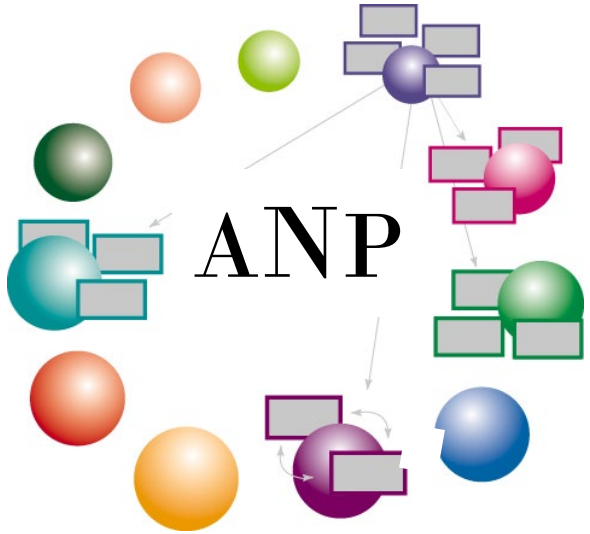
The Analytic Hierarchy Process
The Analytic Network Process



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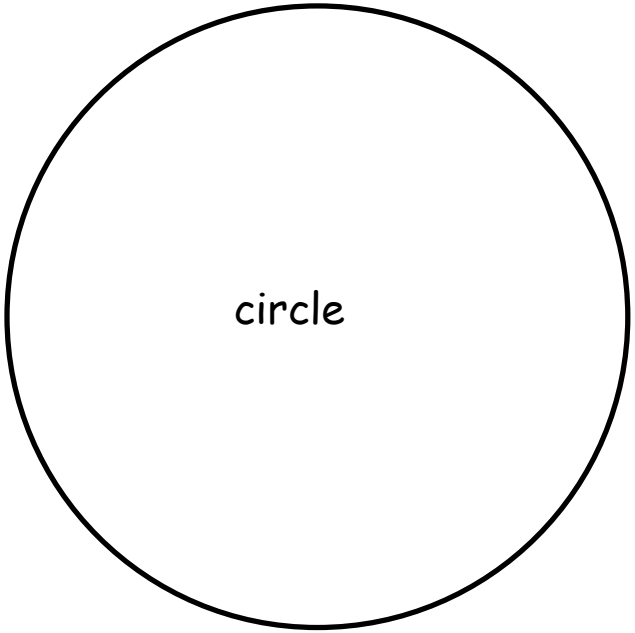
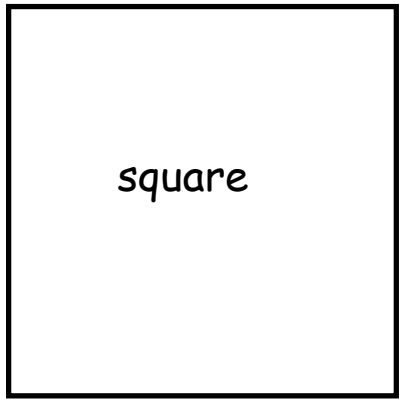
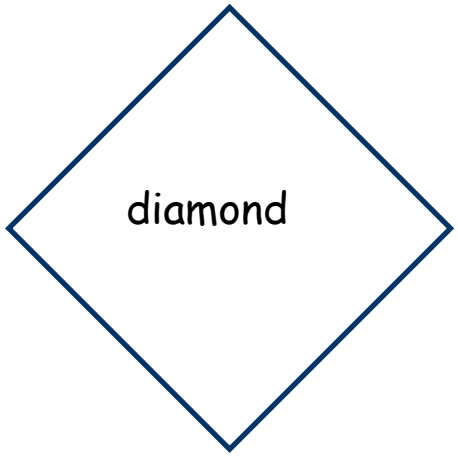
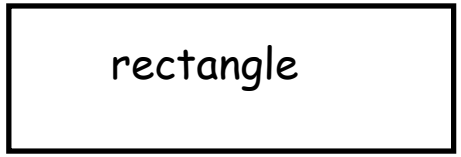
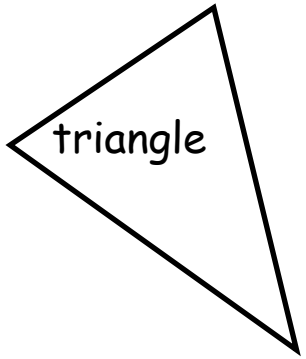
I would like to acknowledge Prof. T.L. Saaty's “ANP_Slideshow_July_2001.ppt” slides submitted by www.creativedecisions.net which greatly influence these notes...









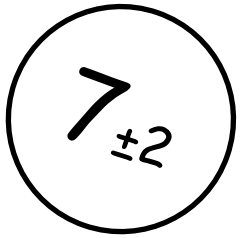


Cognitive Psychology

People are poor at assimilating large quantities of information on problems

They cope with cognitive overload by employing heuristics that simplify the problem

This can lead to selection of suboptimal alternatives



George A. Miller, in his paper

" The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information"

indicated that

the capacity of human short term memory is seven separate items, plus or minus two.

The brain of a regular human can

simultaneously process,

differentiate, and deal with

at most 7 factors

for some people this limit can be decreased to 5, for some other people it can be increased to 9

(The Psychological Review, 1956, vol. 63, pp. 81-97)

Why Hierarchy?

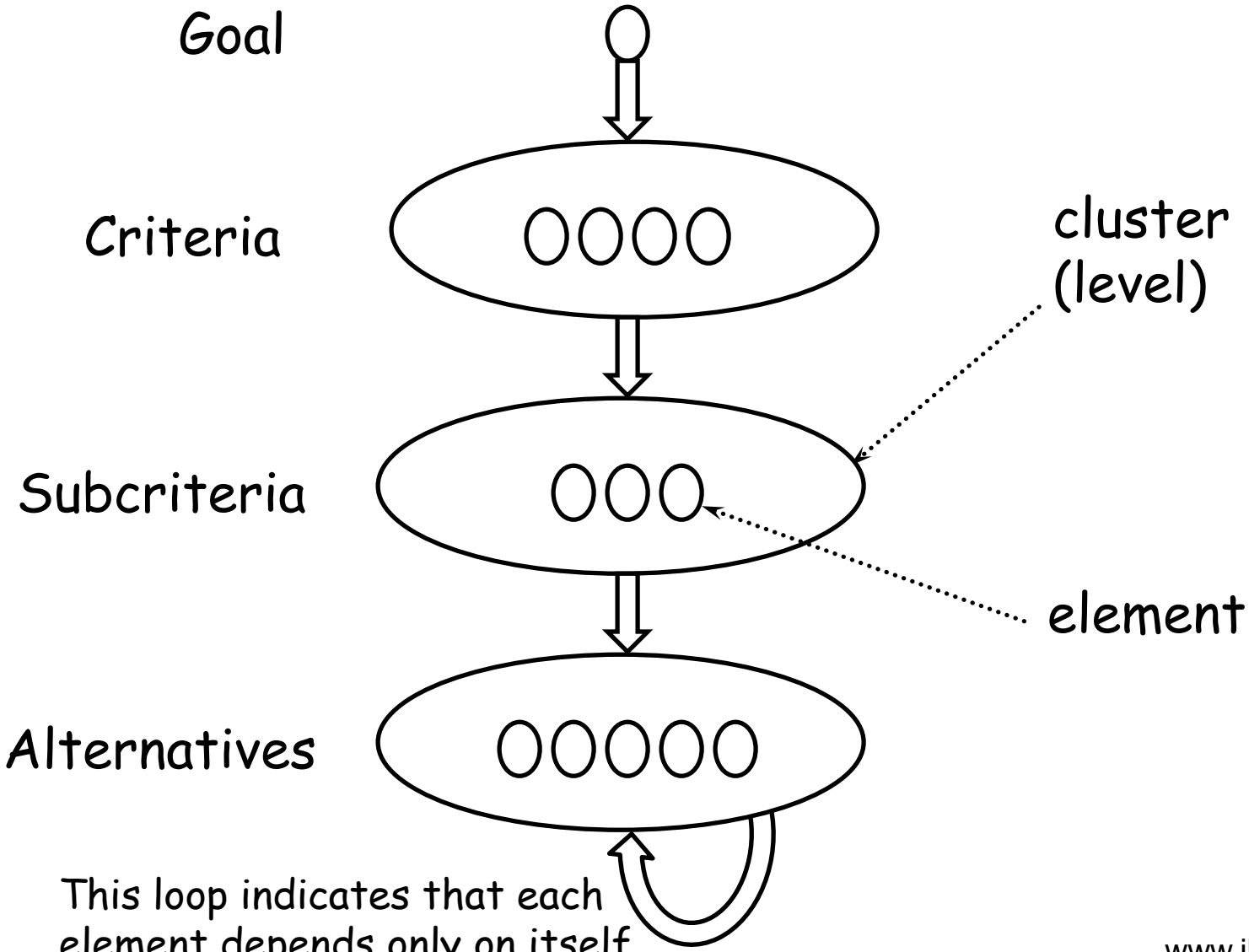
when people faced with a complex problem
in order to understand the problem better
they must break down the problem
into its smaller constituent parts
and construct a hierarchical model to represent it

Why Hierarchy?

