

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**
- **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”**

Pre-Configured Strategies Allow for Gradual Introduction

Health Care Delivery System

Year: 1997

Strategy: TEST

Mode: Individual Provider

Select Strategies for Comparison

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.

Clear Strategies

? Help ?

See Comparisons

Load and Unload

Decision Profile

Central Control

start | Inbox - Outlook Expr... | ISDC 2005 | Microsoft PowerPoint ... | Health Care Delivery ... | 2:37 PM

Role Playing Helps Teach Lessons About Collaboration

Health Care Delivery System

Year: 1997

Strategy: TEST

Mode: Individual Provider

Core Decisions

Select from the following:

The screenshot shows a software window titled 'Health Care Delivery System' with a blue header bar. Below the header, the text 'Year: 1997' and 'Strategy: TEST' is on the left, and 'Mode: Individual Provider' is on the right. The main content area is titled 'Core Decisions' and contains the instruction 'Select from the following:'. Below this instruction is a list of options in a vertical column: 'Network', 'Primary Care', 'Specialty Care', 'Acute Care', 'Long Term Care', 'Home Care', and 'Insurance'. To the left of this list, the text 'Network-Level Strategies' has an arrow pointing to the 'Network' option. Below that, the text 'Roles/System Components' has arrows pointing to 'Primary Care', 'Specialty Care', 'Acute Care', 'Long Term Care', 'Home Care', and 'Insurance'. To the right of the main list, there is a separate box labeled 'Central Control'. The Windows taskbar at the bottom shows the 'start' button, several open applications (Inbox - Outlook Express, ISDC 2005, Microsoft PowerPoint, Health Care Delivery), and the system clock showing 2:46 PM.

Network-Level Strategies

Roles/System Components

Network

Primary Care

Specialty Care

Acute Care

Long Term Care

Home Care

Insurance

Central Control

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	<input type="text" value="0"/>
?	Relative Compensation	<input type="text" value="1"/>
?	Invest in Clinical Information Systems	<input type="text" value="0"/>
?	Invest in Process Redesign	<input type="text" value="0"/>
?	Invest in Technology	<input type="text" value="0"/>
?	Demand Management Budget	<input type="text" value="0"/>

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

Network Decisions Provide Opportunity for Collaborative Strategies

Health Care Delivery System [Window Controls]

Year: 1997 **Network Decisions**

Strategy: INDIV3 Mode: Individual Provider

? Network Information Systems Investment

? Investment in Staff Development

? Network Care Management Investment

? Network Contribution Rate

? Network Allocation to Primary Care

? Network Allocation to Specialty Care

? Network Allocation to Acute Care

? Network Allocation to Long Term Care

? Network Allocation to Home Care

? Network Allocation to Insurance

Sufficient Funds?

Available to Invest (Estimate): \$ 0

Proposed Investment: \$ 0

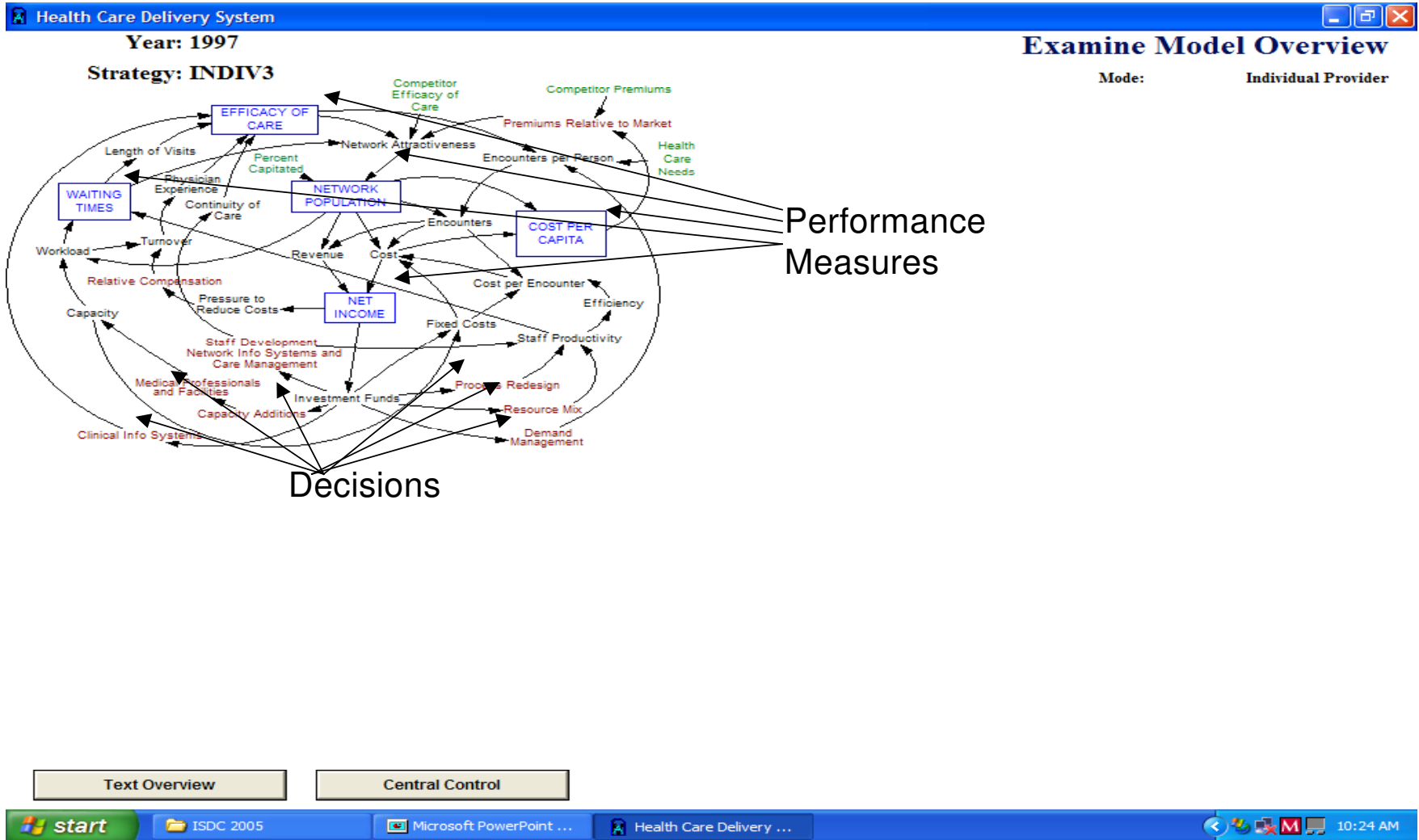
Options:

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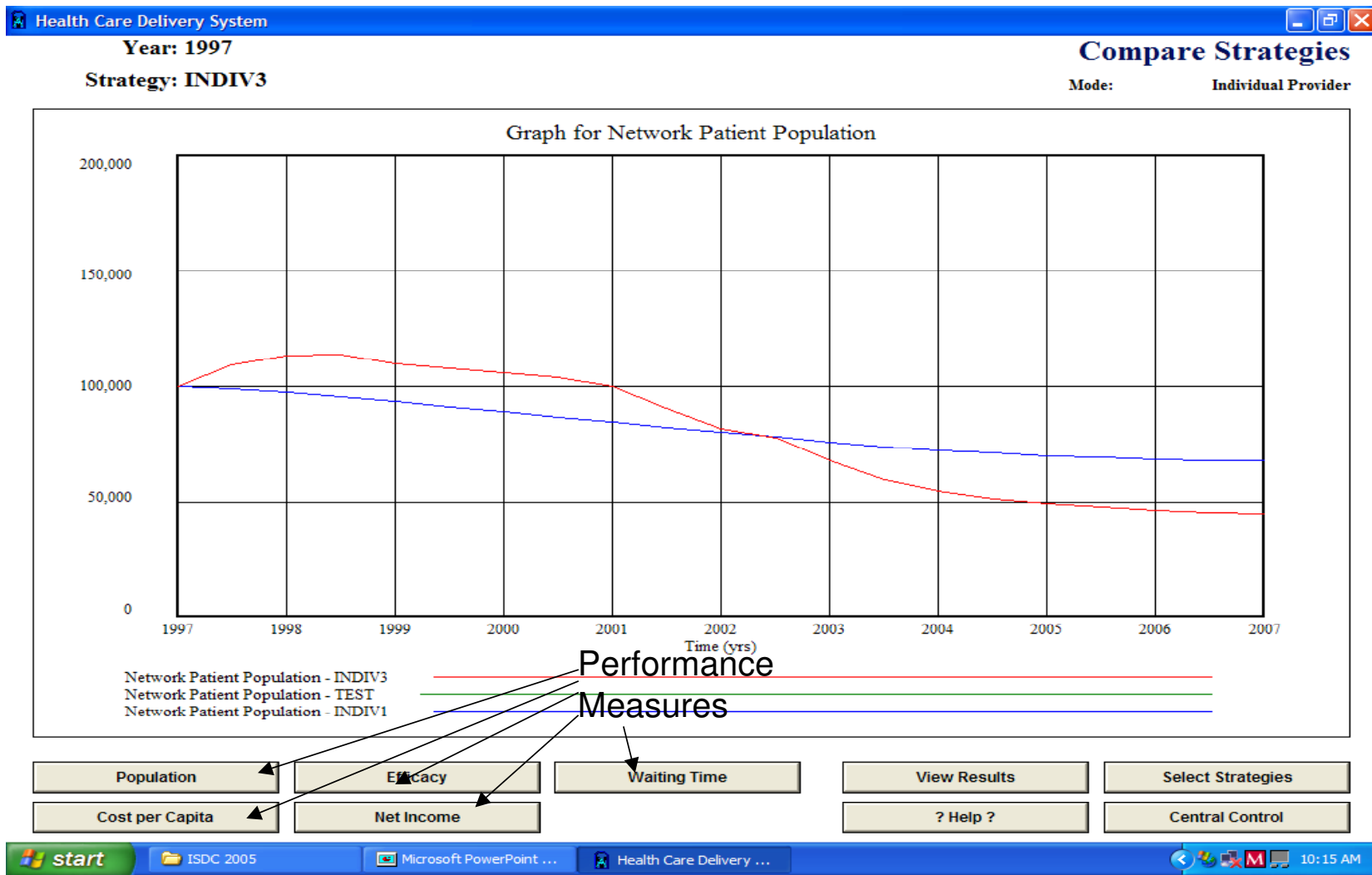
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Status Report Central Control

