expr...

ISDC 2005

Microsoft PowerPoint ...

Health Care Delivery ...

2:46 PM

# Each Role Makes Its Own Decisions Subject to Resource Constraints

Health Care Delivery System

Year: 1997

Strategy: TEST

Specialty Care Decisions

Mode: Individual Provider

?	Add/Subtract Specialty Physicians	-20	0	20
?	Relative Compensation	0.5	1	1.5
?	Invest in Clinical Information Systems	\$0	0	\$5M
?	Invest in Process Redesign	\$0	0	\$5M
?	Invest in Technology	\$0	0	\$10M
?	Demand Management Budget	\$0	0	\$3M

Sufficient Funds?

Available to Invest (Estimate): \$ 15.79 M

Proposed Investment: \$ 0

Resource Constraints

Options:

- Copy Last Period
- ? Help ?
- < Previous
- Decisions
- Next >
- Status Report
- Central Control

start | Inbox - Outlook Expr... | ISDC 2005 | Microsoft PowerPoint ... | Health Care Delivery ... | 7:48 PM

# Network Decisions Provide Opportunity for Collaborative Strategies

Health Care Delivery System [Min] [Max] [Close]

**Year: 1997** **Network Decisions**

**Strategy: INDIV3** Mode: Individual Provider

?	Network Information Systems Investment	<input type="text" value="0"/> \$0 <span style="float: right;">\$30M</span>	?	Network Allocation to Primary Care	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>
?	Investment in Staff Development	<input type="text" value="0"/> \$0 <span style="float: right;">\$1M</span>	?	Network Allocation to Specialty Care	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>
?	Network Care Management Investment	<input type="text" value="0"/> \$0 <span style="float: right;">\$2M</span>	?	Network Allocation to Acute Care	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>
?	Network Contribution Rate	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>	?	Network Allocation to Long Term Care	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>
			?	Network Allocation to Home Care	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>
			?	Network Allocation to Insurance	<input type="text" value="0"/> 0.00 <span style="float: right;">1.00</span>

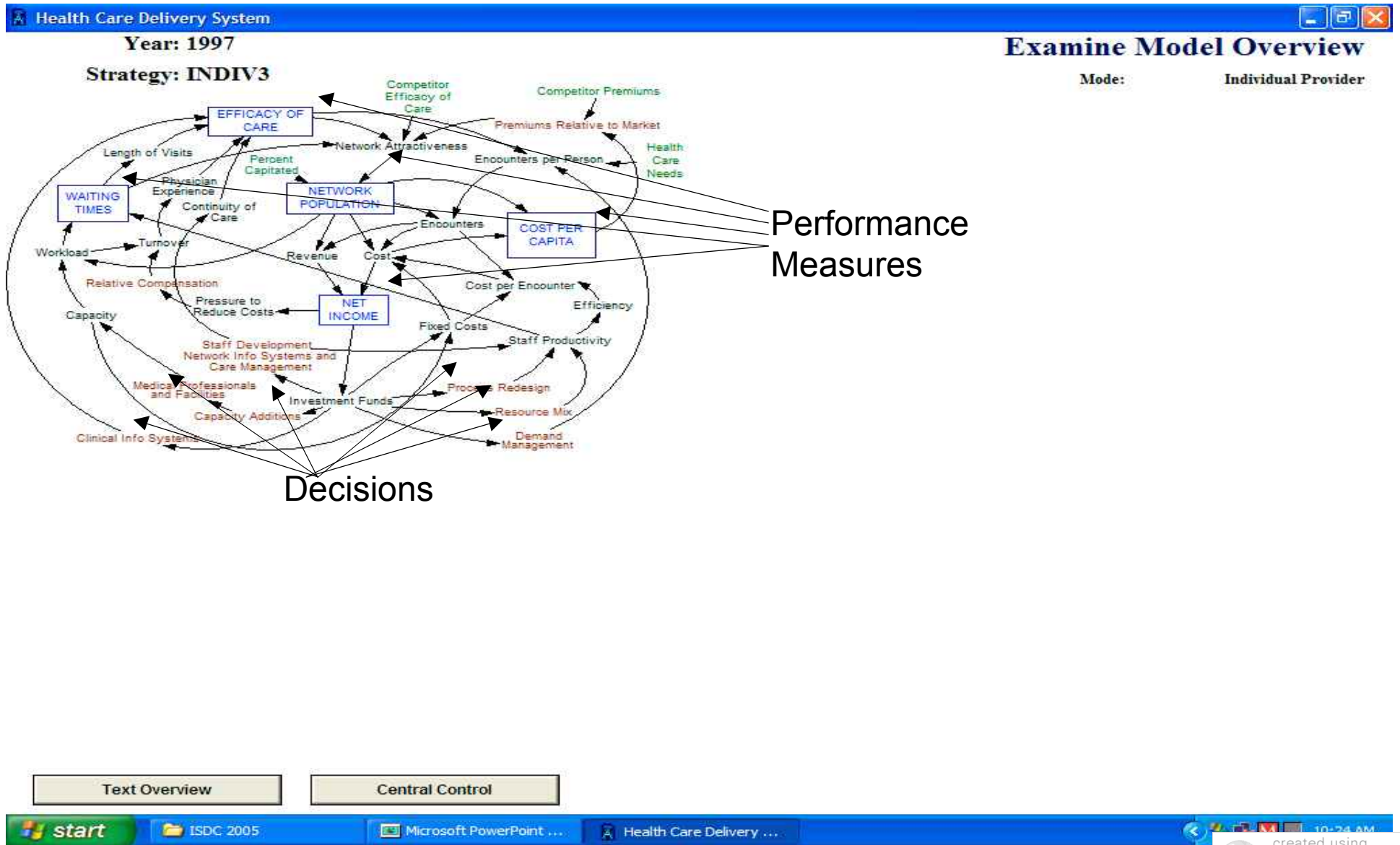
**Sufficient Funds?**

Available to Invest (Estimate): \$ 0

Proposed Investment: \$ 0

**Options:**

# Carefully Selected Performance Measures Give Users Balanced View of Their Strategies



Text Overview

Central Control



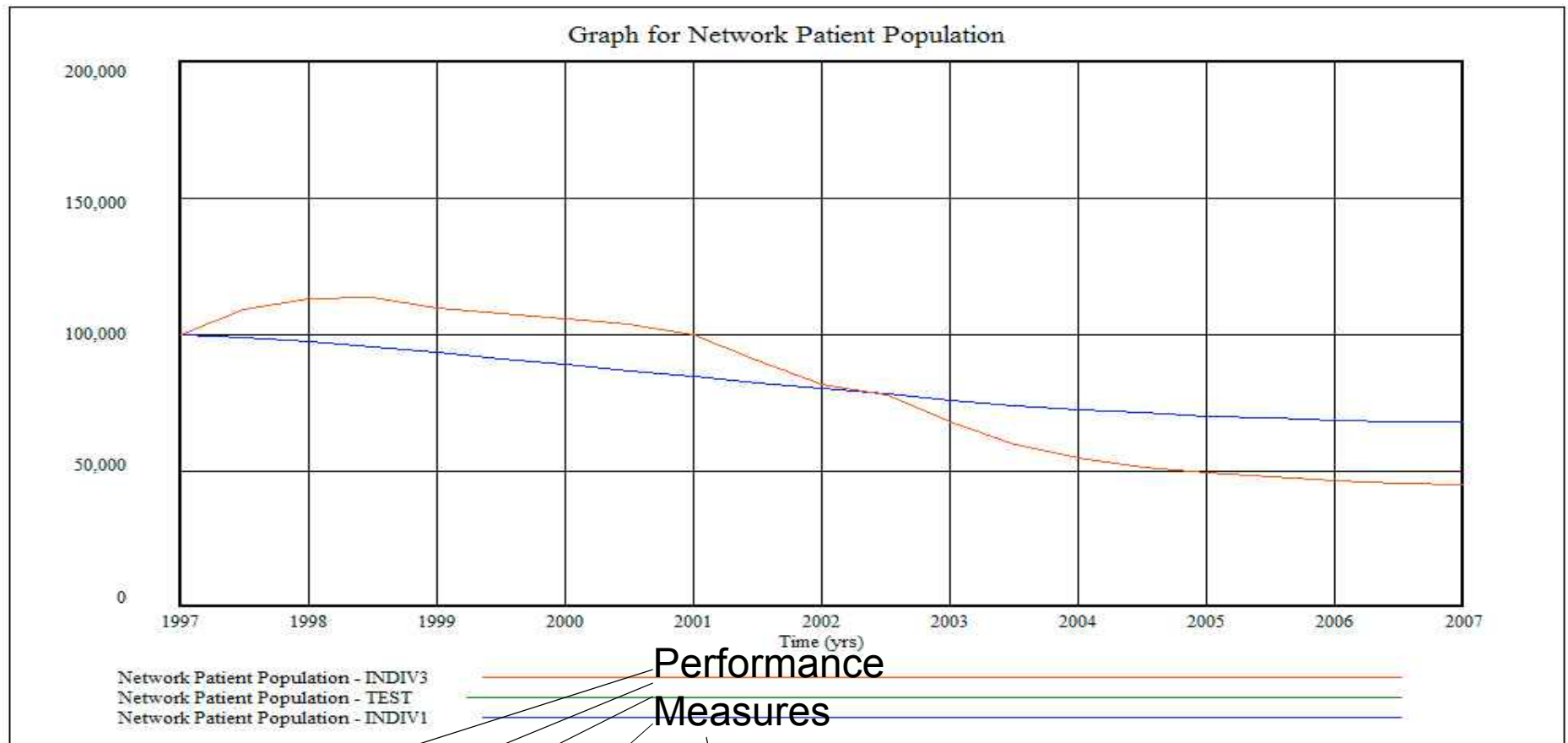
# Comparisons of Selected Variables Across Simulations