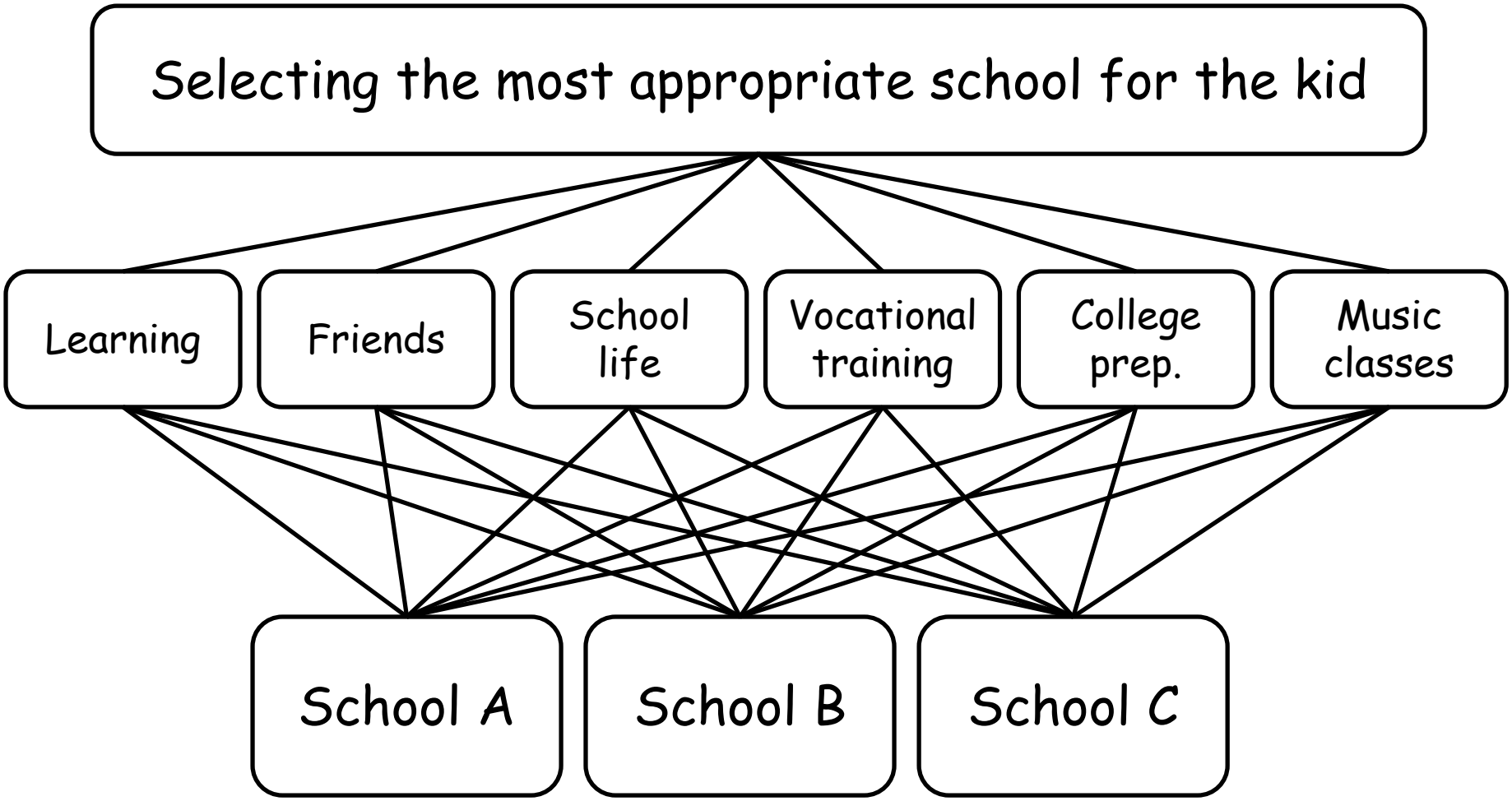
Decision making problem should be depicted as thoroughly as possible:

- The constructed hierarchy
- arranging the factors in appropriate levels
- must include enough relevant detail

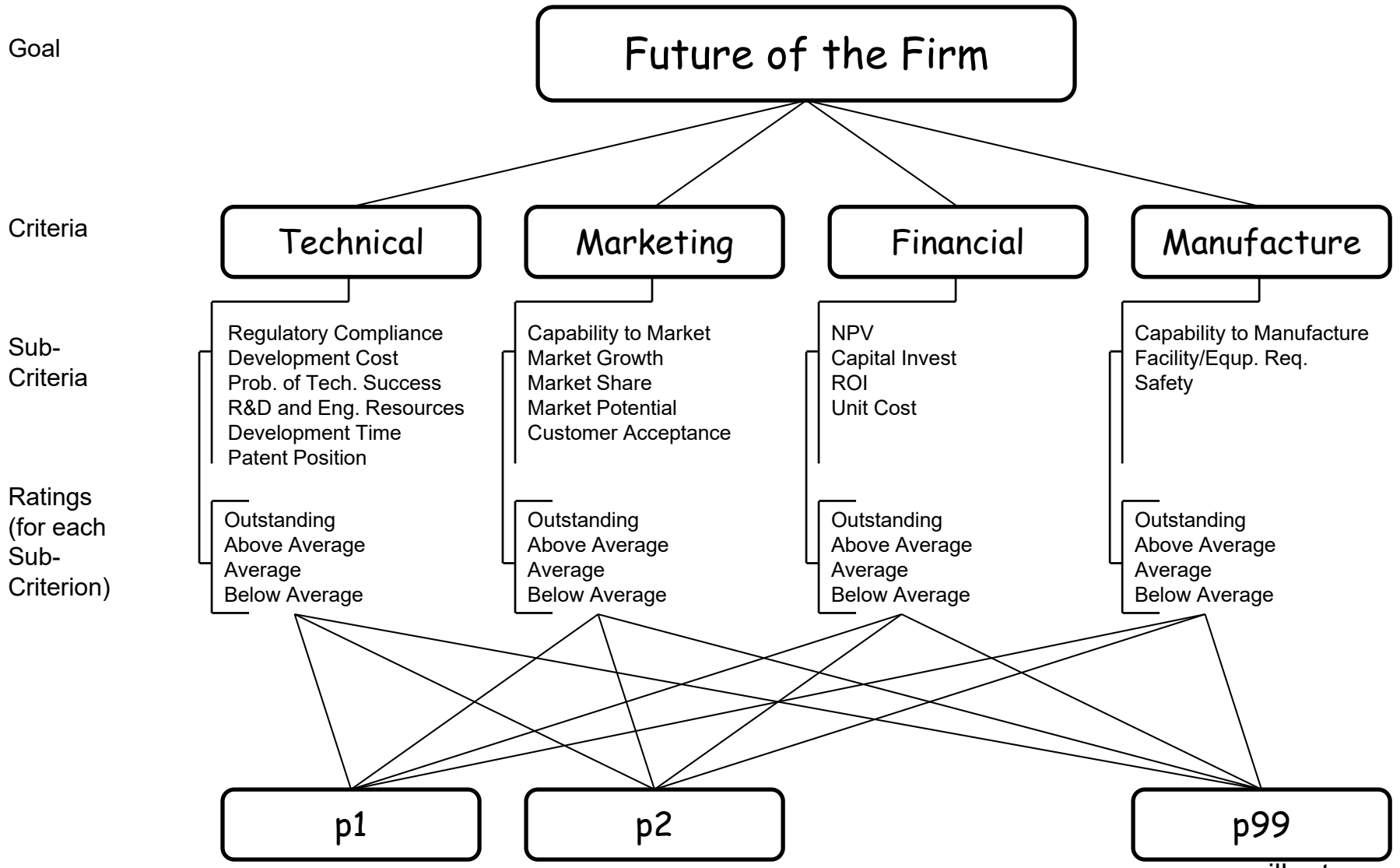
Hierarchy



School Selection



R&D Project Selection



Whom to marry - a compatible spouse

- Flexibity
- Independence
- Growth
- Challenge
- Commitment
- Humor
- Intelligence

