



DSS 2010

the 15th IFIP WG8.3 International Conference on Decision Support Systems

Decision Conferencing with Multicriteria Decision Support Systems

<http://web.ist.utl.pt/carlosbana>

Carlos António Bana e Costa

carlosbana@ist.utl.pt
C.Bana@ISTL.utl
Tel: +351 21 7949000

Home Research Services Contact

Professor of Decision and Informatics
DEG - Department of Engineering and Management
CEG-DEM - Centre for Management Studies of IST
IST - Instituto Superior Técnico (School of Engineering of UTL)
ISTL - Technical University of Lisbon

Copyright 2010 Carlos A. Bana e Costa

Lisbon, 10 July

Agenda

Lessons from case-studies in the field of strategic planning

- Barcelos town strategic plan (1994-95)
- Santa Catarina small textile firms' survival problem (1997)
- Creating a Vision for Puerto Rico 2025 (2004-2005)
- Pernambuco Social Development and Human Rights (2007)

*(could also be
lessons from case-studies of procurement decision support)*

Copyright 2010 Carlos A. Bana e Costa

2

Procurement decision support



PERGAMON

Omega 30 (2002) 227–242

omega
The International Journal
of Management Science

www.elsevier.com/locate/dsw

Facilitating bid evaluation in public call for tenders: a socio-technical approach

DECISION ANALYSIS

Vol. 5, No. 1, March 2008, pp. 22–42
ISSN 1545-8400 | JSTOR 1545-8504 | 08 | 0501 | 0022

informs

doi:10.1287/deca.1080.0104
© 2008 INFORMS

Development of Reusable Bid Evaluation Models for the Portuguese Electric Transmission Company

Copyright 2010 Carlos A. Bana e Costa

3

Interested?
You are invited to attend...



DSS 2010

the 15th IFIP WG8.3 International Conference on Decision Support Systems

■ TC-45

Tuesday, 12:20-13:40

8.2.12

OR in Military I

Stream: OR in Military

Invited session

Chair: Ana Isabel Barros, Information & Operations, TNO - Defense, Security and Safety, POBox 96864, 2509 JG, The Hague, Netherlands, ana.barros@tno.nl

1 - Procurement Decision Support for Portuguese MoD: The MACBETH Approach and the Acquisition of 8x8 AWV

Carlos Bana e Costa, Engineering & Management, IST, Institute of Science and Technology, Technical University of Lisbon,

Copyright 2010 Carlos A. Bana e Costa

4

Some common critical mistakes that must be avoided

- Bad structuring
- mix performance appraisal with value measurement
- Weighting criteria based on the intuitive notion of importance
- Making average sums of ordinal scores

Can the use of Multicriteria DSS, by itself – that is, without the intervention of a decision analyst – avoid all these mistakes?

Agenda

Lessons from case-studies in the field of strategic planning

- Barcelos town strategic plan (1994-95)
- Santa Catarina small textile firms' survival problem (1997)
- Creating a Vision for Puerto Rico 2025 (2004-2005)
- Pernambuco Social Development and Human Rights (2007)

Aim: find elements of response to the question of "How to bridge the socio-technical gap?"

Santa Catarina textile case-study (1997)

What was the problem?



Managers of small textile companies in Santa Catarina, Brazil, asked for our assistance in creating competitive strategies to escape from failing in the global market



European Journal of Operational Research 113 (1998) 315-335



Decision Support Systems in action: Integrated application in a multicriteria decision aid process

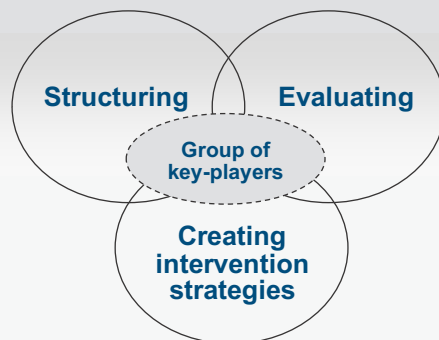
Carlos A. Bana e Costa ^{a,*}, Leonardo Ensslin ^b, Emerson C. Corrêa ^b,
Jean-Claude Vansnick ^c

Copyright 2010 Carlos A. Bana e Costa

Jean-Claude Vansnick ^c

How did we approach the problem?

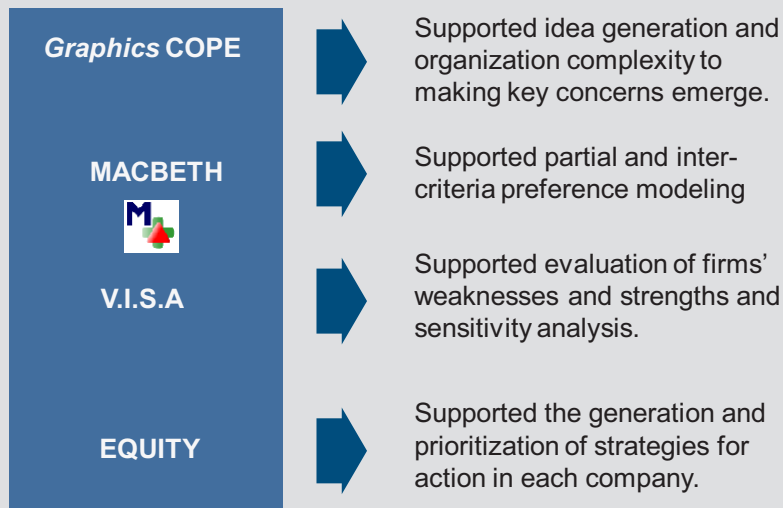
We conducted the group learning process under a MCDA methodological framework, evolving throughout three main decision-aid phases in which several DSS were used.



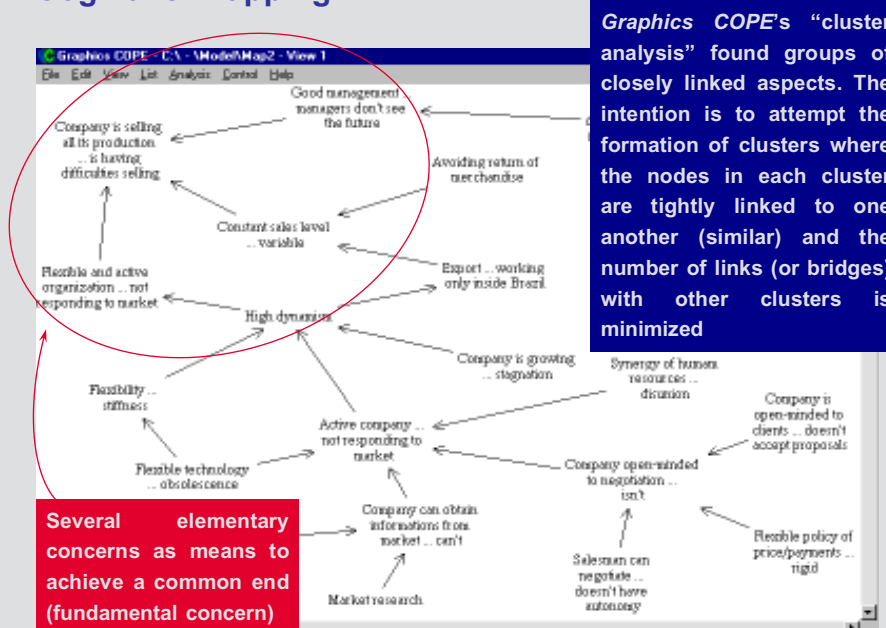
The process has been much more a free-thinking oriented discussion forum for the creation of new intervention opportunities than a technical act of solving a decision-making problem.