## Let Users Identify Consequences of Strategies

Health Care Delivery System Compare Strategies

Year: 1997 Mode: Individual Provider

Strategy: INDIV3

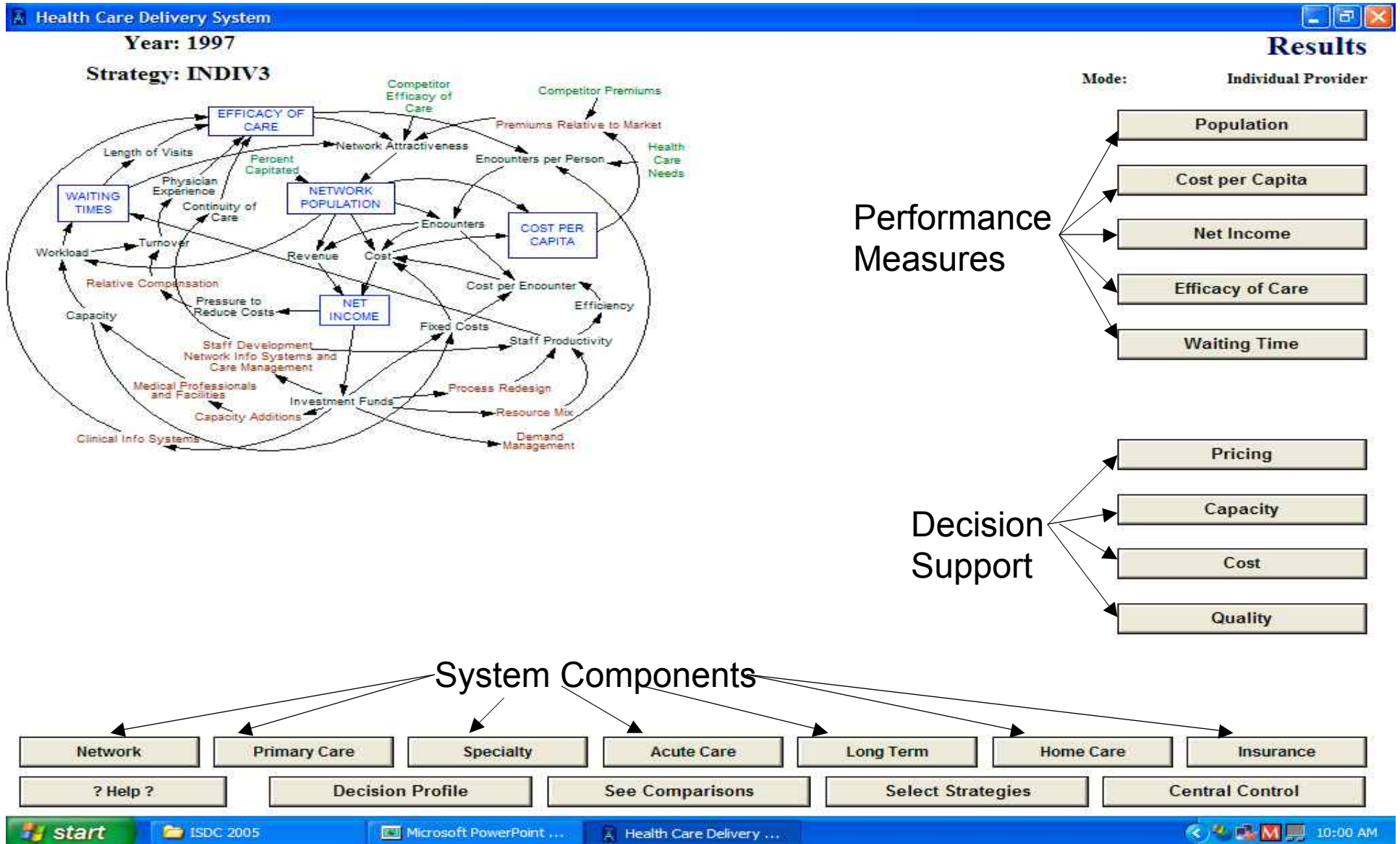


Performance Measures

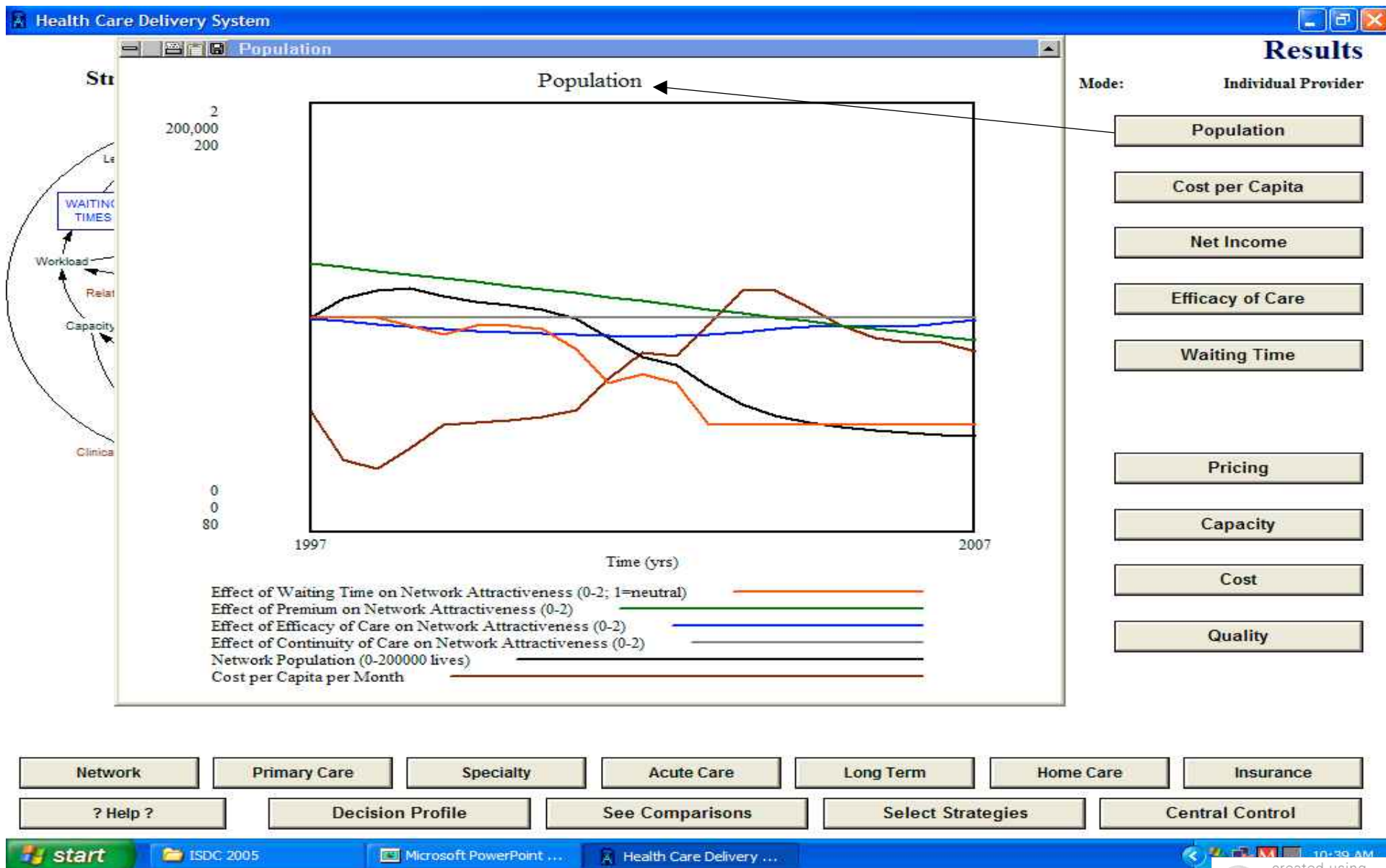
Population    Efficacy    Waiting Time    View Results    Select Strategies