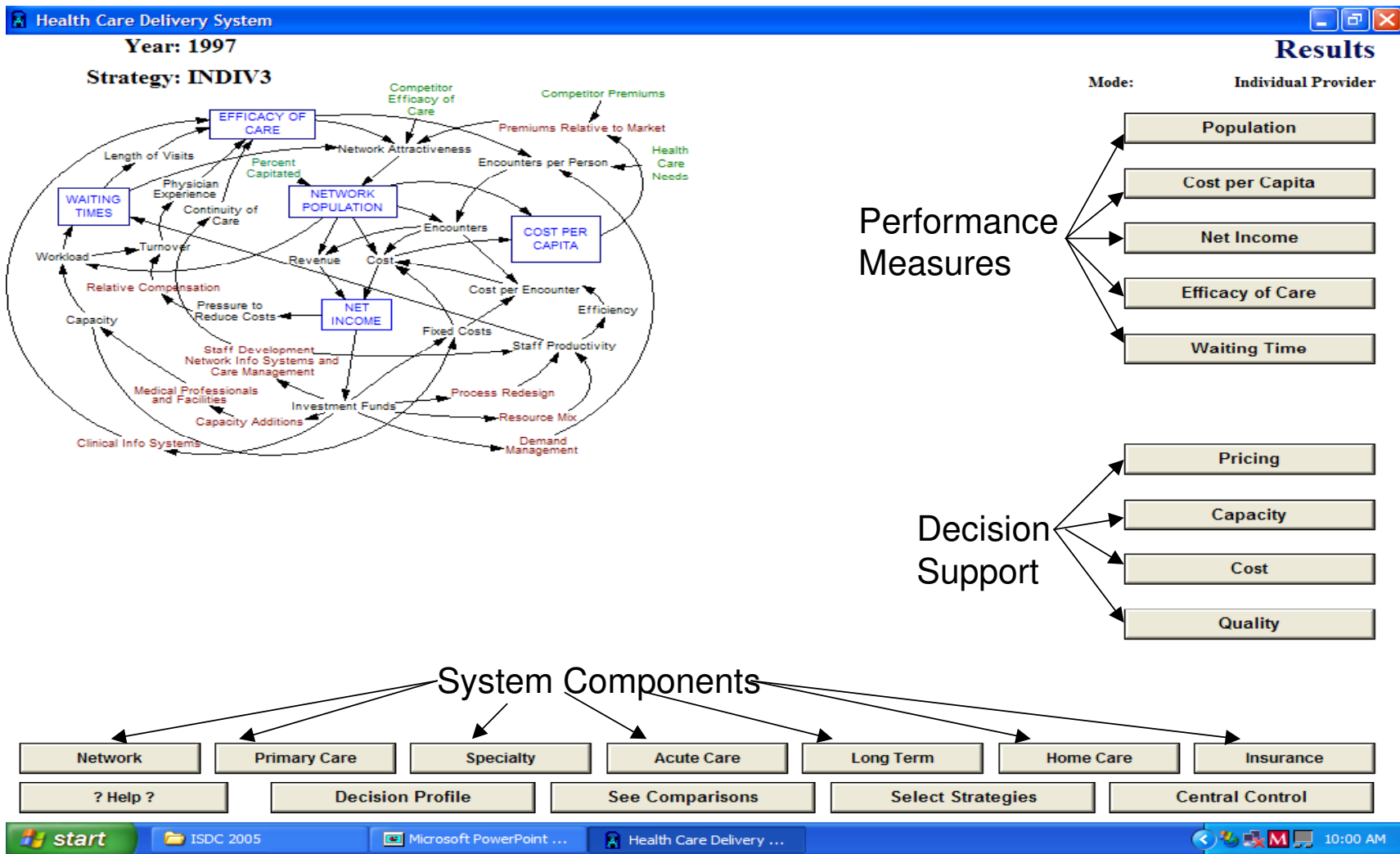
Carefully Selected Performance Measures Give Users Balanced View of Their Strategies



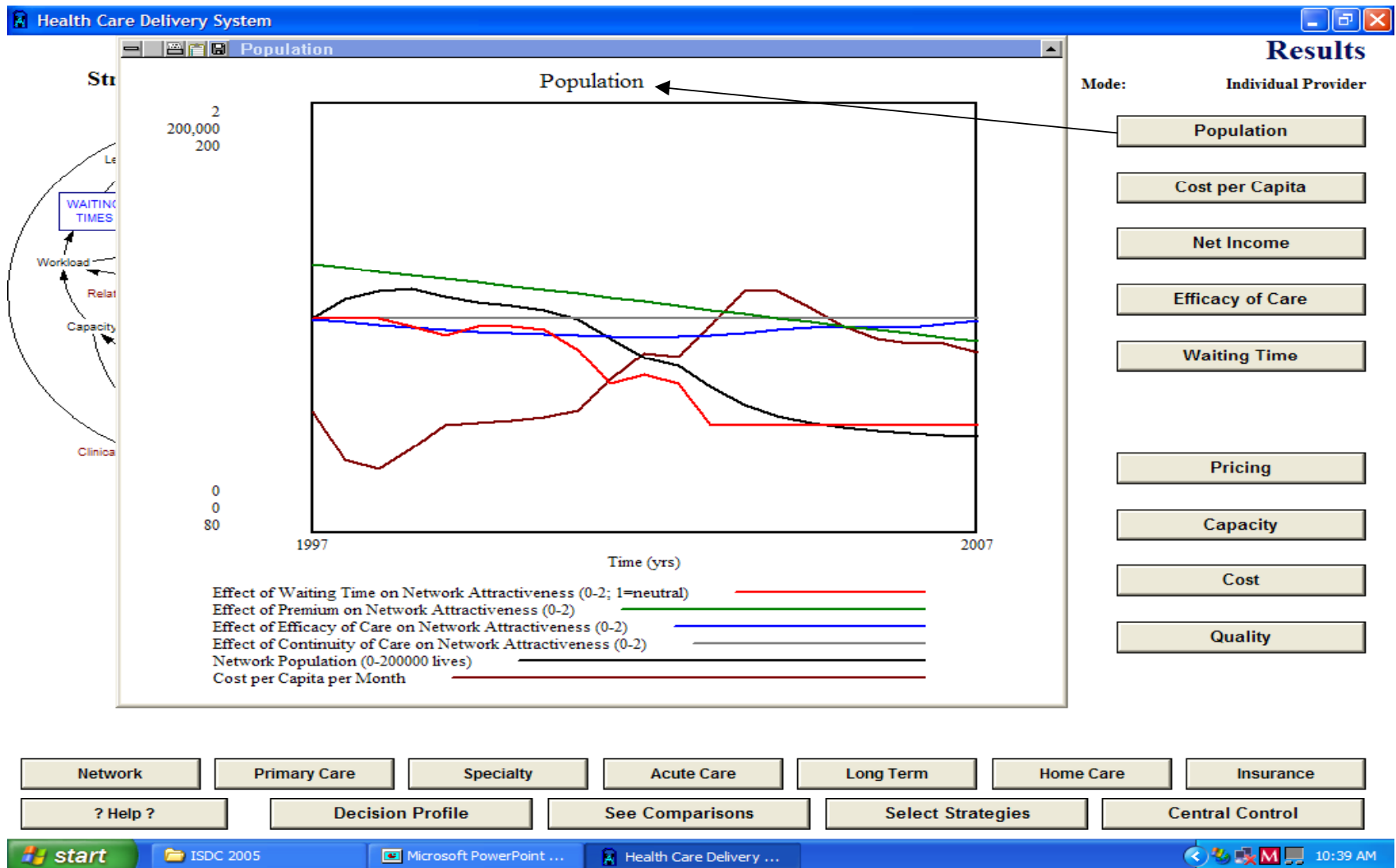
Comparisons of Selected Variables Across Simulations Let Users Identify Consequences of Strategies