Copyright 2010 Carlos A. Bana e Costa

Integrated use of several DSS



Cognitive mapping



From the Conclusions of the 1999 *DSS in action* paper:

“Under a constructive attitude in decision aid, the DSS can be, at least they were in our case, **effective tools for helping the facilitators to help the decision-actors**, instead of magic “black-boxes” which give the dangerous illusion that they are ready for direct use by managers without the intervention of a decision-aid expert.”

Bridging the socio-technical gap in...
Decision Support Systems (DSS)
or, with...
Decision Support Support Systems (DSSS)

Copyright 2010 Carlos A. Bana e Costa

In the 1999 *DSS in action* paper:

Explicit reference to

- ☺ *Facilitator*
- ☺ *Provide the group with a common language for debate*
- ☺ *Constructive attitude in decision aid*
- ☺ *Helping the decision-actors*

Yet, no reference to

- ☹ *Decision Conference*
- ☹ *Requisite model*
- ☹ *Socio-technical process*
- ☹ *Process consultation*

⇒ ***Lack of comprehensive theoretical framework***

Copyright 2010 Carlos A. Bana e Costa

In 1999:



- Invited to join the Operational Research Department of LSE as Centennial Professor of Decision Sciences
- Lecturing Decision Analysis together with Lawrence Phillips
- Discussing key concepts and merge views with Larry: MCDA, Decision Conferencing (join IDCF), Requisite Model, Socio-technical Process, Process Consultation, ...
- Discussing key concepts and exchange viewpoints with Jonathan Rosenhead: Learning paradigm, Problem Structuring Methods, Metamethodologies, ...



Copyright 2010 Carlos A. Bana e Costa

13

Barcelos case (1994-1995)



What was the problem?
Help the local politicians and planners
to develop a strategic plan

Several DSS (Decision Explorer, STRAD,
M-MACBETH, EQUITY) supported structuring,
multicriteria evaluation and prioritization of
intervention actions

In the 2002 paper ...

... **MULTICRITERIA APPROACH
FOR STRATEGIC TOWN PLANNING**
The Case of Barcelos

Explicit reference to

- ☺ *Decision Conference*
- ☺ *Requisite model*
- ☺ *Socio-technical process*
- ☺ *Process consultation*
- ☺ *Methodology enhancement*



Yet, a few process mistakes, namely

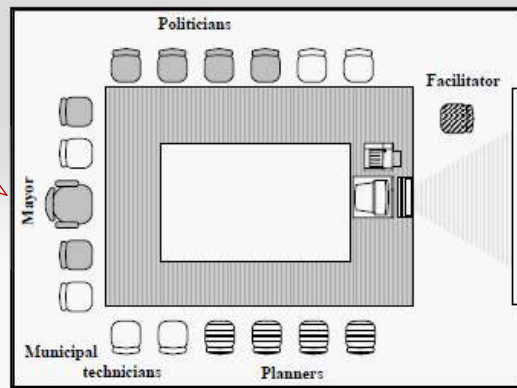
- ☹ *To much protagonist of the Mayor*
- ☹ *No easy eye-to-eye contact between participants ...*

Copyright 2010 Carlos A. Bana e Costa

... wrong rectangular ...

the layout of the meeting room. (Note that the arrangement of the environment can have a profound influence on the effectiveness of group working – cf. Hickling, 1990, Phillips and Phillips, 1993).

Note also the Mayor's armchair !!!



Copyright 2010 Carlos A. Bana e Costa



**So...
... what kind of approach?**

Normative?

Prescriptive?

Constructive!

Participation

→ a sociotechnical approach

Soft? Hard? Both: Smart

**Strategic planning with
multi-criteria decision analysis and
decision conferencing**

Copyright 2010 Carlos A. Bana e Costa

Social component: Methodological guidelines

Decision Conferencing

Phillips, L.D., Bana e Costa, C.A. (2007).

Transparent prioritisation, budgeting and resource allocation with multi-criteria decision analysis and decision conferencing". *Annals of Operations Research*, 154, 1 (51-68).

- "Decision conference is a gathering of key players who wish to resolve important issues facing their organisation, assisted by an impartial facilitator who is a specialist in decision analysis and works as a process consultant (Schein 1999), using a model of relevant data and judgements created on-the-spot to assist the group in thinking more clearly about the issues."

Requisite Models

Phillips, L.D. (1984).

A theory of requisite decision models. *Acta Psychologica*, 56, 29-48.

- Definition: Model is requisite when its form and content are sufficient to resolve the issues at hand. Model generation: Through iterative and consultative interaction amongst specialists and key players, facilitated by an impartial decision analyst.

Process Consultation

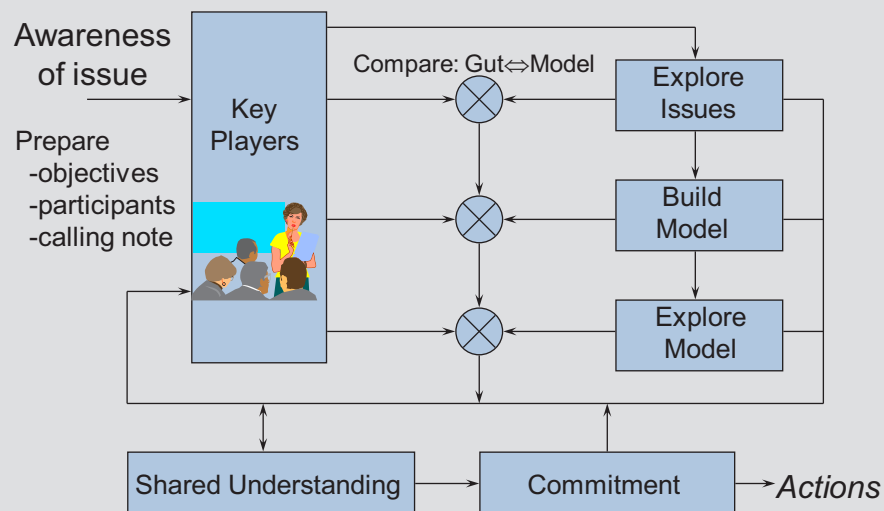
Schein, E. (1999).