Cost per Capita    Net Income    ? Help ?    Central Control

# Users Can Then “Drill Down” to Understand Why Strategies Produce the Results That Are Observed



# Detailed Information Helps Explain Causes of Behavior and Pinpoint Problems with Strategies



# Having Data in Multiple Formats Supports Different Learning Styles

Year: 1997

Strategy: INDIV3

## Summary Statistics

Mode: Individual Provider

	1997	1999	2001	2003	2005	2007
Population Served	100,000	109,733	99,660	68,110	49,324	44,811
% Capitated	1	9.964	18.29	25.95	32.99	39.24
Network Market Share (%)	33.33	36.57	33.22	22.70	16.44	14.93
Cumulative Member Years	0	220,365	431,581	599,779	712,109	805,536
# of Primary Care Physicians	40	37.95	29.66	18.53	10.39	5.404
Population per Physician	2,500	2,891	3,359	3,674	4,744	8,292
# of Specialty Care Physicians	60	57.68	57.75	52.02	36.20	20.15
Population per Physician	1,666	1,902	1,725	1,309	1,362	2,223
# of Acute Care Beds	170	170	120	90	70	50
Average Acute Occupancy (%)	79.18	88.66	91.55	91.04	90.25	90.87
Outpatient Procedure Capacity	17,000	17,000	17,000	17,000	17,000	17,000
Outpatient Procedure Utilization (%)	99.99	99.99	99.99	79.43	58.72	48.14
# of Skilled Care Beds	80	80	80	80	80	80
Average Skilled Bed Occupancy (%)	95.45	100	80.07	57.63	43.38	32.22
# of Intermediate Care Beds	100	100	100	100	100	100
Average Intermediate Occupancy (%)	93.79	98.99	71.36	48.97	38.23	27.48
Home Care Annual Visit Capacity	55,200	52,467	45,115	37,244	30,795	25,518
Home Care Capacity Utilization (%)	91.30	108.61	73.51	58.00	60.00	46.33
Network Efficacy of Care	4.985	4.641	4.451	4.446	4.740	4.953
Network Average Waiting Time/Norm	.0155	1.387	1.531	2.122	2.127	3.331
Capitated Premium per Month	100	80	80	80	80	80
Competitor Capitated Premium	100	94.17	88.68	83.51	78.64	74.06
Fee for Service Premium per Month	135	110	110	110	110	110
Competitor FFS Premium	135	127.13	119.72	112.74	106.17	99.98
Cost per Capita	113.92	110.06	114.31	138.25	137.64	130.55
Total Provider Net Income	24.86 M	-4.020 M	-11.71 M	-29.45 M	-22.22 M	-17.38 M
Cumulative Provider Net Income	0	19.12 M	4.488 M	-40.93 M	-99.00 M	-1378 B

? Help ?

Central Control

# Status Reports and Help Screens Improve Ease of Use

The screenshot displays the 'Health Care Delivery System' interface. A help window titled 'Add/Subtract Primary Care Physicians Help' is open, providing detailed information about the decision and its financial implications. The main window shows a 'Primary Care Decisions' screen with a 'Mode: Individual Provider' setting. A 'Primary Care Status Report' window is also open, displaying various metrics such as 'Percent of Planned Investments Made', 'CAPACITY', 'Ratio of Demand to Capacity', and 'PRIMARY CARE - FINANCIAL REPORT'. The interface includes a sidebar with decision categories like 'Information Systems', 'Invest in Process Redesign', and 'Demand Management', each with a 'Sufficient Funds?' indicator. At the bottom, there are navigation buttons for 'Copy Last Period', '? Help?', '< Previous', 'Decisions', 'Next >', 'Status Report', and 'Central Control'.

**Health Care Delivery System**

**Add/Subtract Primary Care Physicians Help**

Add/Subtract Primary Care Physicians (0-20 positions for physicians per 2-year period) This decision sets the number of funded positions. Investment of \$35,000 per physician for recruiting, etc. plus added operating costs for compensation, support costs, etc. is required to add a position. These positions may be vacant if turnover is high. Physician turnover will go up when workload is high and net income for the practice is negative. A reduction in positions is initially accomplished through attrition; if this does not produce the desired number, layoffs occur.

Starting number of primary care physicians = 40.

**Primary Care Decisions**  
Mode: Individual Provider

**Primary Care Status Report**

PRIMARY CARE - STATUS REPORT

Percent of Planned Investments Made	100
CAPACITY	
Number of Physicians (1997=40)	40
Percent Experienced	76.95
Ratio of Demand to Capacity	.9230
Average Wait for New Visit (months)	.01
Population per Physician	2,500
PRIMARY CARE - FINANCIAL REPORT	
Primary Care Revenue	21.81 M
Primary Care Cost	19.17 M
Primary Care Net Income	2.644 M

NOTE: Only costs are reported for Network Manager strategies.

Capitated Payment to Primary Care (pmpm)	12.5
Primary Care Cost per Capita (pmpm)	15.97
Primary Care Visit Rate	90
Primary Care Cost per Encounter	78.83
EFFICACY OF CARE	
Cumulative Investment in Clinical Info Systems	0
Efficacy of Care (0-10, norm=5)	4.873
Average Length of Visits (minutes)	24.97
PRODUCTIVITY/COST REDUCTION	
Relative Compensation (ratio; 1=market)	1
Turnover Rate (%)	12.07

**Sufficient Funds?**

Available to Invest (Estimate): \$ 12.78 M

Proposed Investment: \$ 0

Copy Last Period    ? Help ?

< Previous    Decisions    Next >

Status Report    Central Control

# Sensitivity Analyses Let Users Change Assumptions and Appreciate Need for Robust Strategies

Health Care Delivery System

Year: 1997

Strategy: INDIV3

Assumption Choices

Mode: Individual Provider

?	Impact of Process Redesign		?	Effect of Capitation on Referrals to Specialists and to Acute Care	
?	Impact of Demand Management Investments		?	Effect of Premiums on Network Attractiveness	
?	Impact of Clinical Info. Sys. Investments on Efficacy of Care		?	Effect of Efficacy of Care on Network Attractiveness	
?	Impact of IS, Care Management and Staff Development		?	Effect of Waiting Times for Care on Network Attractiveness	
?	Effect of Compensation and Workload on Provider Turnover		?	Effect of Efficacy of Care on Return Visits per Episode	

Pessimistic    Default    Optimistic

Pessimistic    Default    Optimistic

Pessimistic    Default    Optimistic

Pessimistic    Default    Optimistic

Pessimistic    Default    Optimistic

Pessimistic    Default    Optimistic

Options:

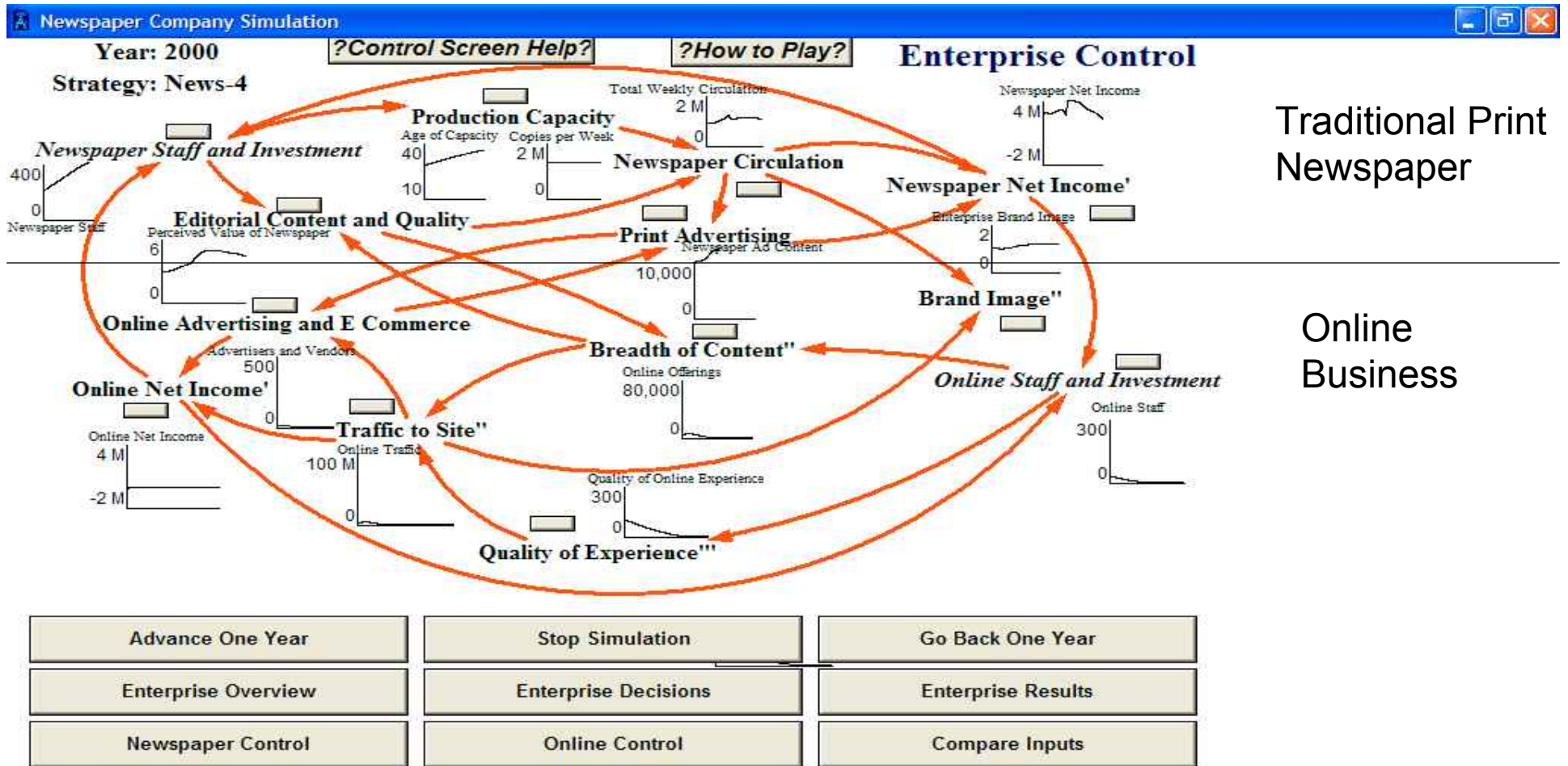
View Results    ? Help ?

Central Control

# Media Company Example

- **Traditional Newspaper That Had Been Profitable, but Facing Increasing Competition**
- **Growing Online Operation That Functioned as a Separate Business, Not Clear How Profitable It Would Be**
- **Strategic Questions:**
  - **How Much to Invest in Online Business**
  - **Strategies for Achieving Critical Mass in Online**
  - **How to Integrate Newspaper and Online to Create Synergy; Function as a Media Enterprise Rather Than Collection of Separate Businesses**
  - **Strategies for Keeping Newspaper Profitable So That It Can Serve as a “Cash Cow” for Investment in Online Business**

# Media Company Simulator Presents Enterprise-Level Results in Context of Causal Diagram





# Alternative Overview at Enterprise Level

Year: 2000

Newspaper Overview

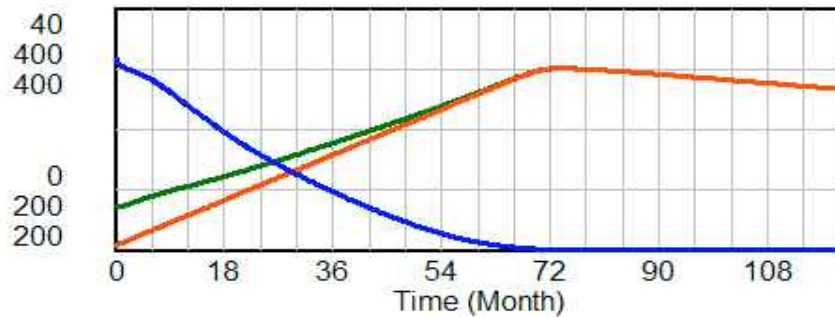
Online Overview

Enterprise Control

**Enterprise Overview**

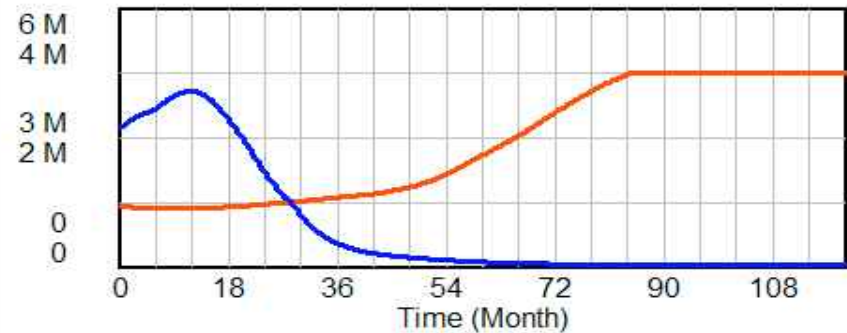
Strategy: News-4c

### Staff Overview



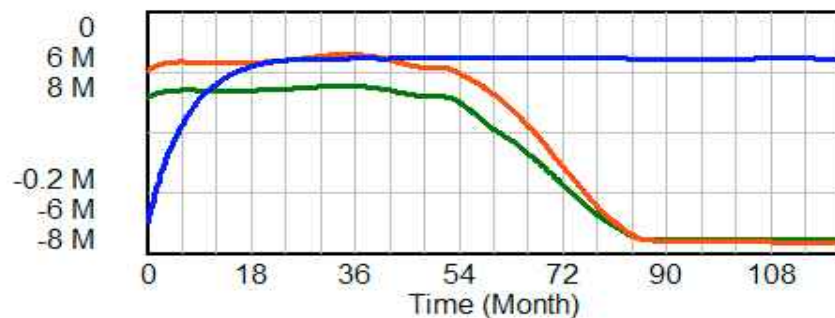
Total Online Staff : News-4c  
 Total Newspaper Professional Staff : News-4c  
 Total Enterprise Staff : News-4c

### Circulation and Traffic Overview



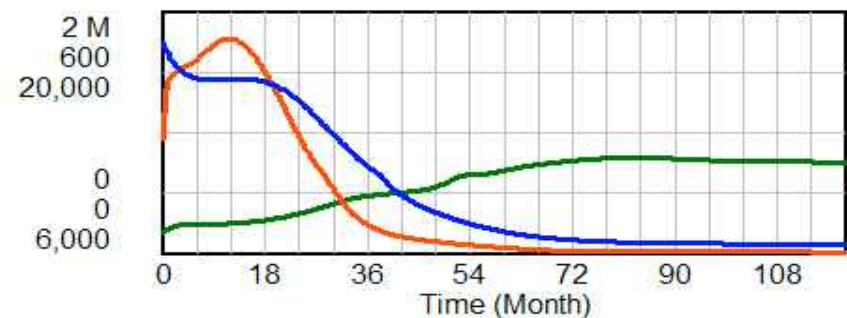
Total Traffic to Site : News-4c  
 Total Weekly Circulation : News-4c