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

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

Year: 1997 **Summary Statistics**

Strategy: INDIV3 **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	66,200	62,467	46,116	37,244	30,796	26,618
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	108.17	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	-1.1378 B

? Help ? Central Control

start | ISDC 2005 | Microsoft PowerPoint ... | Health Care Delivery ... | 10:46 AM

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 process. The main window shows 'Primary Care Decisions' in 'Individual Provider' mode. A 'Primary Care Status Report' window is also open, displaying various metrics. The interface includes a sidebar with navigation options like 'Information Systems', 'Invest in Process Redesign', 'Demand Management', and 'Budget'. A 'Sufficient Funds?' button is visible, along with financial indicators for 'Available to Invest' and 'Proposed Investment'. Navigation buttons at the bottom include '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

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

Health Care Delivery System [-] [x]

Year: 1997 **Assumption Choices**

Strategy: INDIV3 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

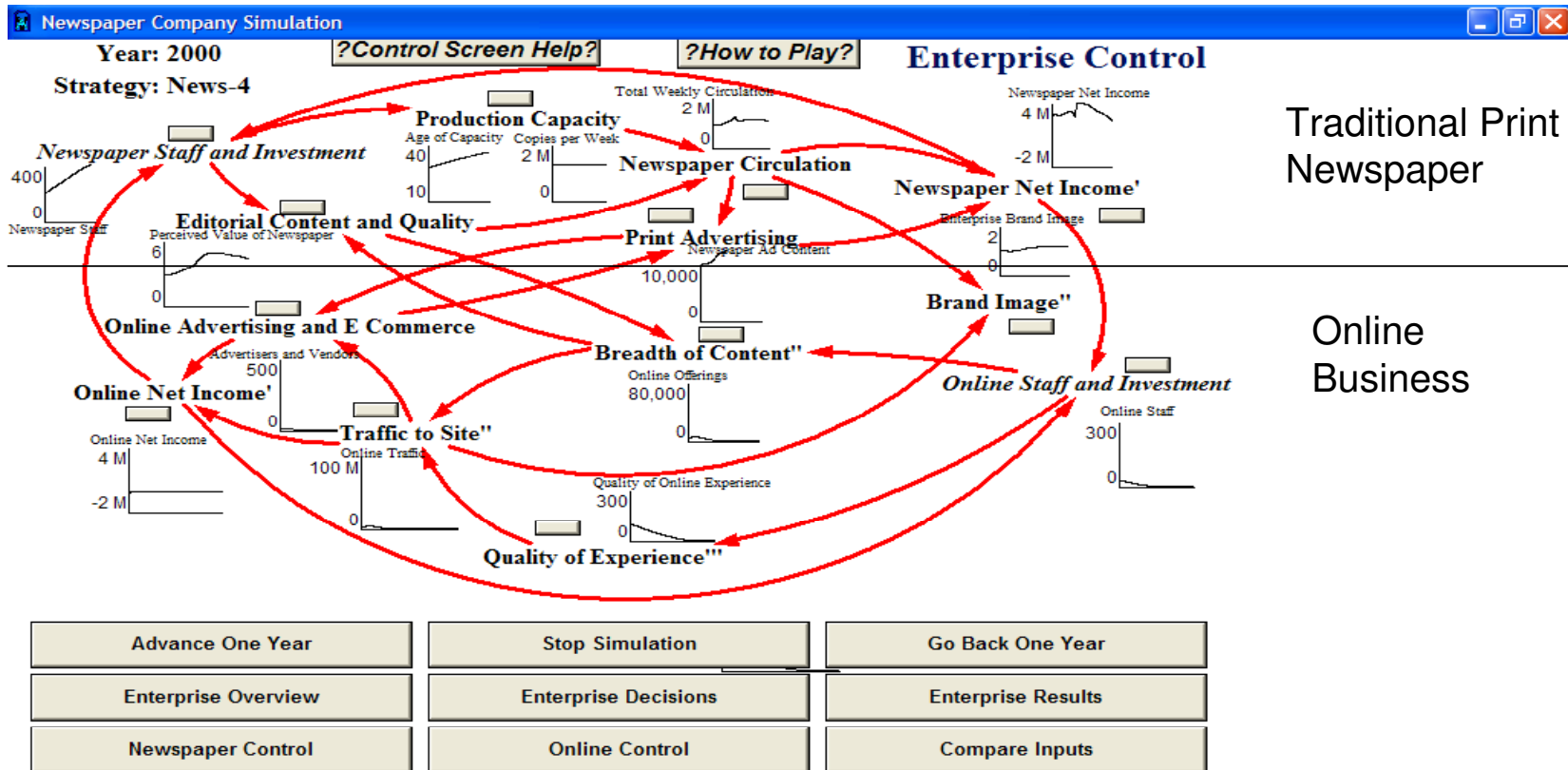
Options:

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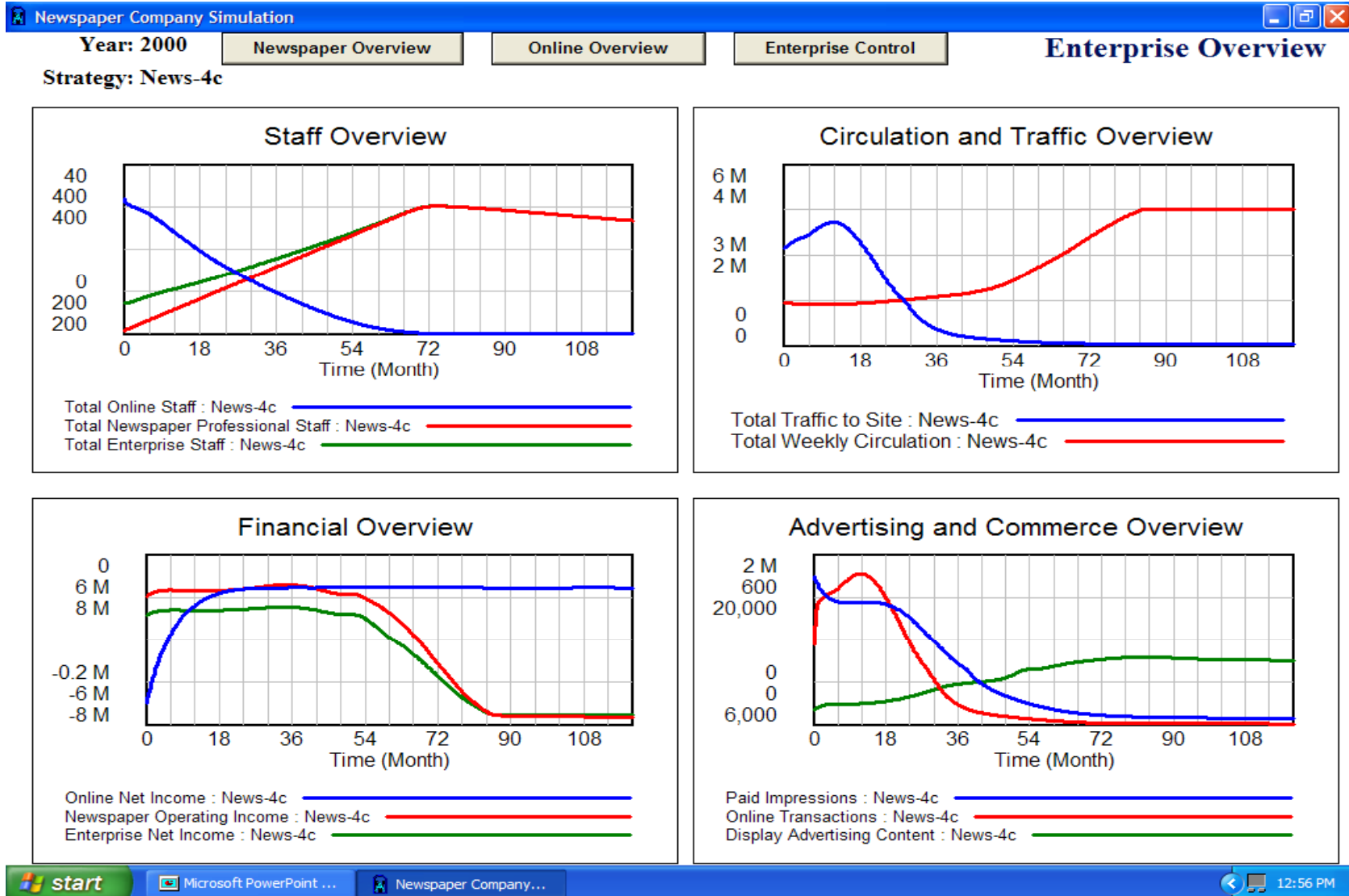
Media Company Example