Process Consultation Revisited: Building the Helping Relationship. Addison-Wesley, Reading.

- The problem and the solution belong to the client not to the consultant.

Decision Conferencing Process

Copyright Larry Phillips



Two other case-studies of Public Strategic Planning in Puerto Rico (2003-2004) and in Pernambuco (2007)

- Development of a Long Term Vision for Puerto Rico 2025
- A comprehensive intervention context
- More than 100 stakeholders involved
- Development of the Social Development and Human Rights Medium Term Strategic Plan for Pernambuco 2008-11
- A focused intervention context
- About 30 actors involved

Pernambuco 2008-11: An government initiative to create convergence on a strategy for Pernambuco's medium term social development...



... engage and align technical and political leaders of the new Secretary of State for Social Development and Human Rights (SESDH) and provide for the participation of local experts



PPA 2008-11

Client:

Secretary of State of Social Development and Human Rights (SESDH) of the Government of the Brazilian State of Pernambuco

Objective of the intervention:

To help SEDSDH develop its medium term strategic plan (PPA 2008-2011)

Methodology:

Socio-technical approach for public strategic planning

Duration of the decision conferencing process:

Five consecutive days (from 11 to 15 June 2007)

Participants:

About thirty technical and political actors

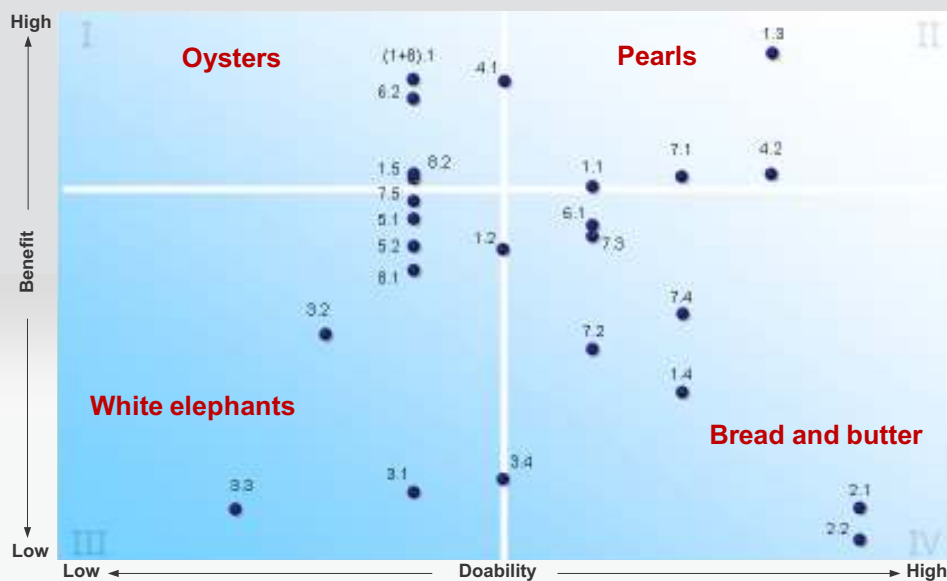
Process consultation team:

1 facilitator + 2 decision analysts + 2 experts



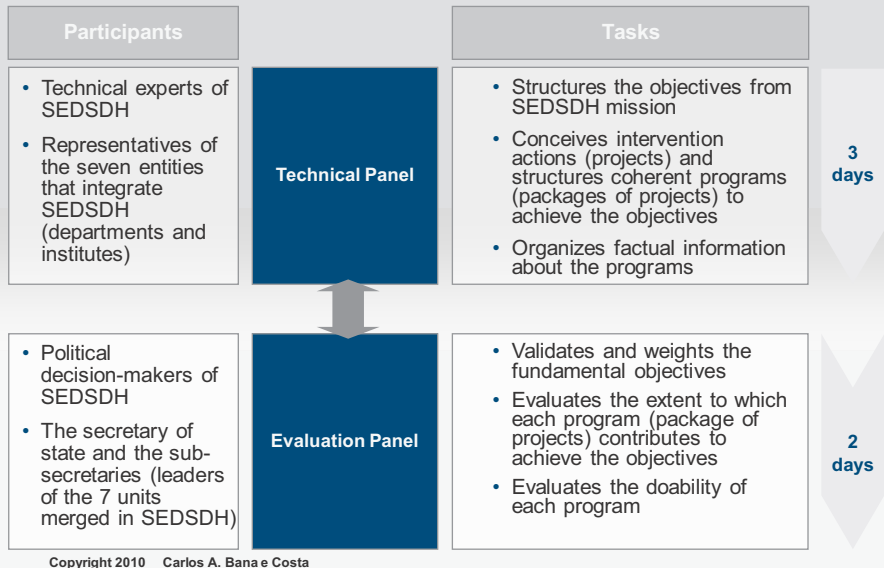
Copyright 2010 Carlos A. Bana e Costa

Output of the process



Copyright 2010 Carlos A. Bana e Costa

Two working-groups: Technical Panel and Evaluation Panel with different tasks in the process



3-days Structuring Decision Conference with Technical panel only

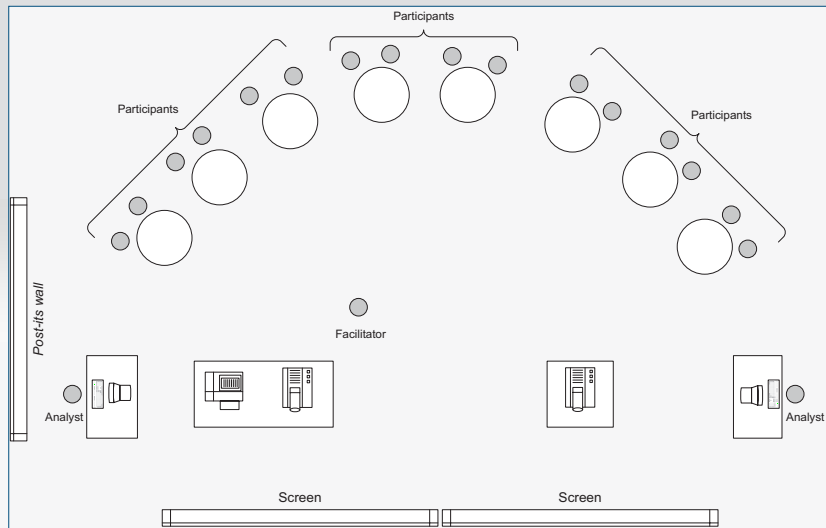


2-days Evaluation Decision Conference with the Evaluation Panel



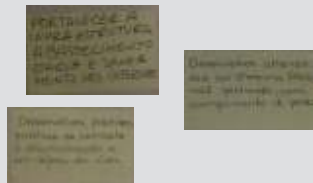
Members of the Technical panel participated as observers in the Evaluation Decision Conference