### Financial Overview



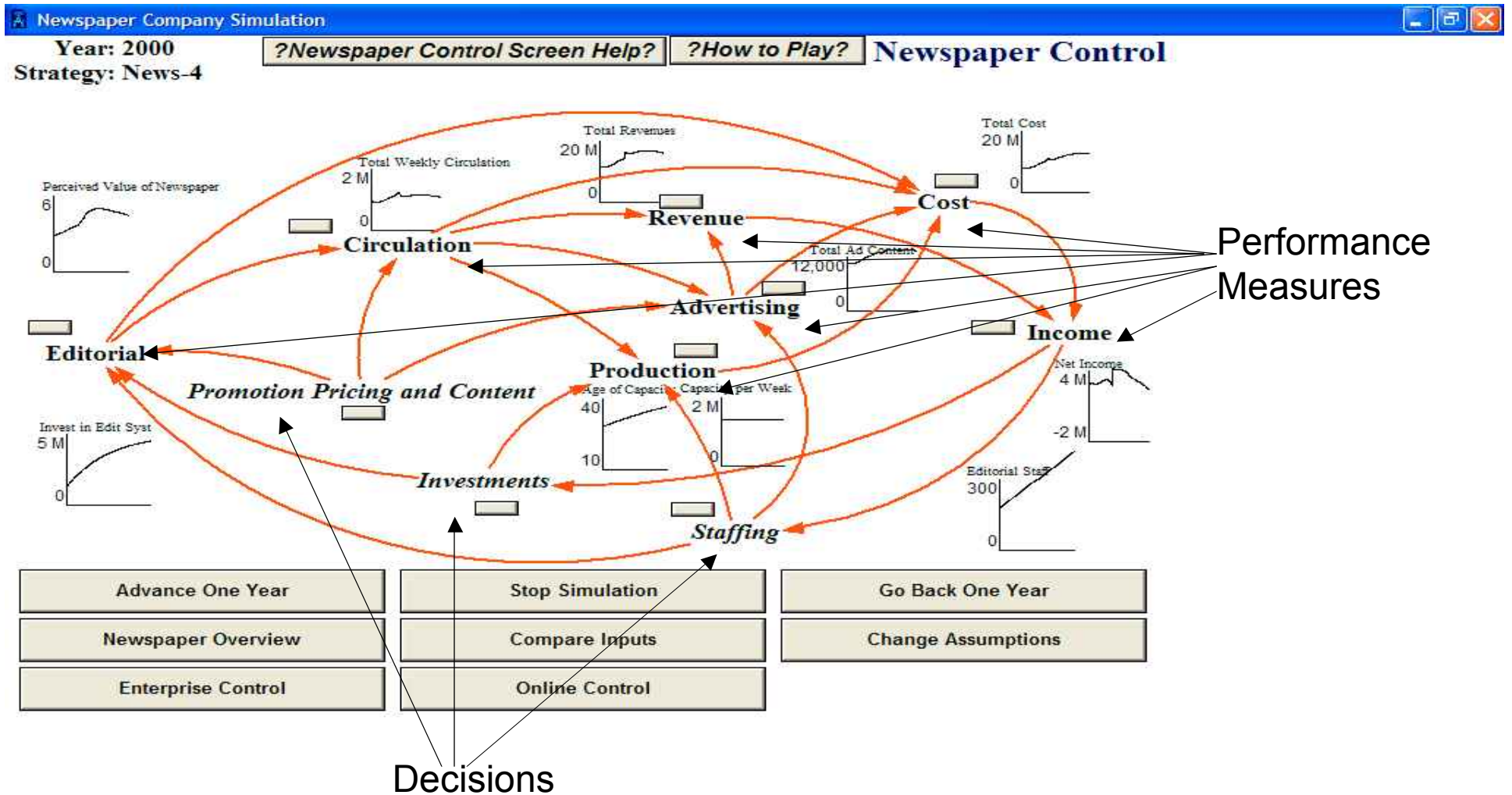
Online Net Income : News-4c  
 Newspaper Operating Income : News-4c  
 Enterprise Net Income : News-4c

### Advertising and Commerce Overview



Paid Impressions : News-4c  
 Online Transactions : News-4c  
 Display Advertising Content : News-4c

# More Detailed Overview is Provided for Each Business--Traditional Print Newspaper...



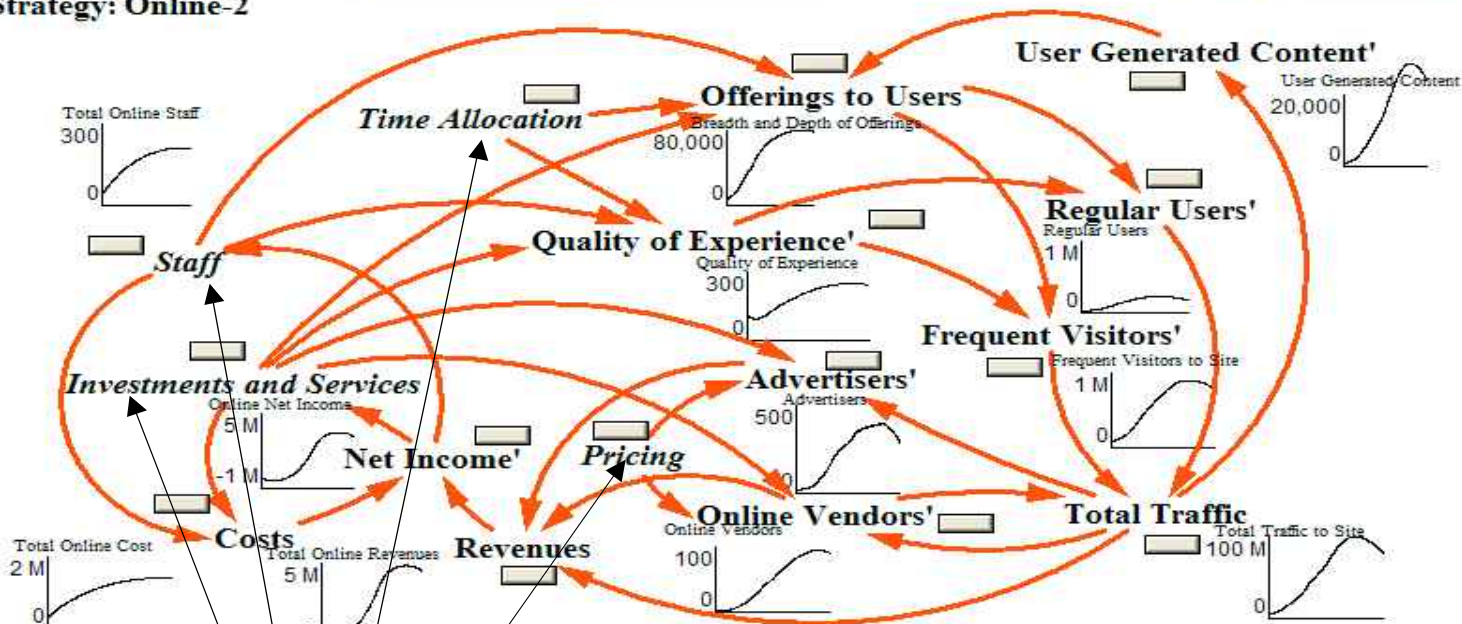
# ...and New Online Business

Year: 2000  
Strategy: Online-2

[?Online Control Screen Help?](#)

[?How to Play?](#)

Online Control



Advance One Year	Stop Simulation	Go Back One Year
Online Overview	Compare Inputs	Change Assumptions
Enterprise Control	Newspaper Control	