- **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**

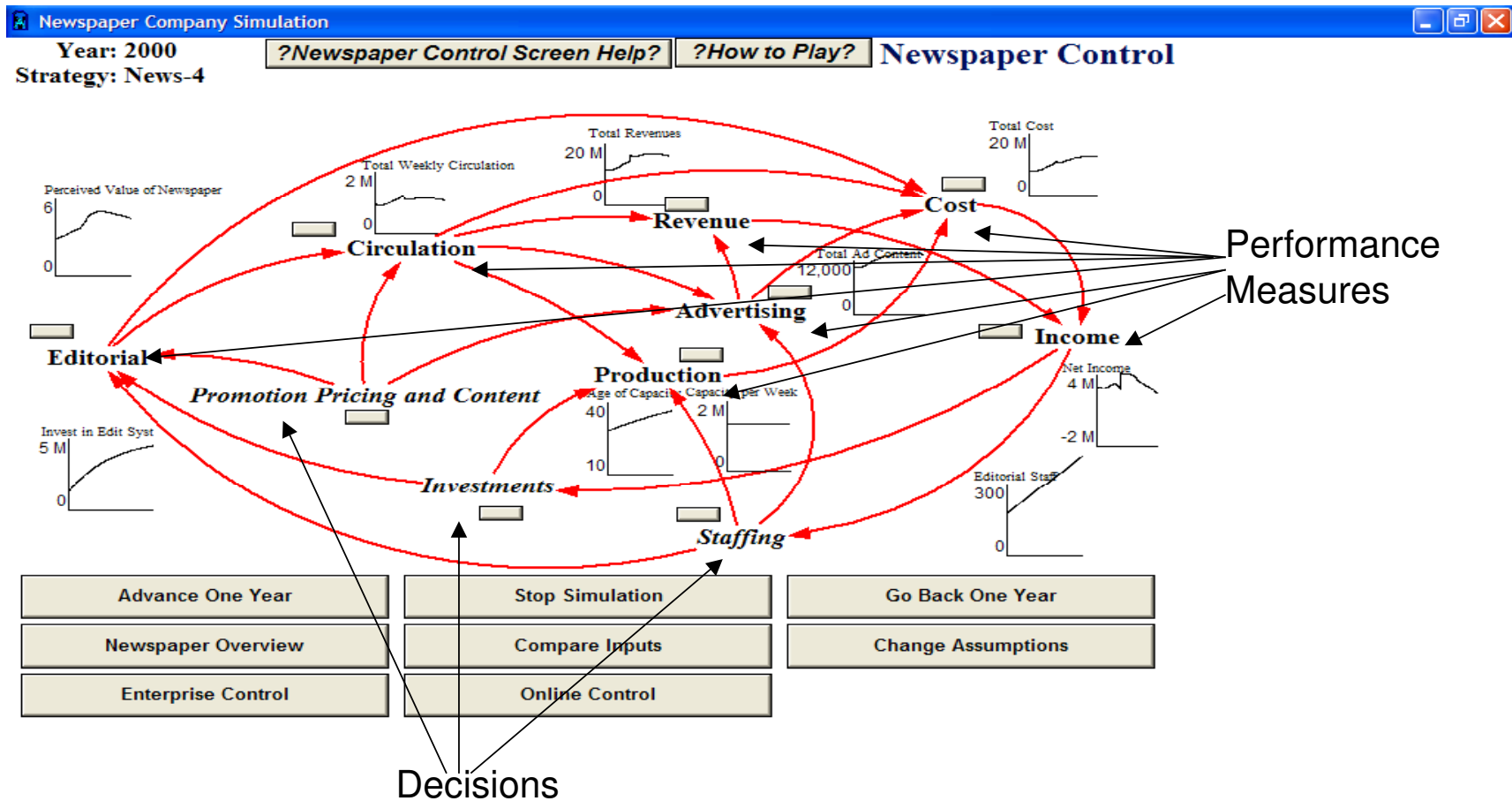
Media Company Simulator Presents Enterprise-Level Results in Context of Causal Diagram



Alternative Overview at Enterprise Level



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



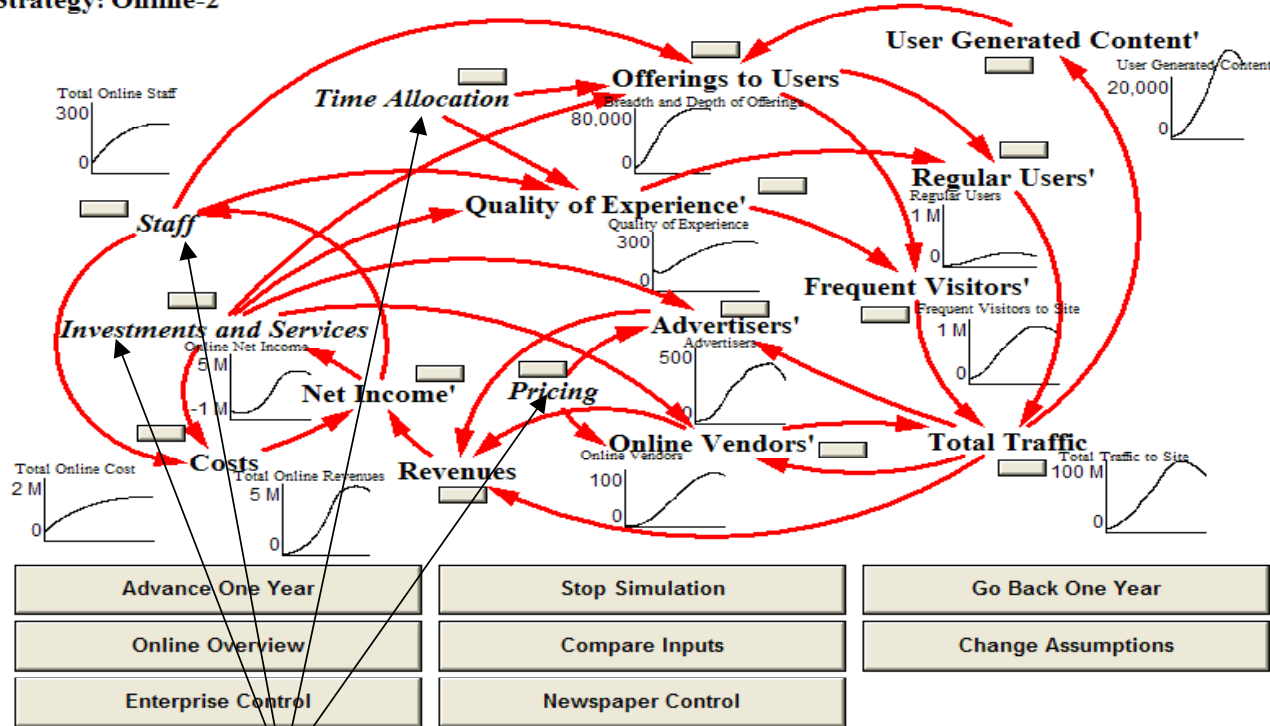
...and New Online Business

Year: 2000
Strategy: Online-2

[?Online Control Screen Help?](#)