Layout of the decision conferencing room



Copyright 2010 Carlos A. Bana e Costa

Post-Its ideation session

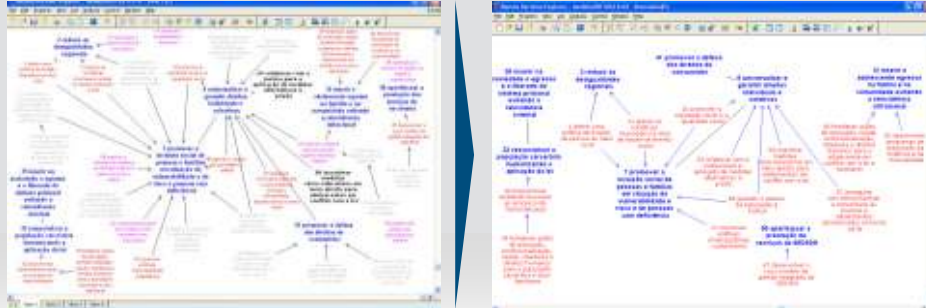


Cognitive mapping using Decision Explorer



Copyright 2010 Carlos A. Bana e Costa

Identifying means and ends



Achieving a coherent set of shared strategic objectives

- Fundamental objectives for the 2008-2011 SEDSDH Multi-Annual Plan
- Promote the inclusion and social protection of people and families
 - Guarantee and promote human rights and make them universal
 - Socialise the adolescent in conflict with the law and re-socialise the prison population

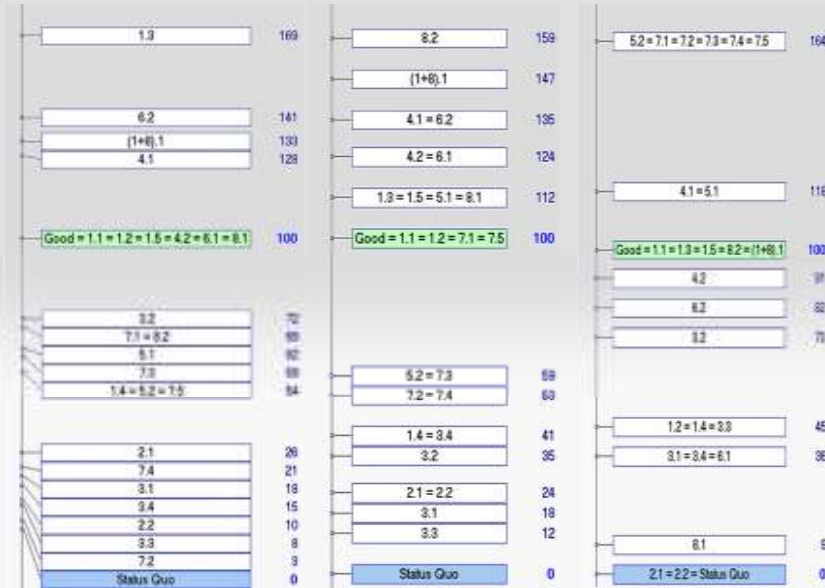
Copyright 2010 Carlos A. Bana e Costa

Qualitative evaluation of 25 programs by the politicians

 Programmes		OBJECTIVE 1: To promote the inclusion and social protection of people and families The contribution of the programme towards achieving the objective is...											
		Negative					Positive						
		Very strong (-)	Strong (-)	Moderate (-)	Weak (-)	Very weak (-)	Neutral (null)	Very weak (+)	Weak (+)	Moderate (+)	Strong (+)	Very strong (+)	Extreme (+)
1.3	PE no Gateado												3 8
6.2	Universal accessibility												1 6 3
(1+6).1	Center for Defence of Life												1 7 1
4.1	Legal, Judicial and out-of-court Service												1 7 1
6.1	Guarantee of rights for people with disabilities												3 5 1
1.5	Management of SUAS												4 5
1.1	Pernambuco caring for the street population												5 4
4.2	New DPPE												5 4
1.2	Food on the Table												3 6

Copyright 2010 Carlos A. Bana e Costa

Deriving benefit scores for the programs on each objective using the M-MACBETH decision support system



Copyright 2010 Carlos A. Bana e Costa

Weighting the objectives

Pernambuco caring for the population living on the street



Current situation (Status Quo)

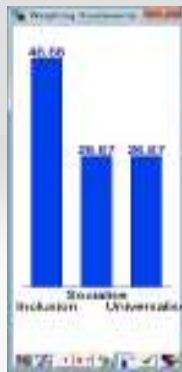
Promote the inclusion and social protection of people and families

Guarantee and promote human rights and make them universal

Socialise the adolescent in conflict with the law and re-socialise the prison population

Copyright 2010 Carlos A. Bana e Costa

Calculating the overall benefit score of each program



Options	Overall	Promote Socio	Universalize	Soc and Re-soc
1.3	135.40	169.00	112.00	100.00
(1+8).1	127.33	133.00	147.00	100.00
4.1	127.20	128.00	135.00	118.00
6.2	123.66	141.00	135.00	92.00
4.2	104.00	100.00	124.00	91.00
1.5	102.20	100.00	112.00	100.00
7.1	102.60	49.00	100.00	164.00
8.2	101.27	49.00	159.00	100.00
1.1	100.00	100.00	100.00	100.00
Good	100.00	100.00	100.00	100.00
7.5	95.61	54.00	100.00	164.00
5.1	90.37	62.00	112.00	118.00
6.1	89.33	100.00	124.00	36.00
7.3	87.00	59.00	59.00	164.00
1.2	86.33	100.00	100.00	45.00
5.2	84.67	54.00	59.00	164.00
8.1	70.93	100.00	112.00	9.00
7.4	67.67	21.00	53.00	164.00
3.2	62.40	72.00	35.00	73.00
7.2	59.27	3.00	53.00	164.00
1.4	48.13	54.00	41.00	45.00
3.4	27.53	15.00	41.00	36.00
3.1	22.80	18.00	18.00	36.00
3.3	18.93	8.00	12.00	45.00
2.1	18.53	24.00	24.00	0.00
2.2	11.07	10.00	24.00	0.00
Status Quo	0.00	0.00	0.00	0.00
Scaling constants		0.4568	0.2667	0.2667