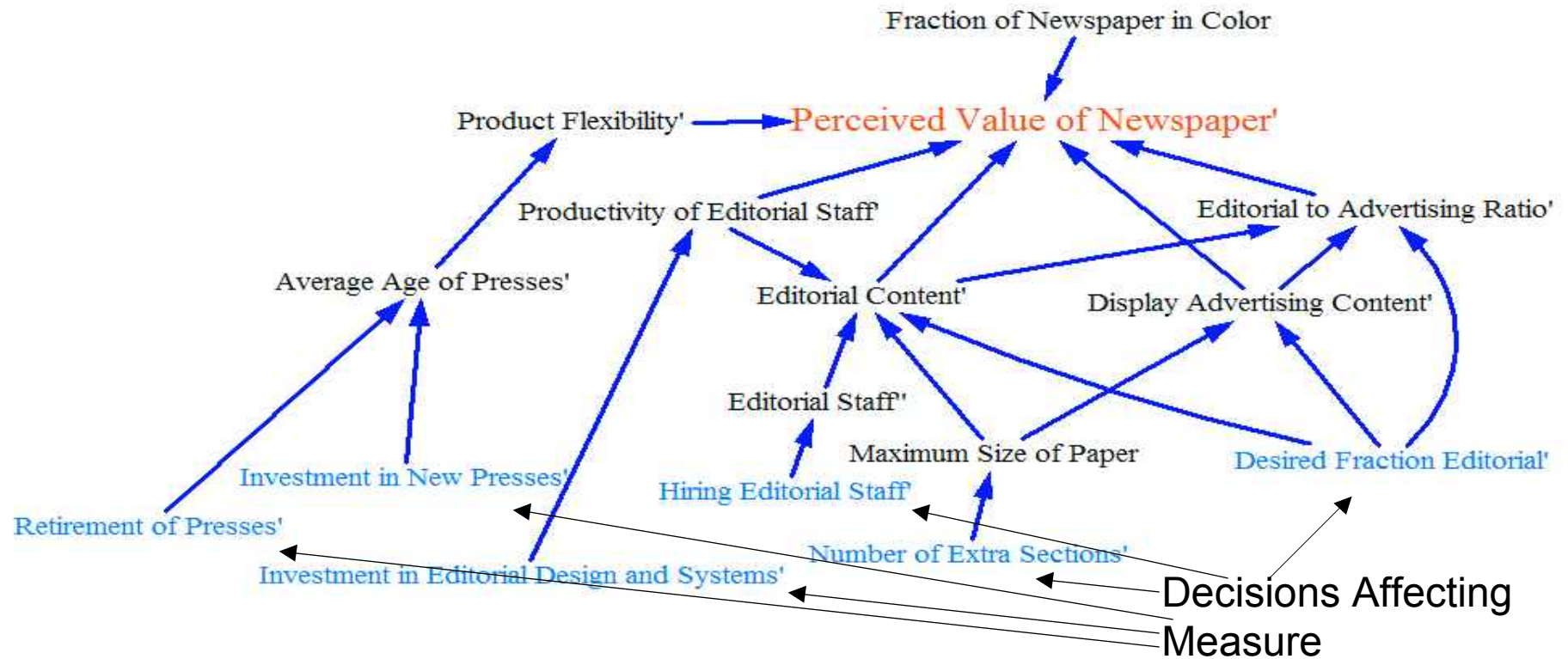
Decisions

# Buttons on Overview Screens Take Users to More Detailed Views of Causal Structure,

Year: 2000

Strategy: News-4

Compare Strategies for Newspaper

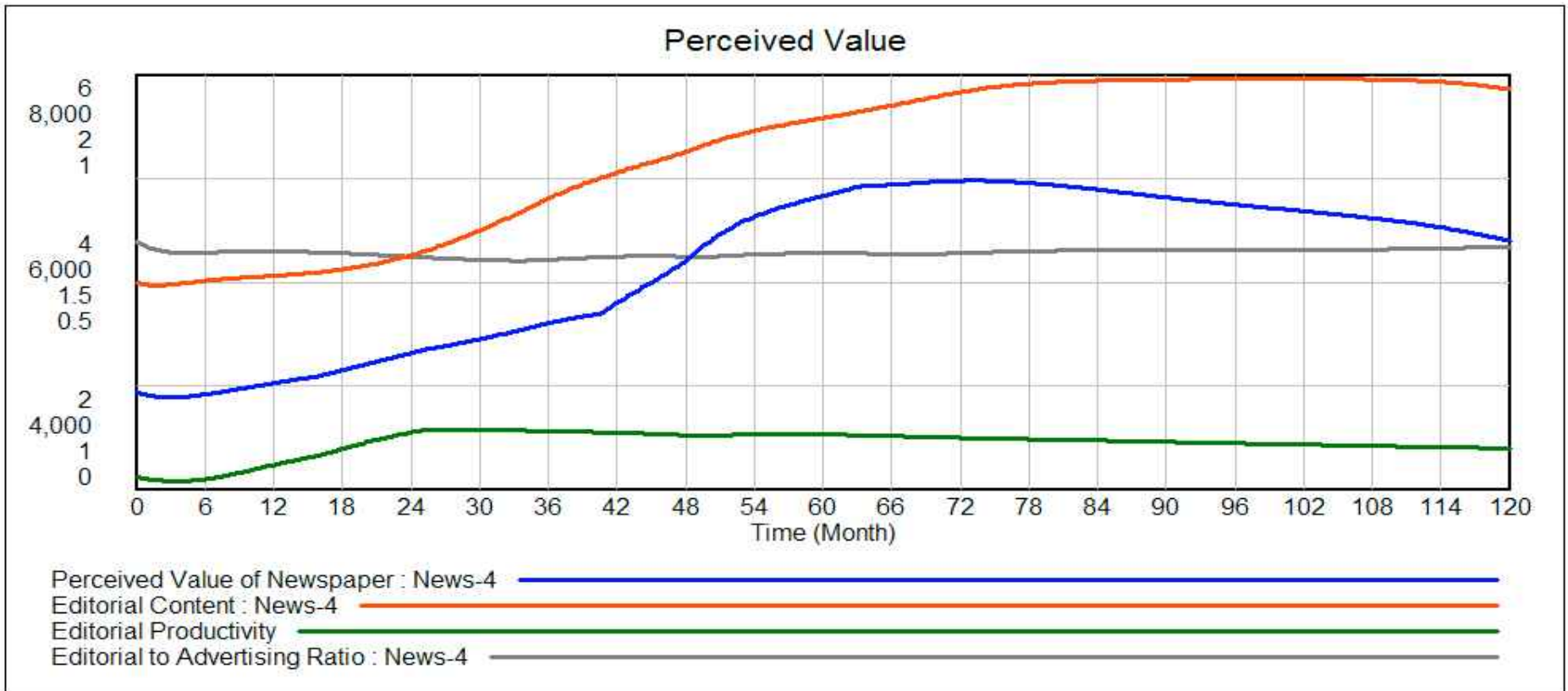


Operating Income	Perceived Value	Brand Image	Decisions	Detailed Results
Total Cost	Circulation Revenue	Display Ad Revenue	Causal Graph	Select Strategies
Metro Circulation	National Circulation	Display Advertising	Comparison	Central Control
Editorial Cost	Circulation Cost	Production Cost		

# Behavior of Other Variables That Affect Key Measures,

Newspaper Company Simulation Compare Strategies Help Compare Strategies for Newspaper

Year: 2000  
 Strategy: News-4



Operating Income	Perceived Value	Brand Image	Decisions	Detailed Results
Total Cost	Circulation Revenue	Display Ad Revenue	Causal Factors	Select Strategies
Metro Circulation	National Circulation	Display Advertising	Comparison	Central Control
Editorial Cost	Circulation Cost	Production Cost		

# ...and Decision Screens

Newspaper Company Simulation [Min] [Max] [Close]

**Year: 2000** **Newspaper Promotion, Pricing & Content Decisions**

**Strategy: Online-2** Decisions Help

?	Metro Newspaper Price \$	<input type="text" value="0.45"/>	?	Metro Subscription Price (\$ per Week)	<input type="text" value="2"/>
?	National Newspaper Price	<input type="text" value="0.55"/>	?	National Subscription Price (\$ per Week)	<input type="text" value="2"/>
?	Display Advertising Rates (\$ per Inch)	<input type="text" value="50"/>	?	Metro Subscriber Promotion (\$ per Year)	<input type="text" value="0"/>
?	Metro Promotions (\$ per Year)	<input type="text" value="2 M"/>	?	National Subscriber Promotion (\$ per Year)	<input type="text" value="0"/>
?	National Promotions (\$ per Year)	<input type="text" value="2 M"/>	?	Number of Extra Sections (Sections per Week)	<input type="text" value="6"/>
?	Marketing Expenditures (\$ per Year)	<input type="text" value="2 M"/>	?	Desired Fraction Editorial (Fraction of Content)	<input type="text" value="0.37"/>

Detailed Results	Advance One Year
Investment Decisions	Central Control
Hiring and Training	Sufficient Funds?