- **Psychological**
  - Communication & Problem Solving
  - Family & Children
  - Temper
  - Security
  - Affection
  - Loyalty
- **Physical**
  - Food
  - Shelter
  - Sex
- **Socio-cultural**
  - Sociability
  - Finance
  - Understanding
- **Philosophical**
  - World View
  - Theology
- **Aesthetic**
  - Housekeeping
  - Sense of Beauty & Intelligence

Case 1

- **marry**
- **don't marry**

Case 2

- Campbell
- Graham
- McGuire
- Faucet

Decision Conferencing

- A tool that brings key experts and stakeholders together to generate a shared understanding of a challenge, create a sense of common purpose, and gain commitment to a way forward
- It is a specific type of group decision-support process for solving strategic decision problems
- DMs or problem owners may meet in the same room or in small groups and discuss each judgment to arrive at a consensus judgment
- Facilitator(s) may help DMs aggregate their judgments through information technologies

Organized Workshops

GOVERNANCE

Provinces and Districts

- Antalya 2023 Future Design and Decision Conference (2013)
- Rize Future Design and Decision Conference (2005)
- Kocaeli Decision Conference (2003)
- Eskişehir 2010 Future Design and Decision Conference (2000)
- Kadıköy Municipality "Kadıköy in My Mind" Decision Conference (2014)
- Bodrum Future Design and Decision Conference (2008)
- Bakırköy Future Design Decision Conference (2006)

Others

- İPKB (Istanbul Project Coordination Unit) "Cost Analysis and Evaluation of Retrofitting and Reconstruction Projects" Workshop (2014)
- İSTKA (Istanbul Development Agency) Decision Conference (2010)
- Museum of Topkapı Palace Decision Conference (2008)

Organized Workshops

ASSOCIATIONS & UNIONS

Organizational Management

- TÜSİAD (Turkish Industry & Business Association) Collaborative Decision Conference (2022)
- DTİK (World Turkish Business Council) Vision Workshop (2017)
- DTİK (World Turkish Business Council) Mission Workshop (2017)
- TOBB (The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey) "Corporation Change" Decision Conference (2011)
- TOBB (The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey) "Evaluation of Policies" Decision Conference (2011)
- TOBB (The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey) Decision Conference (2003)
- DTO (Chamber of Shipping) Decision Conference (2003)

Organized Workshops

ASSOCIATIONS & UNIONS

Trade and Services

- İHKİB (İstanbul Apparel Exporters' Association) "Apparel Sector Transformation Vision" Decision Conference (2019)
- İTKİB (Istanbul Textile and Apparel Exporter Association) "Turkish Textile Sector in Global Competition" Decision Conference (2004)
- Improving Turkish Advertisement Sector Decision Conference (2003)
- AMPD (Trade Council of Shopping Centers and Retailers) Decision Conference (2003)
- Undersecreteriat of Customs – Undersecreteriat of Foreign Trade – UND (International Transporters Association) – Turkey Exporters Assembly – Custom Affairs Association "Identifying Efficient Trade Policy and Custom Affairs" Decision Conference (2002)
- Association of Communications Agencies Decision Conference (2002)

Organized Workshops

ASSOCIATIONS & UNIONS

Transportation and Logistics

- UND (International Transporters Association) "Future Design for Transportation and Logistics" Decision Conference (2013)
- Ministry of Transportation – UND (International Transporters Association) - TOBB (The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey) "Ideal Land Transportation" Future Design Workshop (2003)

Construction and Housing

- GYODER (Association of Real Estate and Real Estate Investment Partnership) "Real Estate Industry" Decision Conference (2017)
- TMB (Turkish Contractors Association) Decision Conference (2010)

Agriculture and Food

- Food Associations Workshop (2004)
- MEYED (Association of the Industry of Juices and Nectars) Decision Conference (2002)

Organized Workshops

ASSOCIATIONS & UNIONS

Health

- "Improving Transplantation System" Decision Conference (2007)
- Private Health Sector Decision Conference (2002)
- İEİS (Pharmaceutical Manufacturers Association of Turkey) "Identification of Pharmaceutical Industry" Decision Conference (1999)

Education

- TÜSİAD (Turkish Industry & Business Association) "Improving Vocational and Technical Education" Decision Conference (2003)

Organized Workshops

CONGLOMERATES

- TEKFEN Strategic Direction Workshop (2017)
- Anadolu Group Strategic Business Options Prioritization Conference (2015)
- Erdemir Group Decision Conference (2014)
- Bozlu Holding Decision Conference (2014)

Organized Workshops

CORPORATIONS

Automotive

- TOFAŞ "Proactive Failure Prevention" Decision Conference (2017)
- BMC "Restructuring Distribution Channels" Decision Conference (2008)
- BMC "Evaluation of Strategic Projects" Decision Conference (2008)
- FIAT Argentina "Product Model Evaluation" Decision Conference (2002)
- FIAT China "Product Model Evaluation" Decision Conference (2002)
- FIAT Egypt "Product Model Evaluation" Decision Conference (2002)
- FIAT India "Product Model Evaluation" Decision Conference (2002)
- FIAT Morocco "Product Model Evaluation" Decision Conference (2002)
- FIAT South Africa "Product Model Evaluation" Decision Conference (2002)
- FIAT Thailand "Product Model Evaluation" Decision Conference (2002)
- FIAT Turkey "Product Model Evaluation" Decision Conference (2002)
- Brisa "ERP Selection" Decision Conference (2000)
- TOFAŞ-FIAT Search and Decision Conferences (1999)

Organized Workshops

CORPORATIONS

Energy

- Milangaz Decision Conference (2023)
- PO (Petrol Ofisi) fuel products distributor "New Station Design" Decision Meeting (2005)

Chemical Products

- Polisan Kimya Strategy Workshop (2021)
- DYO Paints Factories "Evaluation of Strategic Options" Decision Conference (2011)
- AKSA Acrylic Fiber Corporation "Evaluation of Strategies and Prioritization of Options" Workshop (2008)

Transportation and Logistics

- BANTAŞ (Cash and Valuables Transfer and Security Services) Hybrid Search and Decision Conference (2022)

Paper Products

- Viking Pulp and Paper Mill "Evaluation of Strategic Options" Decision Conference (2011)

Organized Workshops

CORPORATIONS

Agriculture and Food

- Çamlı Feed and Farming "Evaluation of Strategic Options" Decision Conference (2011)
- ETİ "Global Delight" Decision Conference (2009)
- Mis Süt Decision Conference (1999)

E-Business

- Yemek Sepeti (Online Food Delivery and Market Shopping Company) "Market Domination Strategies" Decision Conference (2021)
- E-export Strategy Decision Conference (2015)

Information Systems

- Datasel Information Systems Decision Conference (2007)

Organized Workshops

CORPORATIONS

Finance

- Osmanlı Bank "Rating of Bank Branches" Decision Conference (2000)
- Osmanlı Bank "Selection of Bank Branch Rating System" Decision Conference (2000)

Electronic Appliance

- Vestel and Business Partners Decision Conference (2010)

Tourism

- Rixos Hotels Future Design and Decision Conference (2010)

Organized Workshops

DEFENSE INDUSTRY

- Turkish Cyber Security Cluster "Selection of Collaboration Models" Decision Conference (2022)
- Turkish Cyber Security Cluster "Prioritization of Projects" Decision Conference (2022)
- Presidency of Defense Industries "Modeling and Simulation Industry" Workshop (2019)
- Presidency of Defense Industries, Department of Cyber Security and Electronic Warfare Systems – TÜBİTAK (The Scientific and Technological Research Council of Turkey) BİLGEM (Informatics and Information Security Research Center) Cyber Security Institute "Cyber Security Cluster Design" Workshop (2017)

Organized Workshops

FOUNDATION MANAGEMENT

- Sabancı Foundation Decision Conference (2016)
- Sabanci Foundation Decision Conference (2007)
- Vehbi Koç Foundation Search and Decision Conferences (1999)

UNIVERSITIES

- TJU (Turkish Japanese University) "Campus Design" Workshop (2021)
- Atatürk University "New Generation University Design and Transformation Project" Decision Conference (2018)

Organized Workshops

LAW SYSTEM

- "Quality in Law System" Decision Conference (1998)