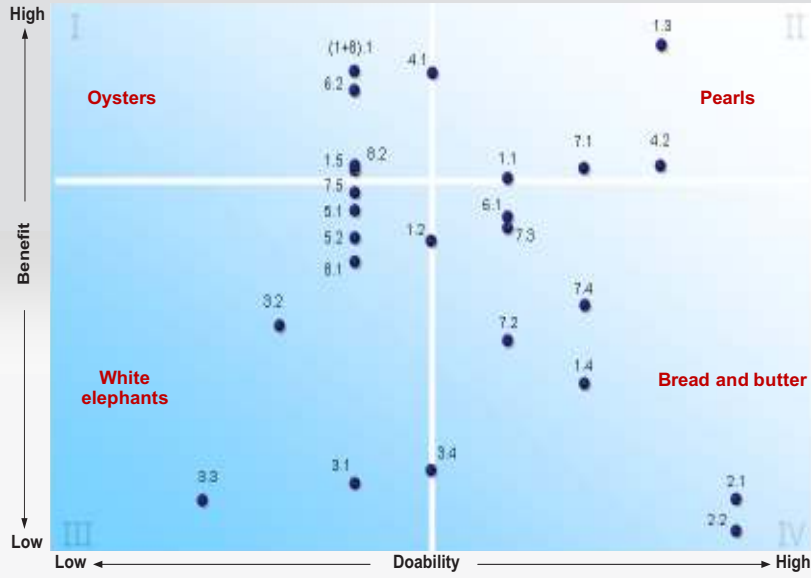
Copyright 2010 Carlos A. Bana e Costa

Assessing the doability of each project

Programme		Doability				
		Aspects of financial and human resources, logistical aspects, political and socio-cultural aspects, need for legislation, etc.				
The impressive status effort associated with the programme is...						
		Very weak	Weak	Average	Strong	Very strong
2.1	IPES and Society				7	2
2.2	IPES - Services				7	2
4.3	PE re-Balade			2	5	2
4.2	New CPPE			1	7	1
7.4	Transparency to re-socialize				8	3
7.1	Work to re-socialize				6	3
1.4	Socialist obligation and control		1	8	3	
7.3	Partnerships to re-socialize				8	1
6.1	Guarantee of rights for people with disabilities		2	6	1	
1.1	Pernambuco caring for the street population				7	2

Copyright 2010 Carlos A. Bana e Costa

Benefit vs. Doability analysis



PR 2025:

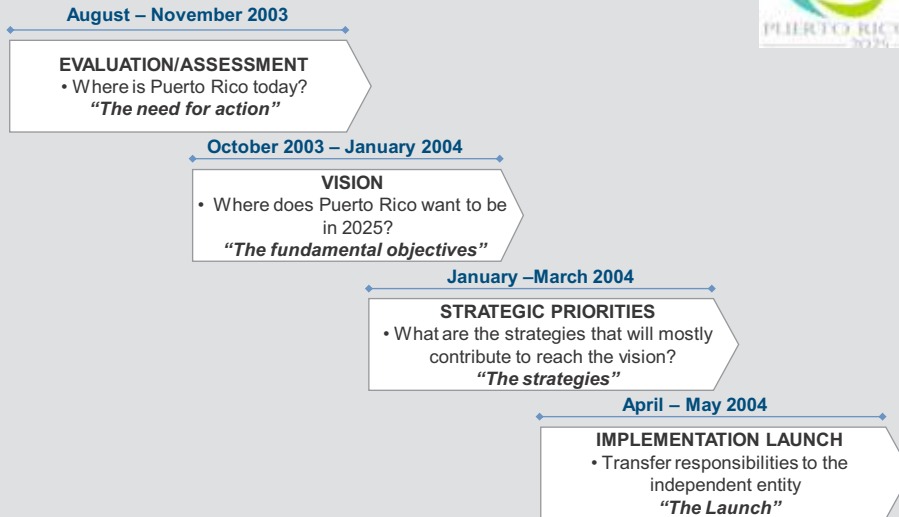
An government initiative to create convergence on a strategy for Puerto Rico's long-term future ...



... engage community and private sector leaders and provide for the participation of local experts

The Puerto Rico 2025 project was structured around four phases

Project Phases

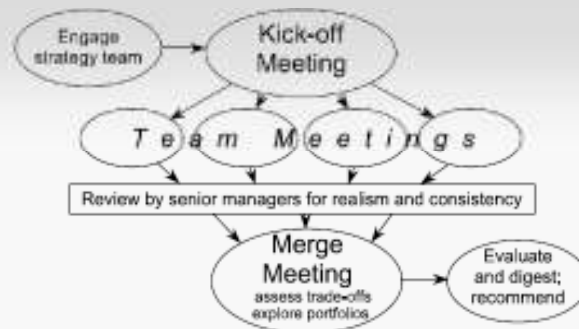


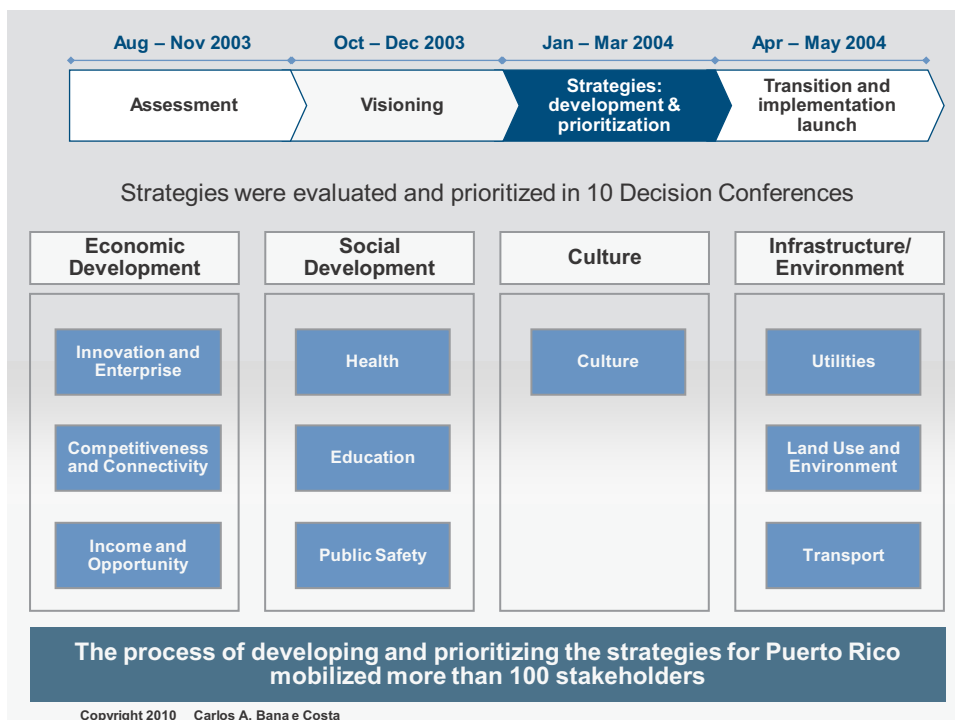
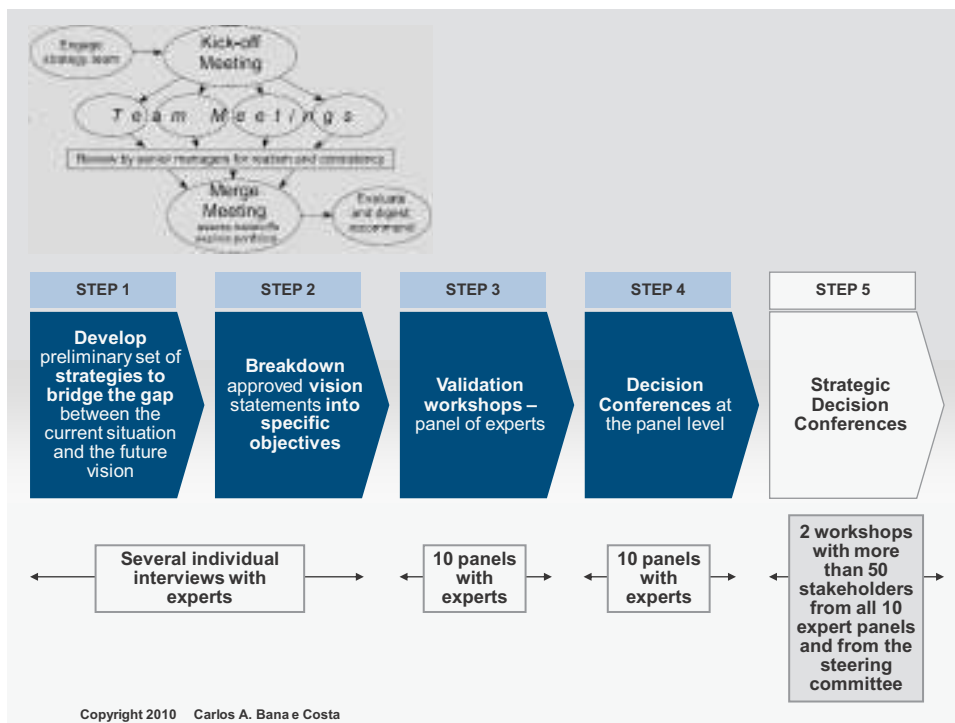
Design of the social process