[?How to Play?](#)

Online Control



Decisions

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

Newspaper Company Simulation

Year: 2000
Strategy: News-4

Compare Strategies for Newspaper

Fraction of Newspaper in Color

Product Flexibility' → Perceived Value of Newspaper'

Productivity of Editorial Staff' → Perceived Value of Newspaper'

Average Age of Presses' → Product Flexibility'

Productivity of Editorial Staff' → Editorial Content'

Editorial Staff' → Editorial Content'

Maximum Size of Paper → Editorial Content'

Editorial Content' → Perceived Value of Newspaper'

Editorial Content' → Display Advertising Content'

Display Advertising Content' → Perceived Value of Newspaper'

Editorial to Advertising Ratio' → Perceived Value of Newspaper'

Desired Fraction Editorial' → Editorial to Advertising Ratio'

Investment in New Presses' → Average Age of Presses'

Retirement of Presses' → Average Age of Presses'

Investment in Editorial Design and Systems' → Productivity of Editorial Staff'

Hiring Editorial Staff' → Editorial Staff'

Number of Extra Sections' → Maximum Size of Paper'

Decisions Affecting Measure → Retirement of Presses'

Decisions Affecting Measure → Hiring Editorial Staff'

Decisions Affecting Measure → Number of Extra Sections'

Decisions Affecting Measure → Desired Fraction Editorial'

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		

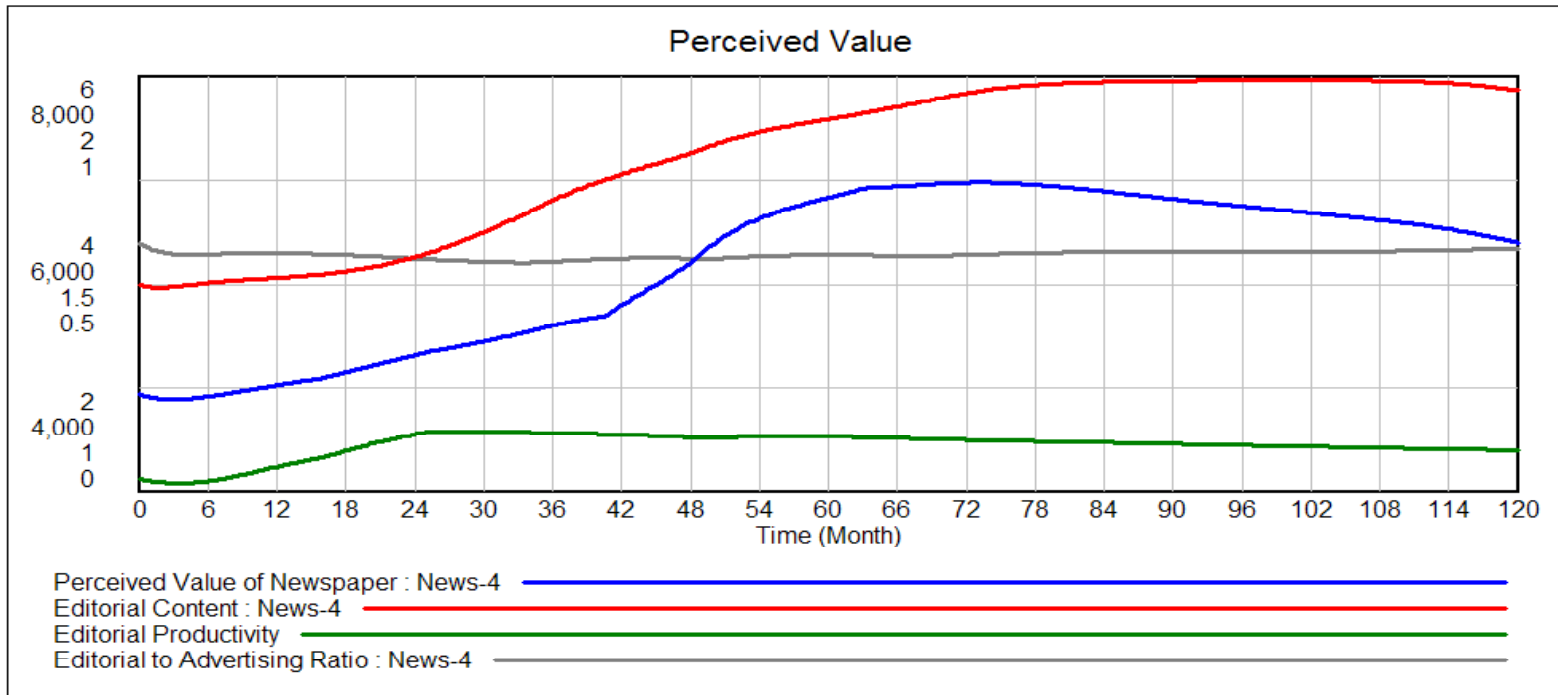
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Behavior of Other Variables That Affect Key Measures,