INTERNATIONAL RELATIONS

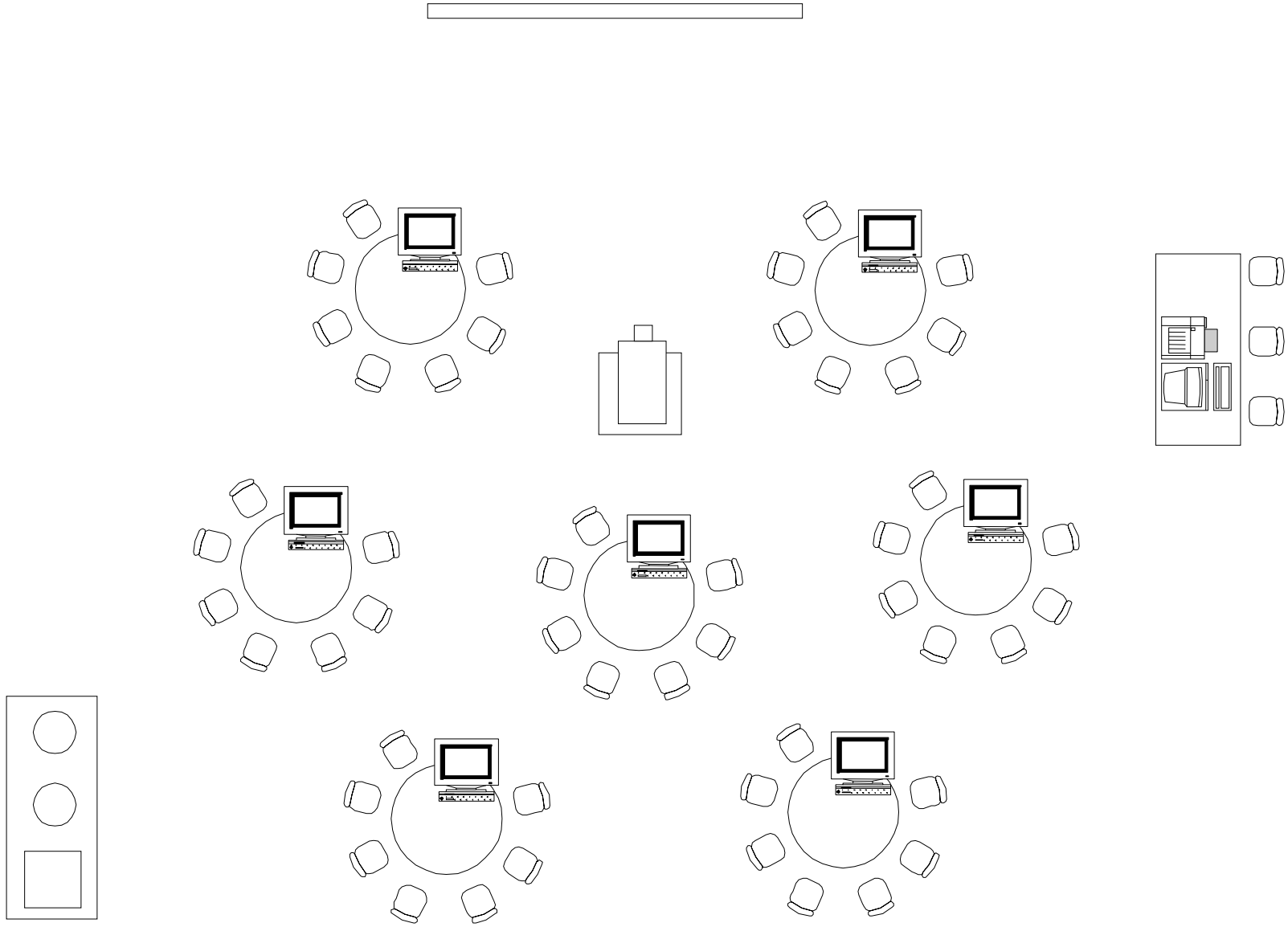
- CATS (Centre for Applied Turkey Studies) Network "Searching for a new formula for collaboration between Turkey and the EU in North Africa" Workshop (2021)

ENVIRONMENTAL PROTECTION

- TEMA (The Turkish Foundation for Combating Soil Erosion for Reforestation and the Protection of Natural Habitats) Decision Conference (2000)

SPORTS

- Galatasaray Sports Club Decision Conference (2002)



CATS Network

GOAL

Collaboration between Turkey and the EU in North Africa (Algeria, Egypt and Morocco)

CRITERIA

Mutual Benefit

Probability of success

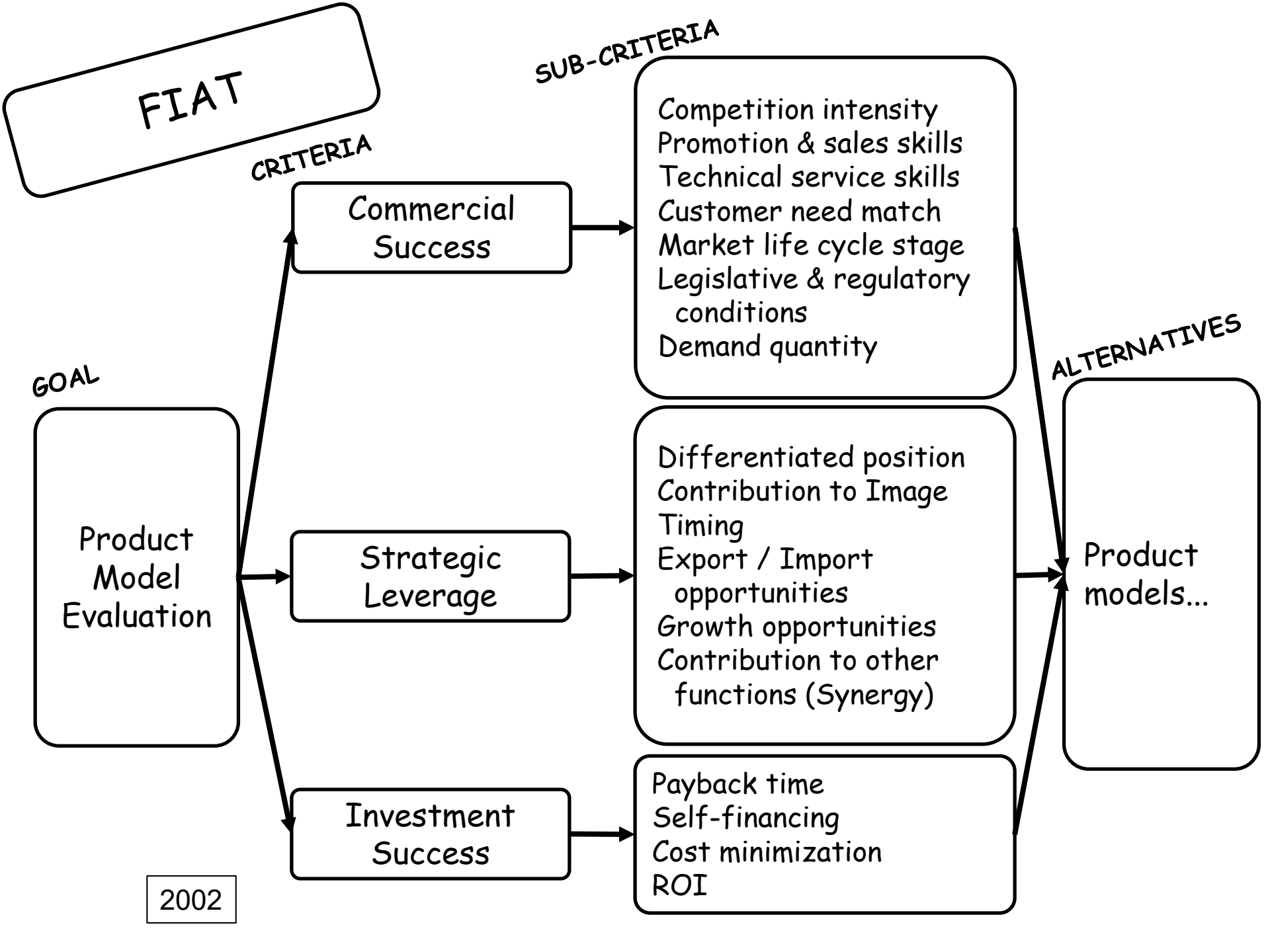
Actionability (ease of implementation)

Purposefulness

PROJECTS

1. Cooperation on tourism with a main focus on educative tourism
2. Economic cooperation on construction with a main focus on public infrastructure
3. Cooperation on health with a main focus on post-Covid societies
4. Cooperation on the European Green Deal with a main focus on renewable energy
5. Cooperation on agriculture with a main focus on food security
6. Cooperation on natural resources with a main focus on water management
7. Cooperation on education with a main focus on capacity building
8. Cooperation on migration with a main focus on aid
9. Cooperation on migration with a main focus on border management
10. Military cooperation with a main focus on military equipments
11. Military cooperation with a main focus on capacity building
12. Economic cooperation on textile
13. Cooperation on digitalization with a main focus on e-government
14. Cooperation on financial sector with a main focus on digital banking
15. Cooperation on women's rights
16. Cooperation on good governance with a main focus on local governance