Transparent prioritisation, budgeting and resource allocation with multi-criteria decision analysis and decision conferencing

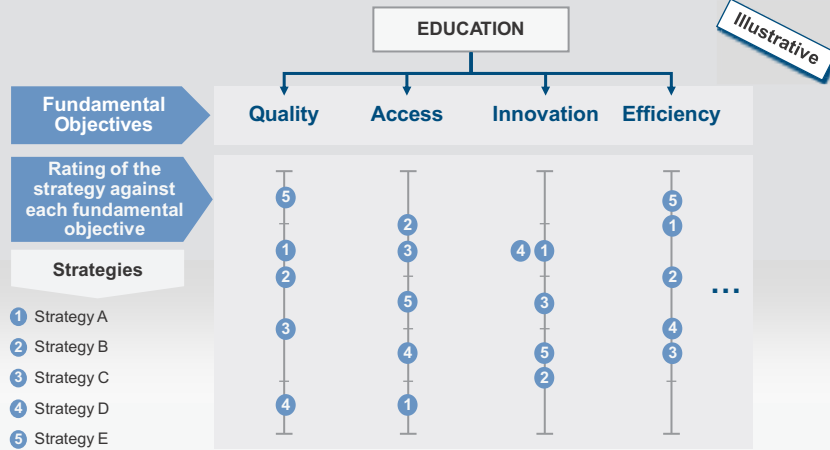
Lawrence D. Phillips · Carlos A. Bana e Costa
 Ann Oper Res (2007) 154: 51–68

Fig. 8 A social process for decision conferencing





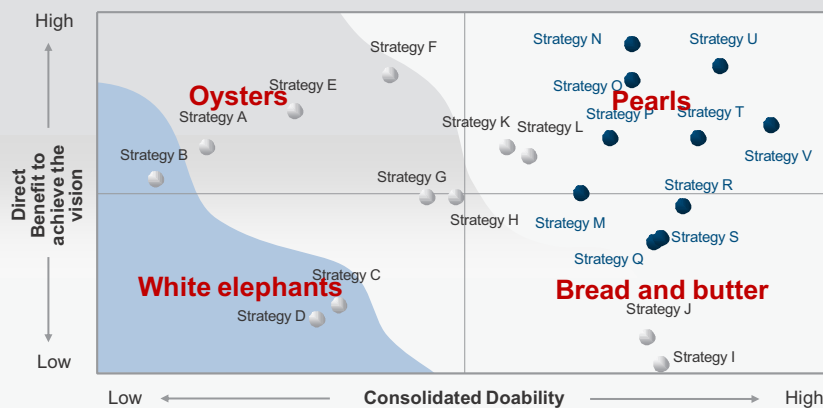
All strategies scored in terms of their direct contribution to the achievement of each of the fundamental objectives



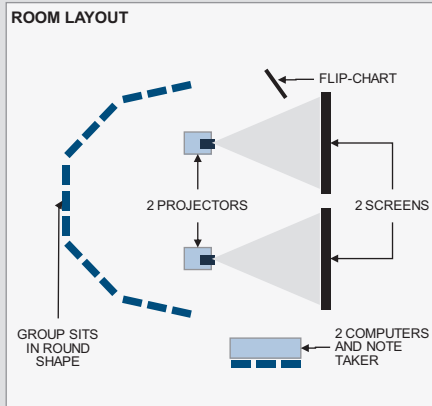
The doability of each strategy was evaluated in a similar process through a consolidated qualitative judgment that considered technical, political, institutional, financial and other issues

Strategies were evaluated according to their direct contribution to achieve fundamental objectives in each area and according to their perceived doability

Example of the Output Obtained in each of the 10 Decision Conferences



Layout of the decision conference room



PROCESS CONSULTING TEAM

- 1 facilitator
 - 1 analyst (computer operator for M-MACBETH)
- Optional (depending on the context):
- 1 analyst/consultant (computer operator for background/support information)
 - 1 note taker

GROUP OF PARTICIPANTS

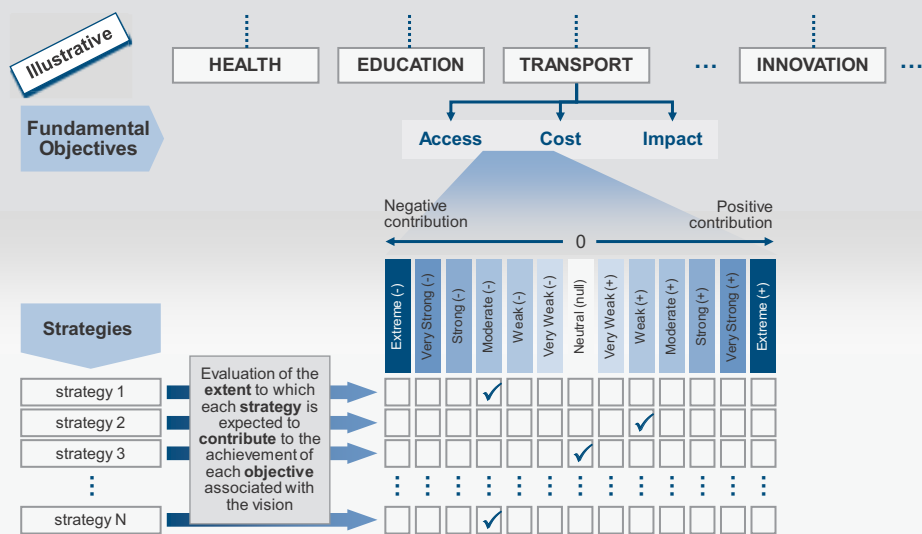
- 5 to 15 people with a balanced perspective on the meeting's subject (experts, stakeholders, decision makers,...)