<b>Enterprise Allocation to Newspaper: \$</b>	<b>5.420 M</b>
<b>Newspaper Budget Available: \$</b>	<b>135.51 M</b>
<b>Proposed Newspaper Budget: \$</b>	<b>97.98 M</b>

# Microfinance Case Example

- **Simulator developed for Harvard's Kennedy School of Government for training both graduate students and practicing MFI managers**
- **Strategic Questions Addressed by Simulator**
  - **Right focus given population in market and its needs**
  - **Product design (mix of rates terms, policies) that meets populations needs and MFI goals and assures MFI's survival and ability to grow**
  - **How fast to grow in terms of branches, staff, etc.**
  - **Product mix--e.g., whether or not to accept savings deposits**
  - **Mix of external sources of funds**

# Hierarchy of Decisions: First Select Overall Strategy

Vensim Application Environment

## KSG Micro Finance Institutions Management Simulator

Initial

### Creating the Strategy for Your MFI

#### Decisions: First Select the Target Market

Both Men and Women

(Unchecking Box Selects Women Only)

#### Lending to New or Existing Businesses

- New Businesses Only
- Existing Businesses Only
- Both New and Existing Businesses

#### Nature of Loans Being Granted

- Agriculture
- Trade

#### Scenario Switches

1  2a  2b  3  4

Use Scenario from Spreadsheet

Means Testing to Select Income Groups

(If unchecked, market will determine income profile of borrowers.)

If checked, also check the income groups below to be included in the target market.

- \$ 200 Lowest Quintile
- \$ 400
- \$ 500 Middle Quintile
- \$ 700
- \$2700 Highest Quintile

(Amounts shown are median income for each quintile.)

Control

Results

Advance Simulation

#### Target Market

#### Then Make Your First Set of Decisions About

Loan Design

Staff/Productivity

Info Syst and Savings

Sources of Funds

start ISDC 2005 Microsoft PowerPoint ... Vensim Application En... 4:54 AM



# Then Fine Tune Strategy with Decisions About Product Mix, Growth, Sources of Funds, Etc.

Vensim Application Environment

## KSG Micro Finance Institutions Management Simulator

Initial **Creating the Strategy for Your MFI**

*Decisions: Design the Loan Product You Will Offer*

Offer Group vs. Individual Loans?

- Individual Only
- Groups Only
- Both Individual and Group Loans

Frequency of Payment

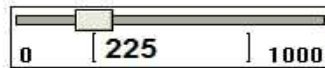
- Monthly
- Weekly
- Every Six Months

Collateral Required?

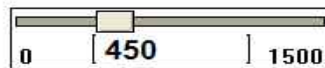
Compulsory Savings?

Monthly Interest Rate Paid on Compulsory Savings

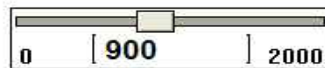
Loan Amounts?



First Stage

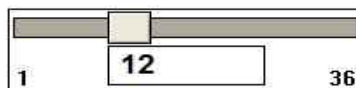


Second Stage

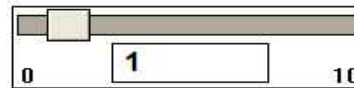


Third Stage

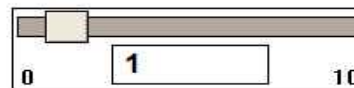
Term of Loans (Months)



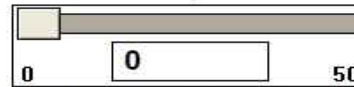
Commission Rate



Monthly Interest Rate



Built-In Late Payment Penalty



(Expressed as percentage of interest rate.)

Interest Calculation

- Straight Interest
- Declining Balance

Control

Results

Advance Simulation

*Other Decisions*

*Loan Design*

Target Market

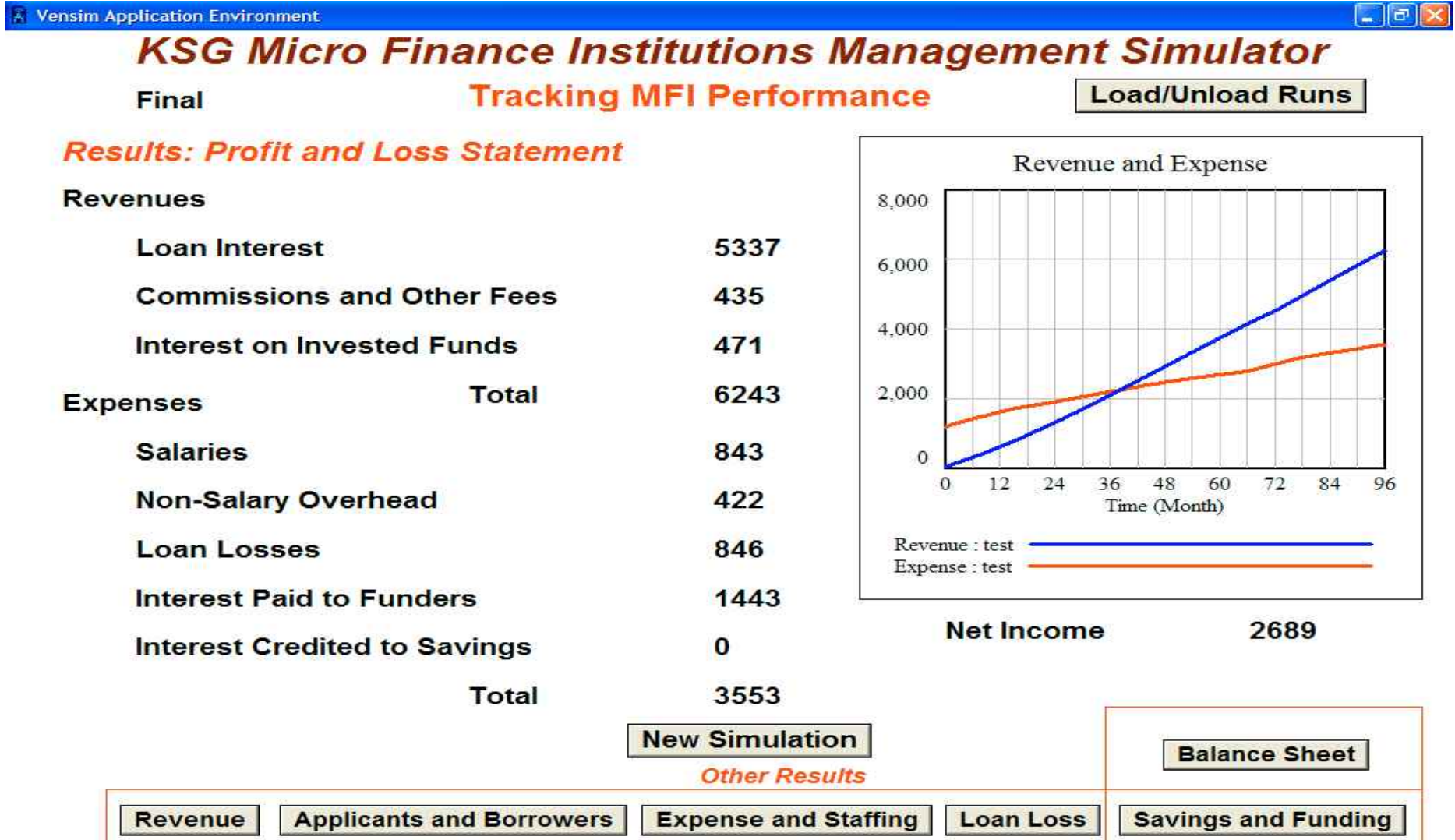
Staff/Productivity

Info Syst and Savings

Sources of Funds

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# For Results, Users Can Drill Down from High Level Such as P&L to Understand Reasons for MFI Performance



# For Example, The Components of Revenue...

Vensim Application Environment

## KSG Micro Finance Institutions Management Simulator

Final **Tracking MFI Performance** Load/Unload Runs

**Results: Revenues**

	First Stage	Second Stage	Third Stage	Total
Group	\$ 836	1346	1425	3607
Individual	\$ 499	812	862	2174
<b>Total</b>	<b>\$ 1335</b>	<b>2158</b>	<b>2287</b>	<b>5781</b>