2021


FIAT
SUB-CRITERIA
CRITERIA
Commercial Success
Competition intensity
Promotion & sales skills
Technical service skills
Customer need match
Market life cycle stage
Legislative & regulatory conditions
Demand quantity
GOAL
Product Model Evaluation
Strategic Leverage
Differentiated position
Contribution to Image
Timing
Export / Import opportunities
Growth opportunities
Contribution to other functions (Synergy)
ALTERNATIVES
Product models...
Investment Success
Payback time
Self-financing
Cost minimization
ROI
2002

Turkish Japanese University

GOAL

Designing and implementing a state-of-the-art Campus for research focused University of Science and Technology

CRITERIA

Functionality / Performance

Sustainability

TJU culture

Architectural style

Uniqueness / Landmark

Investment

Time to completion

The model prioritize criteria

2021

Rixos

GOAL

Becoming a unique and fast growing international luxury hotel brand

CRITERIA

Guest Satisfaction & Loyalty

Profitability

Fast Growth

Brand Value

Agility

Innovation

STRATEGIES

1. Defining "Rixos Experience" and Design Standards
2. Reactivating Rixos Academy
3. Developing a Business Model
4. Developing a Marketing Strategy (Segmentation & Brand Communication)
5. Implementing a Performance Management System
6. Developing a Growth Business Plan
7. Integrating an ERP System
8. Developing an Internal Communication Plan
9. Setting Rixos' Policies & Procedures (Code of Conduct)
10. Designing Organizational Structure - Defining Responsibilities and Standards

2010

Galatasaray

GOAL

To be a globally successful, leading, respected, stable organization with a strong administrative and financial structure, having a robust youth academy, and distinguished by its success in football; a brand, institution, and sports club that stands out

2002

CRITERIA

Sporting success

Financial success

Administrative success

Commercial success

Human success

PROJECTS

1. Realize the football statdium project
2. Create brand revenue and diversify by increasing distribution channels
3. Structure amateur branches to be profitable
4. Delegate authority to professionals.
5. Establish a player scouting and selection system
6. Protect brand rights
7. Strengthen the youth football academy
8. Be listed on the Istanbul stock exchange (Initial Public Offering)

...

...

...

21. Reduce the number of board members

The Analytic Hierarchy Process is

a powerful and understandable methodology that allows groups or individuals to combine qualitative and quantitative factors in decision making process.

a Multi Criteria Decision Making method for complicated and unstructured problems.

an approach that uses a hierarchical model having levels of goal, criteria, possible sub-criteria, and alternatives.

Priorities: Importance - Preference

AHP captures priorities from paired comparison judgments of the elements of the decision with respect to each of their parent criteria:

- Paired comparison judgments are arranged in a matrix
- Priorities are derived from the matrix as its principal eigenvector
- It also allows for the measurement of inconsistency in judgment

9 7 5 3 **1**

Importance of elements are **equal**
Decision maker is indifferent between elements

9 7 5 **3** 1

First element is **moderately** more important than second one
First element is moderately preferred to second one

9 7 **5** 3 1

First element is **strongly** more important than second one
First element is strongly preferred to second one

9 **7** 5 3 1

First element is **very strongly** more important than second one
First element is very strongly preferred to second one

9 7 5 3 1

First element is **extremely** more important than second one
First element is strongly preferred to second one

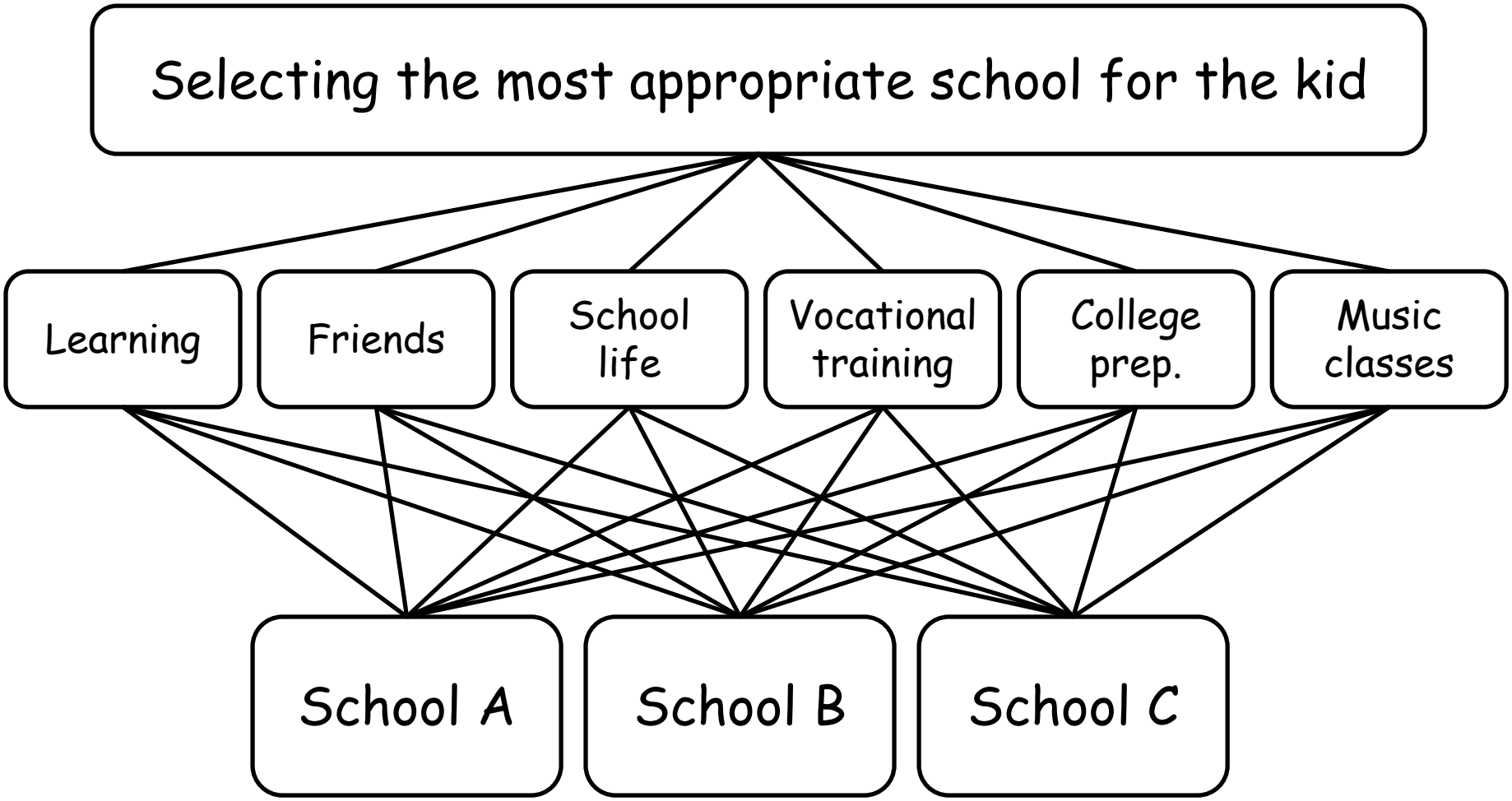
9 8 7 6 5 4 3 2 1

Intermediate values

$1\ \frac{1}{2}\ \frac{1}{3}\ \frac{1}{4}\ \frac{1}{5}\ \frac{1}{6}\ \frac{1}{7}\ \frac{1}{8}\ \frac{1}{9}$

Use reciprocals for inverse comparisons
Second element is more important than first one
Second element is more preferred to first one

School Selection



Comparison of criteria w.r.t. goal

	Learning	Friends	School life	Vocational training	College prep.	Music classes	Priorities
Learning	1	4	3	1	3	4	.3047
Friends	1/4	1	7	3	1/5	1	.1486
School life	1/3	1/7	1	1/5	1/5	1/6	.0382
Vocational training	1	1/3	5	1	1	1/3	.1414
College prep.	1/3	5	5	1	1	3	.2208
Music classes	1/4	1	6	3	1/3	1	.1463

Comparison of schools w.r.t. criteria

Learning

	A	B	C	Priorities
A	1	1/3	1/2	.16
B	3	1	3	.59
C	2	1/3	1	.25

Friends

	A	B	C	Priorities
A	1	1	1	.33
B	1	1	1	.33
C	1	1	1	.33

School life

	A	B	C	Priorities
A	1	5	1	.46
B	1/5	1	1/5	.09
C	1	5	1	.46

Vocational training

	A	B	C	Priorities
A	1	9	7	.75
B	1/9	1	1/5	.06
C	1/7	5	1	.19

College prep.