Copyright 2010 Carlos A. Bana e Costa

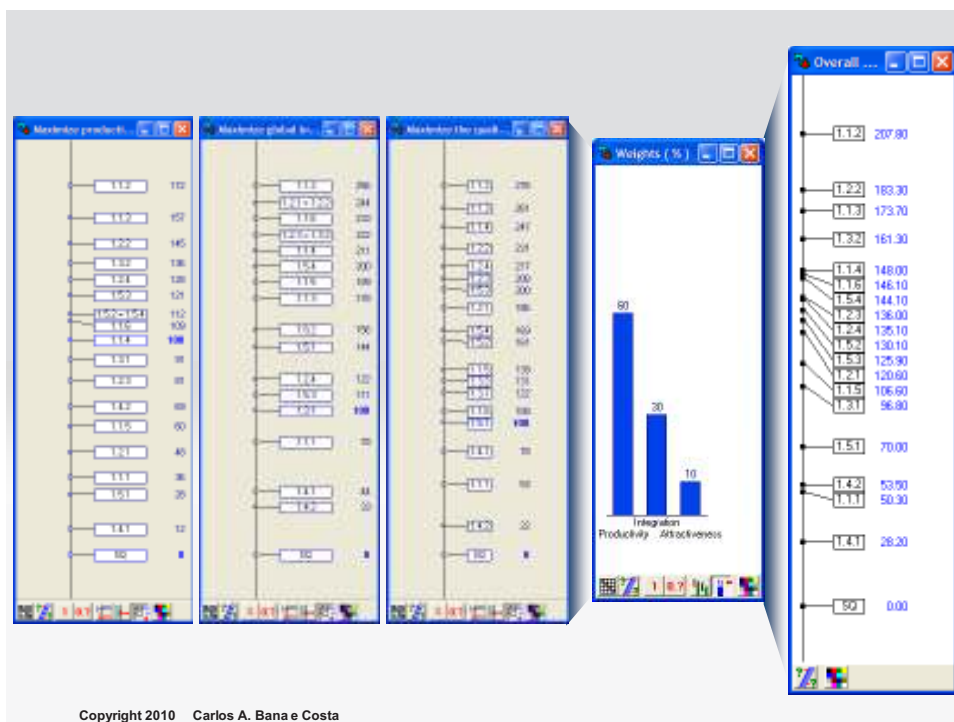
MACBETH was used to evaluate the strategies in terms of their contribution to achieve each fundamental objective



Copyright 2010 Carlos A. Bana e Costa

AREA: Productivity, Competitiveness & Connectivity				OBJETIVE 1: Maximize Productivity and Competitiveness												
		Ranking		The contribution of the strategy to achieve the objective is...												
				Negative Contribution (-)					Positive Contribution (+)							
Strategies				Extreme (-)	Very Strong (-)	Strong (-)	Moderate (-)	Weak (-)	Very weak (-)	NEUTRAL	Very weak (+)	Weak (+)	Moderate (+)	Strong (+)	Very Strong (+)	Extreme (+)
1.1.2	Increase human productivity through education	Extreme	Strong													7
1.1.3	Increase human productivity through tech.	Extreme	Moderate													7
1.2.2	Improve infrastructure for information	Extreme	Weak-Moderate													7
1.2.4	Increase efficiency of local utilities	Extreme	Weak													7
1.5.3	Overhaul system for investment promotion	Extreme	Weak													7
1.3.2	Decrease regulatory burden	Extreme	Weak												1	6
1.5.2	Overhaul system for national strategy	Extreme	No											1		6
1.5.4	Overhaul system for export promotion	Extreme	V. Weak												1	5
1.1.4	Attract global talent	V. Strong-Extreme	Weak-Moderate											2		5
1.3.1	Decrease financial cost of government	V. Strong	Weak											3		3
1.1.6	Provide multilingual abilities	V. Strong	Moderate												5	2
1.2.3	Improve infrastructure for people	V. Strong	Moderate												5	2
1.4.2	Rationaliza unproductive subsidies	V. Strong	Weak												5	2
1.1.5	Deepen people linkages	V. Strong	Moderate-Strong											1	4	2
1.2.1	Improve infrastructure for goods	V. Strong	Moderate												6	1
1.1.1	Decrease cost of labor	V. Strong	Weak										1	1	4	1
1.5.1	Repositioning Puerto Rico	V. Strong	Strong											3	3	1
1.4.1	Decrease protections	Moderate-Strong											3	4		

Copyright 2010 Carlos A. Bana e Costa



Copyright 2010 Carlos A. Bana e Costa

AREA: Productivity, Competitiveness & Connectivity

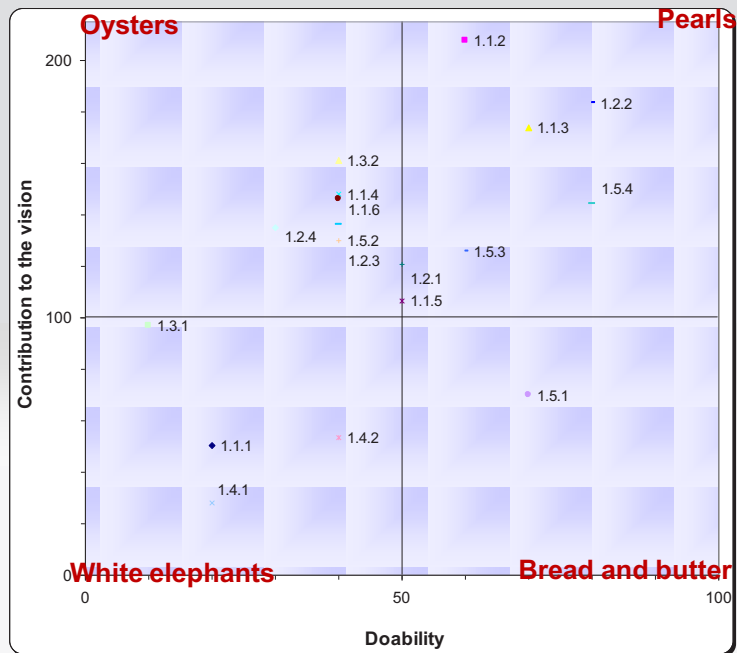


Strategies

Doability of the strategy
considering political,
institutional, financial and
technical dimensions