Newspaper Company Simulation _ □ ×

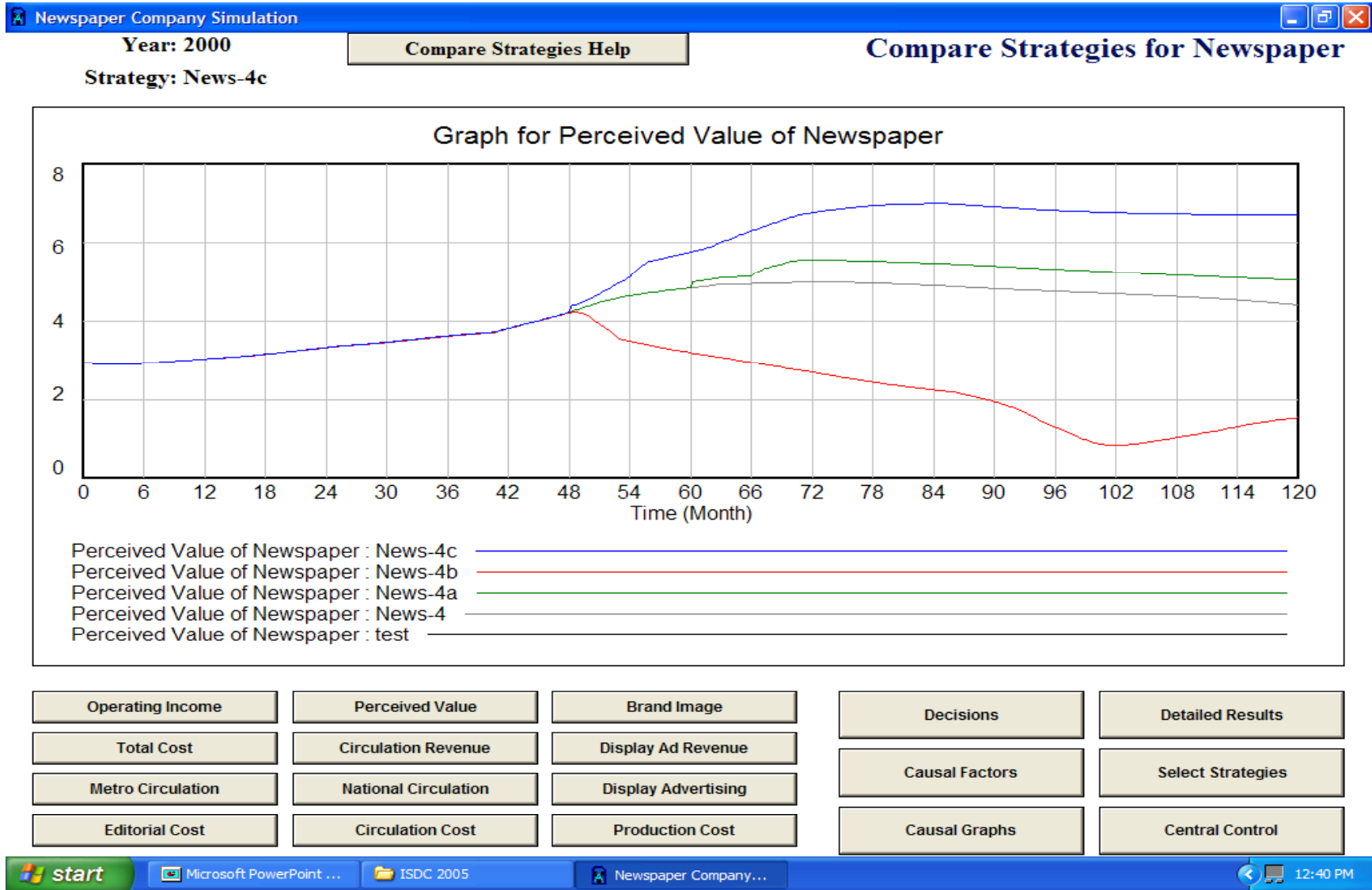
Year: 2000 Compare Strategies Help Compare Strategies for Newspaper

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		

Comparisons with Other Strategies,



...and Decision Screens

Newspaper Company Simulation _ □ ×

Year: 2000 Newspaper Promotion, Pricing & Content Decisions

Strategy: Online-2 Decisions Help

?	Metro Newspaper Price \$	0 <input style="width: 50px;" type="text" value="0.45"/> 2	?	Metro Subscription Price (\$ per Week)	0 <input style="width: 50px;" type="text" value="2"/> 10
?	National Newspaper Price	0 <input style="width: 50px;" type="text" value="0.55"/> 2	?	National Subscription Price (\$ per Week)	0 <input style="width: 50px;" type="text" value="2"/> 10
?	Display Advertising Rates (\$ per Inch)	0 <input style="width: 50px;" type="text" value="50"/> 200	?	Metro Subscriber Promotion (\$ per Year)	\$0 <input style="width: 50px;" type="text" value="0"/> \$10M
?	Metro Promotions (\$ per Year)	\$0 <input style="width: 50px;" type="text" value="2 M"/> \$10M	?	National Subscriber Promotion (\$ per Year)	\$0 <input style="width: 50px;" type="text" value="0"/> \$10M
?	National Promotions (\$ per Year)	\$0 <input style="width: 50px;" type="text" value="2 M"/> \$10M	?	Number of Extra Sections (Sections per Week)	0 <input style="width: 50px;" type="text" value="6"/> 20
?	Marketing Expenditures (\$ per Year)	\$0 <input style="width: 50px;" type="text" value="2 M"/> \$10M	?	Desired Fraction Editorial (Fraction of Content)	0 <input style="width: 50px;" type="text" value="0.37"/> 1

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

Enterprise Allocation to Newspaper: \$	5.420 M
Newspaper Budget Available: \$	135.51 M
Proposed Newspaper Budget: \$	97.98 M

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?**