	A	B	C	Priorities
A	1	1/2	1	.25
B	2	1	2	.50
C	1	1/2	1	.25

Music classes

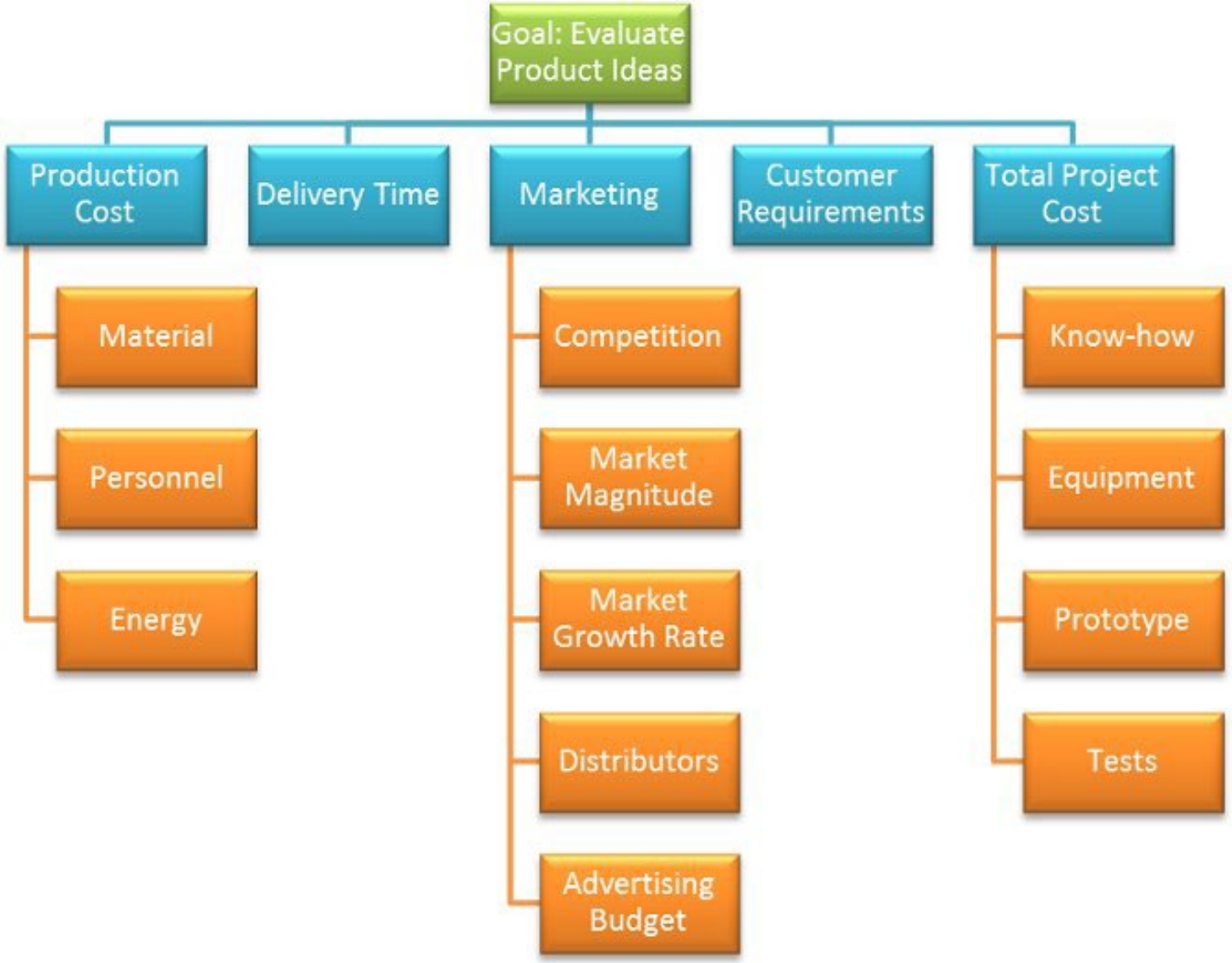
	A	B	C	Priorities
A	1	6	4	.69
B	1/6	1	1/3	.09
C	1/4	3	1	.22

Composition and synthesis

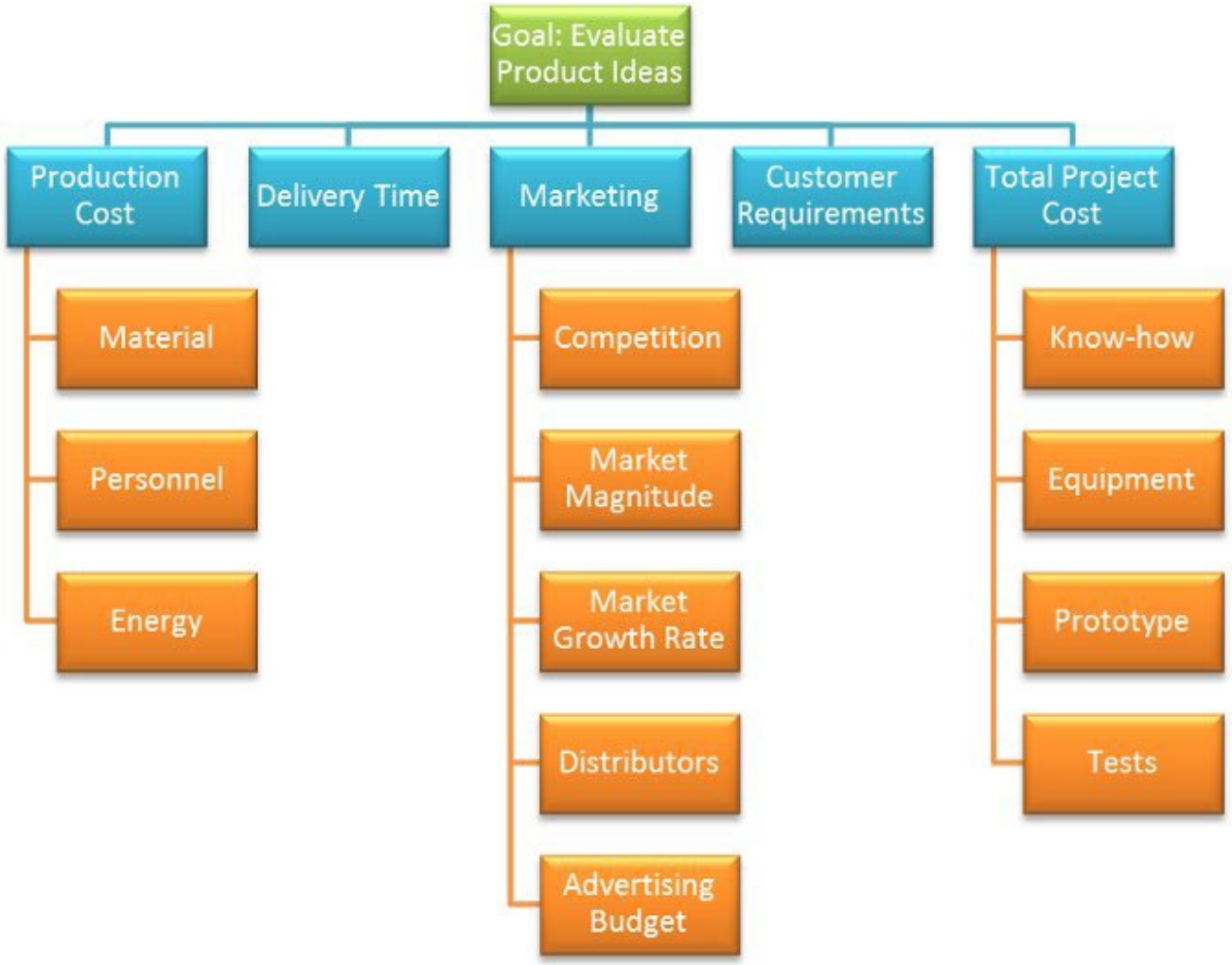
Impact of schools on goal

	Learning	Friends	School life	Vocational training	College prep.	Music classes	Composite impact of schools
	.3047	.1486	.0382	.1414	.2208	.1463	
A	.16	.33	.46	.75	.25	.69	.3776
B	.59	.33	.09	.06	.50	.09	.3643
C	.25	.33	.46	.19	.25	.22	.2570