Strategies		Ranking	Doability of the strategy						
			NEUTRAL	Very weak (+)	Weak (+)	Moderate (+)	Strong (+)	Very Strong (+)	Extreme (+)
1.5.4	Overhaul system for export promotion	V. Strong						7	
1.2.2	Improve infrastructure for information	V. Strong					1	6	
1.1.3	Increase human productivity through tech.	Strong-V. Strong					3	4	
1.5.1	Reposition/Rebrand	Strong-V. Strong					4	3	
1.1.2	Increase human productivity through education	Strong					7		
1.5.3	Overhaul system for investment promotion	Strong					7		
1.2.1	Improve infrastructure for goods	Moderate-Strong				3	3	1	
1.1.5	Deepen people linkages	Moderate-Strong				2	5		
1.5.2	Overhaul system for national strategy	Moderate			2	2	3		
1.1.4	Attract global talent	Moderate				5	2		
1.1.6	Provide multilingual abilities	Moderate				7			
1.3.2	Decrease regulatory burden	Moderate				7			
1.4.2	Decrease subsidies	Moderate			1	6			
1.2.3	Improve infrastructure for people	Moderate			2	5			
1.2.4	Increase efficiency of local utilities	Weak-Moderate			4	3			
1.1.1	Decrease cost of labor	Weak			5	2			
1.4.1	Decrease protections	Weak			7				
1.3.1	Decrease financial cost of government	V. Weak-Weak	3	4					

Copyright 2010 Carlos A. Bana e Costa



Copyright 2010 Carlos A. Bana e Costa



Copyright 2010 Carlos A. Bana e Costa

Puerto Rico 2025 Strategic Decision Conference

The primary objective was to consolidate
the results of the 10 area decision conferences
into a coherent and integrated strategic plan



Copyright 2010 Carlos A. Bana e Costa

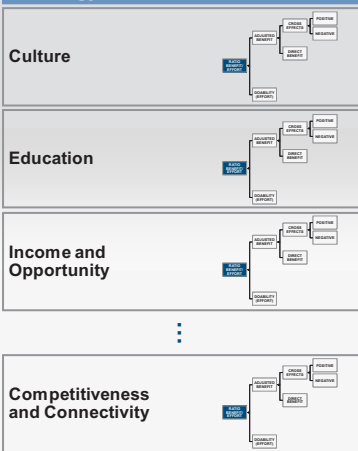


Puerto Rico 2025 Strategic Decision Conference



Copyright 2010 Carlos A. Bana e Costa

Benefit/effort ratios for each strategy in each area of concern



Strategic Decision Conferences
(April 22 and 24)

Group analysis across the ten areas of concern

Integrated Strategic Packages (implementation plan)



- PACKAGE 1: Immediate Term
- PACKAGE 2: Short Term
- PACKAGE 3: Medium Term
- PACKAGE 4: Long Term

Copyright 2010 Carlos A. Bana e Costa

Equity model that supported the discussion on the packages of strategies for implementation

Equity Model : First Output

Four prioritization packages were created:

- immediate** (included those strategies to be pursued if only 10% of the total effort is to be put forth),
- short-term** (included those strategies to be pursued if only 30% of the total effort is to be put forth),
- medium-term** (included those strategies to be pursued if only 70% of the total effort is to be put forth)
- and long-term** (included those strategies to be pursued if 100% of the total effort is to be put forth).

The screenshot shows a software interface with a table of strategies. The table is organized into four columns representing different prioritization packages. The columns are labeled: Immediate package (blue), Short-term package (yellow), Medium-term package (green), and Long-term package (red). The table contains various strategy codes and their corresponding effort percentages.

Copyright 2010 Carlos A. Bana e Costa

Fine-tuning prioritization packages (continued)

The screenshot shows a software interface with a table of strategies. The table is organized into two columns representing different prioritization packages: Rearranged short-term package (yellow) and Rearranged medium-term package (green). The table contains various strategy codes and their corresponding effort percentages.

Copyright 2010 Carlos A. Bana e Costa

Strategic Decision Conference

2nd day agenda: Identify from the short-term package the immediate strategies

Saturday, April 24th

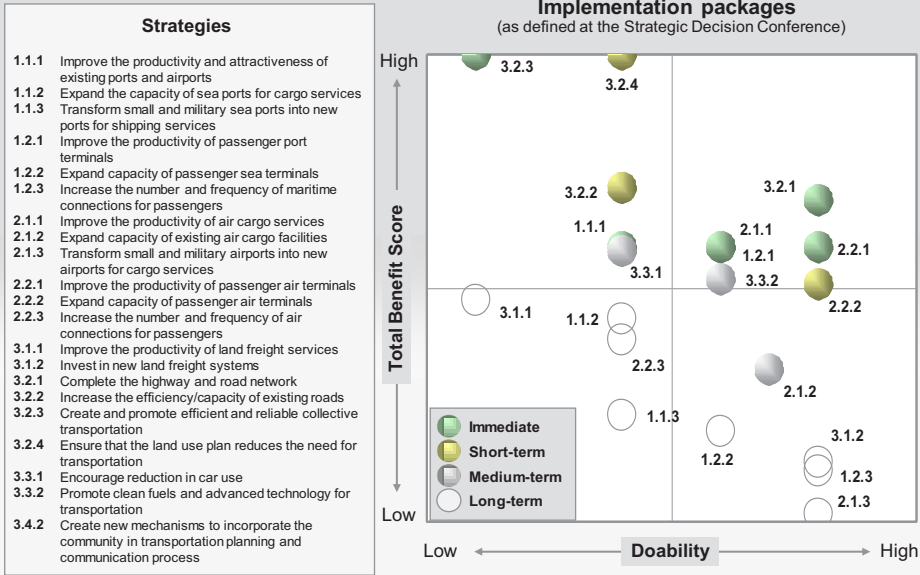


Copyright 2010 Carlos A. Bana e Costa



Copyright 2010 Carlos A. Bana e Costa

TRANSPORT – Distribution of strategies in terms of implementation packages



Social development	Culture	Culture
	Education	Education
	Health	Health
Infrastructure / environment	Public safety	Public safety
	Utilities	Utilities
	Transport	Transport
Economic development	Land Use and Environment	Land Use and Environment
	Competitiveness, Productivity and Connectivity	Competitiveness, Productivity and Connectivity
	Opportunities and Income	Opportunities and Income
	Innovation and Enterprise	Innovation and Enterprise

At the end of the day...

Alice and the Cheshire Cat



"Cheshire Puss," she began...
"Would you tell me, please,
which way I ought to go from
here?"

"That depends a good deal on where you
want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you walk,"
said the Cat.

"—so long as I get
somewhere," Alice added
as an explanation.

"Oh, you're sure to do
that," said the Cat, "if you
only walk long enough."

Lewis Carroll, *Alice's Adventures in Wonderland*