**Average Payments**

Principal	19	38	75
Interest	2	5	10
<b>Total</b>	<b>21</b>	<b>42</b>	<b>85</b>

**Components of Revenue** Total Revenue Stage 1 Stage 2 Stage 3

**Drivers of Revenue:** Total Borrowers Revenue per Borrower Loss Rate

**Revenue** Other Results Back to P+L Changes in Borrowers

Applicants and Borrowers Expense and Staffing Loan Loss Savings and Funding

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# ...and Factors That Drive Total Revenue

Vensim Application Environment

## KSG Micro Finance Institutions Management Simulator

Performance Load/Unload Runs

**Borrowers**

Total Borrowers : test  
Total Borrowers : newtest

**Revenue per Borrower**

Revenue per Borrower : test  
Revenue per Borrower : newtest

**Overall Loss rate**

Overall Loss Rate : test  
Overall Loss Rate : newtest

5	10
42	85

Other Results

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# Ability to Output to Spreadsheet Gives the Greatest Detail and Option of Further Analysis

Revenue	0	76	122	168	214	260	308	356	406	456	507	559
Revenue YTD	0	44	140	282	470	704	985	1,314	1,692	2,120	2,598	3,128
Revenue Cumulative	0	44	140	282	470	704	985	1,314	1,692	2,120	2,598	3,128
Revenue per Borrower	0	5	3	3	3	3	3	3	3	3	3	3
Loan Interest Paid Over Term of Loan	0	33	77	122	167	212	257	302	348	394	442	490
Loan Interest Paid Over Term of Loan YTD	0	11	63	160	301	488	719	995	1,317	1,686	2,101	2,563
Loan Interest Paid Over Term of Loan Cumulative	0	11	63	160	301	488	719	995	1,317	1,686	2,101	2,563
Interest Income on Unborrowed Funds	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income on Unborrowed Funds YTD	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income on Unborrowed Funds Cumulative	0	0	0	0	0	0	0	0	0	0	0	0
Commission Income	0	43	45	46	47	49	51	54	58	62	65	69
Prepaid Late Payment Penalty Payments	0	0	0	0	0	0	0	0	0	0	0	0
Total Fees Paid	0	43	45	46	47	49	51	54	58	62	65	69
Total Fees Paid YTD	0	33	77	122	169	216	266	319	375	434	497	565
Total Fees Paid Cumulative	0	33	77	122	169	216	266	319	375	434	497	565
First Stage Group Revenue	0	34	72	103	132	160	187	214	239	265	289	312
Second Stage Group Revenue	0	0	0	0	1	2	4	8	13	19	26	35
Third Stage Group Revenue	0	0	0	0	0	0	0	0	0	0	0	0
First Stage Individual Revenue	0	22	43	61	78	95	112	128	143	158	173	187
Second Stage Individual Revenue	0	0	0	0	1	1	3	5	8	11	16	21
Third Stage Individual Revenue	0	0	0	0	0	0	0	0	0	0	0	0
Expense	1162.5	1225.303	1271.604	1308.904	1343.357	1377.415	1411.671	1445.998	1480.104	1513.504	1546.341	1578.653

# Design Considerations--The Model (1)

- **Maintain Right Level of Detail, Resist Pressure for More--  
Keep Balance Among Issues, Sectors, Stakeholders**
- **Have Enough (Dynamic) Complexity--People Need to  
Recognize Their World**
- **Make Certain That Model Can Replicate Key Reference  
Modes**
- **Use a Modular Structure If Possible--Be Able to Deal with  
Smaller Parts of the Problem and Then Combine to Look at  
Entire System**
- **Do Extensive Testing to Avoid Misleading Results**

## **Design Considerations--The Model (2)**

- **Validation Standard Should Be Robustness, Plausible Behavior Under a Variety of Conditions**
- **Validity is in Having Some Confidence in Comparative Results, That the Model is a Consistent Test-bed for Strategy**
- **People Need to Be Sold on the Idea That No Model is Really “Right”, The Model’s Value as a Thinking Tool**

# Design Considerations--The Learning Experience (1)

- **Keep Introduction Short**
  - **Why a Systemic View? Use Simple Example**
  - **Case Material**
  - **Brief Outline of Day**
- **Get “Hands On” Quickly**
  - **Make the “Tour” Interactive**
  - **Use Pre-configured Strategies to Practice the Desired Way of Thinking**
    - **Anticipate Behavior**
    - **Articulate Hypotheses**
    - **Use Results to Understand What Happened, Especially Surprises**
  - **Group Debrief, Facilitation to Share Learning**



# Design Considerations--The Learning Experience (2)

- **Free Play to Craft and Test Broader Set of Strategies; Allow Open Choice of Strategy or Use Pre-Configured Strategy as Starting Point**
- **Make Time for Multiple Iterations, Periodic Debriefings, Sensitivity Analyses**
- **Multiple Modes of Play for Different Audiences--Make It Possible to Do Something Useful in Shorter Time Period**
- **Discuss Application Back to Organization--Implications for:**
  - **Learning Needs**
  - **Strategy**
  - **Data**
- **Make Embedded Archetypes Explicit; Provide Archetypes and Templates as “Take-Away’s” for Immediate Application**

# Design from the Ground Up (1)

- **If the Objective is to Improve the Thinking of Decision Makers-- Start by Getting Inside Their Heads**
  - **What Are Their Needs, Concerns?**
  - **What Are the Short- and Long-term Decisions Facing Them?**
  - **What Are Their Mental Models?**
- **Where Do Their Mental Models Fall Short?**
  - **Laundry List Thinking; Lack of Systemic Context**
  - **Poor Sense of Second Order Effects**
  - **Perils That Need to Surface--Where Can Strategies Make Things Worse**
  - **“We vs. They” Thinking--Accidental Adversaries**
  - **Failure to See That Multiple Interventions Are Required for Effective Strategy; Emphasis on Single “Magic Bullet”**
  - **Potential Conflicts Among Objectives**
  - **Focus on Fire-fighting Instead of Long-Term**

## **Design from the Ground Up (2)**

- **Develop Clear Learning Objectives**
- **Model Boundary and Structure Should Focus on the Elements Needed to Produce These Lessons; Not Try to Capture All the Detail in Real World**
- **Have Client Help Identify Structure--Part of Their Learning Process**
- **Be Open to What Might Be Learned from Modeling as Well as Original Learning Objectives**
- **Process with Multiple Checkpoints and Mid-Course Corrections**
- **Anticipate Ongoing Uses--e.g., Strategic Planning, Staff Development, Links to MIS, Detailed Planning and Budgeting Tools--and Build Into Design**

# Design from the Ground Up (3)

- **Design and Development Should Have Multiple Rounds of Interaction with Client(s) and Range of Stakeholders**
- **Early Opportunities for Model Builder to Feed Back and Test Impressions, Group Model Building Techniques May Help**
- **Early Testing of Prototypes**
  - **Realistic?**
  - **Useful?**
  - **Does Interface Design Support or Get in the Way of Learning?**
- **Design Team**
  - **Include Range of Experience and Points-of-View**
  - **Workable Size**
  - **Draw on Wider Range of Inputs at Selected Points**

# Design from the Ground Up (4)

- **Provide Sufficient On Screen and Written Documentation; Guidelines for Facilitators**
- **Build In Evaluation**
  - Questionnaires
  - Focus Groups
  - Debrief Pre- and Post- Mental Models, Can Participants Articulate What They've Learned?
- **Periodic Revisions to Incorporate Lessons Learned**

# Watch Outs!

- **Pressure for More Detail--Until the Model is Too Complex to Be Useful**
- **Event Rather Than Policy Orientation (e.g. short-term crisis) Based on Client's Past Experience with Simulation**
- **Where Did You Get Your Data? How Do You Know the Model is Right?**
- **Interesting, but Not Our Company, Agency, Hospital, etc.**
- **Great Off-site Exercise, but Same Monday Morning Behavior**
- **Pet Ideas That People Want Reflected in the Model**

# Summary

- **Who Are the Client(s), Decision Maker(s), Stakeholder(s)?**
- **What Are Their**
  - **Problems?**
  - **Needs for Deeper Understanding?**
  - **Options for Taking Action?**
- **What is the Minimal Model for:**
  - **Addressing Their Concerns**
  - **Asking “What If?” Questions About the Range of Options Open to Them?**
- **What Kind of Learning Experience Will Let Them Explore Their Options and, In the Process, Understand the System They Are Managing?**

**More Examples and Information at:**

**[www.garybhirsch.com](http://www.garybhirsch.com)**