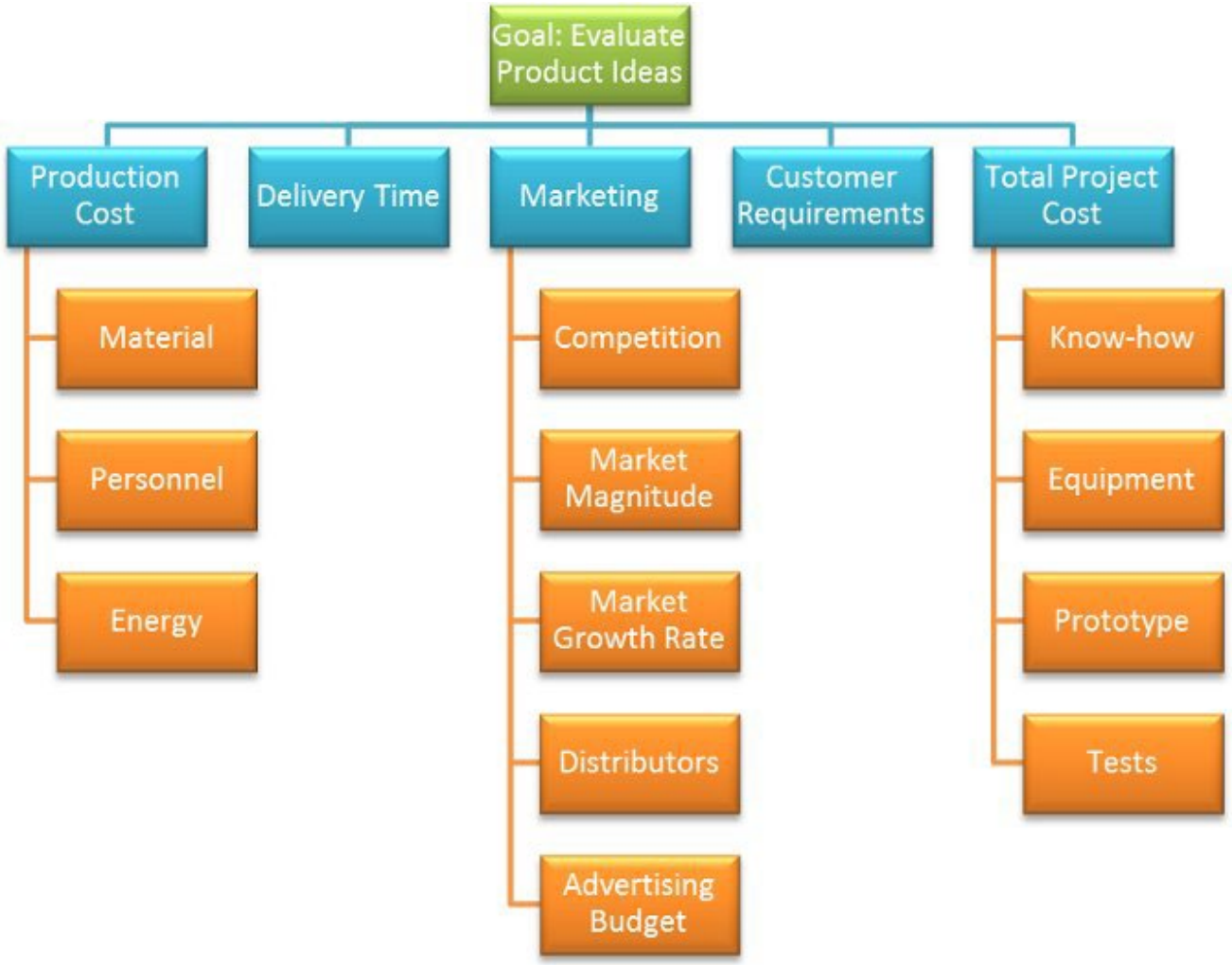
Composite impact – Global score



http://makeitrational.com/analytic-hierarchy-process/ahp-model/product-idea-screening



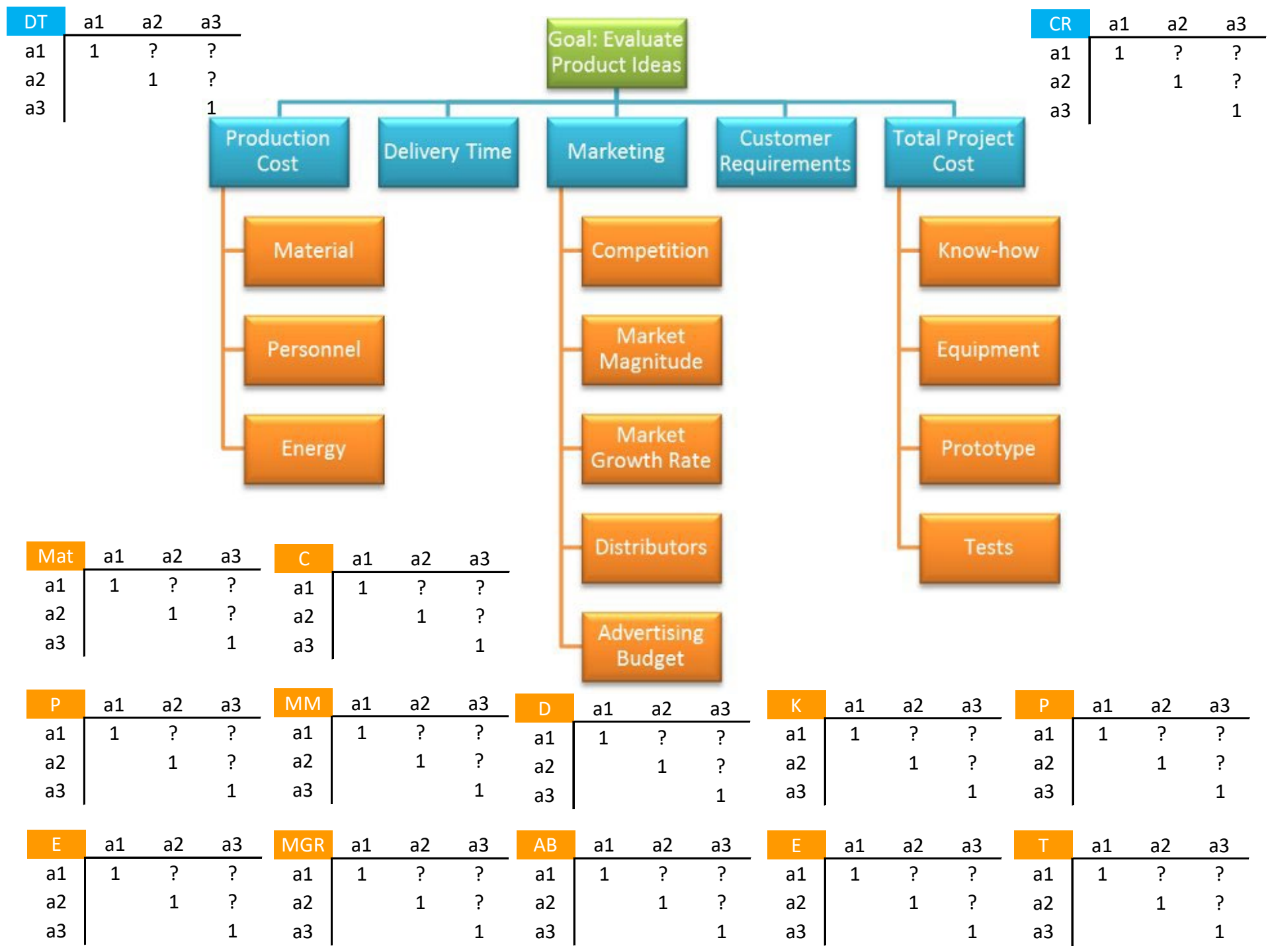
Goal	PC	DT	M	CR	TPC
PC	1	?	?	?	?
DT		1	?	?	?
M			1	?	?
CR				1	?
TPC					1



PC	Mat	P	E
Mat	1	?	?
P		1	?
E			1

M	C	MM	MGR	D	AB
C	1	?	?	?	?
MM		1	?	?	?
MGR			1	?	?
D				1	?
AB					1

TPC	K	E	P	T
K	1	?	?	?
E		1	?	?
P			1	?
T				1



DT	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

CR	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

Mat	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

C	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

P	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

MM	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

D	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

K	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

P	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

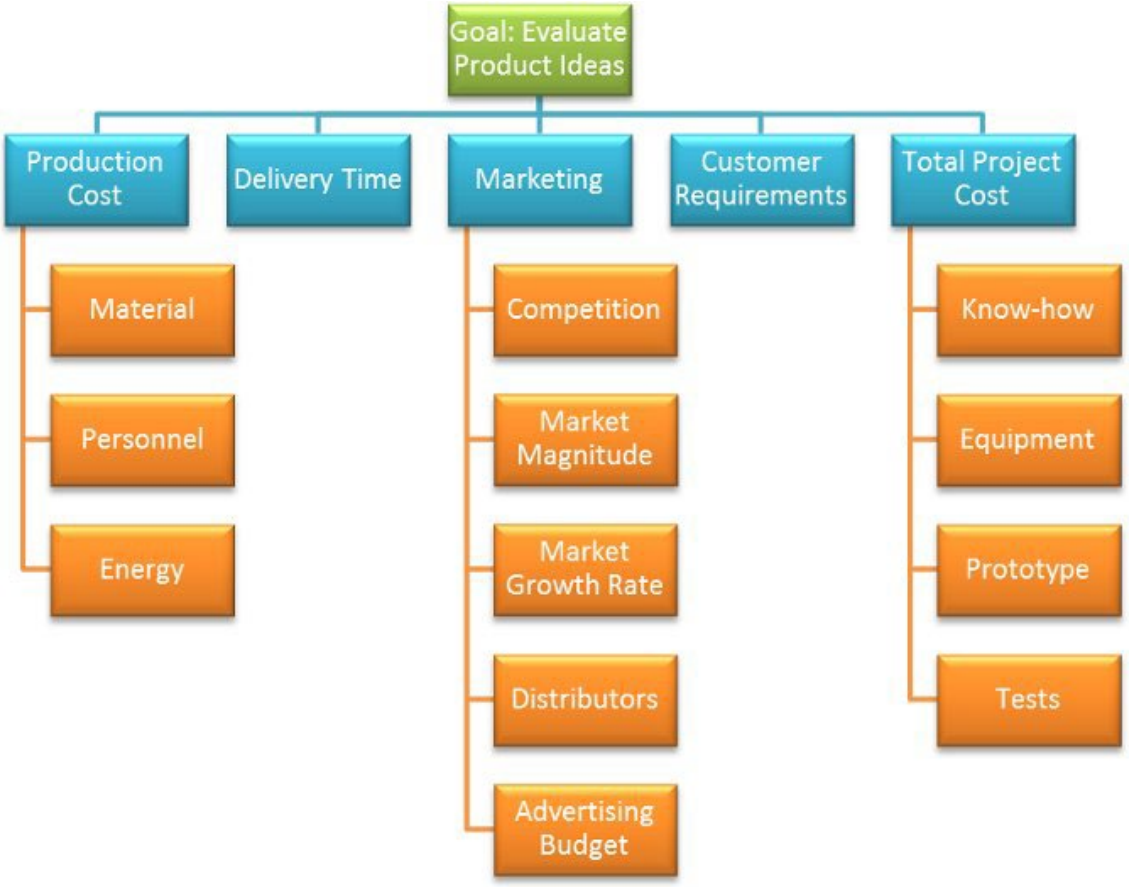
E	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

MGR	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

AB	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

E	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1

T	a1	a2	a3
a1	1	?	?
a2		1	?
a3			1



Goal	priorities
PC	w1
DT	w2
M	w3
CR	w4
TP	w5

M	priorities
C	w31
MM	w32
MGR	w33
D	w34
AB	w35

PC	priorities
Mat	w11
P	w12
E	w13

TPC	priorities
K	w51
E	w52
P	w53
T	w54

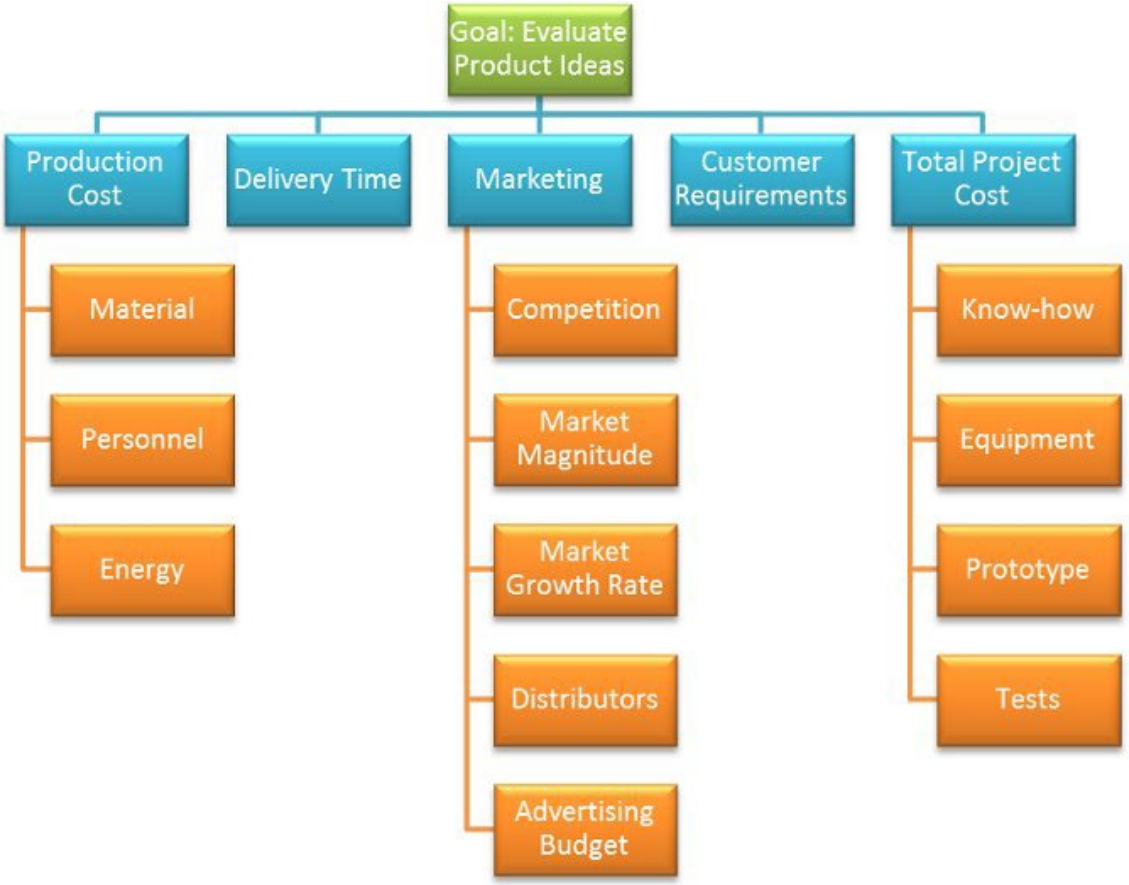
Mat	priorities
a1	w111
a2	w112
a3	w113

E	priorities
a1	w131
a2	w132
a3	w133

P	priorities
a1	w121
a2	w122
a3	w123

DT	priorities
a1	w21
a2	w22
a3	w23

		w1*w12		w2		w3*w32		w3*w34		w4		w5*w52		w5*w54
	w1*w11		w1*w13		w3*w31		w3*w33		w3*w35		w5*w51		w5*w53	
	Mat	P	E	DT	C	MM	MGR	D	AB	CR	K	E	P	T
a1	w111	w121	w131	w21	w311	w321	w331	w341	w351	w41	w511	w521	w531	w541
a2	w112	w122	w132	w22	w312	w322	w332	w342	w352	w42	w512	w522	w532	w542
a3	w113	w123	w133	w23	w313	w323	w333	w343	w353	w43	w513	w523	w533	w543



		w1*w11	w1*w12	w1*w13	w2	w3*w31	w3*w32	w3*w33	w3*w34	w3*w35	w4	w5*w51	w5*w52	w5*w53	w5*w54
		Mat	P	E	DT	C	MM	MGR	D	AB	CR	K	E	P	T
a1		w111	w121	w131	w21	w311	w321	w331	w341	w351	w41	w511	w521	w531	w541
a2		w112	w122	w132	w22	w312	w322	w332	w342	w352	w42	w512	w522	w532	w542
a3		w113	w123	w133	w23	w313	w323	w333	w343	w353	w43	w513	w523	w533	w543

Global score of a1 = w1*w11*w111 + w1*w12*w121 + w1*w13*w131 + w2*w21 + ... + ... + w5*w54*w541

Global score of a2 = w1*w11*w112 + w1*w12*w122 + w1*w13*w132 + w2*w22 + ... + ... + w5*w54*w542

Global score of a3 = w1*w11*w113 + w1*w12*w123 + w1*w13*w133 + w2*w23 + ... + ... + w5*w54*w543

Eigenvector solution

A	a	b	c
a	1	0.5	3
b	2	1	4
c	0.3333	0.25	1
Sum	3.3333	1.75	8

Column normalization

x/sum	a	b	c	**w**
a	.3000	.2857	.3750	.3202
b	.6000	.5714	.5000	.5571
c	.1000	.1429	.1250	.1226
	1	1	1	

Row average

Use this method for paper-and-pencil solutions

Eigenvector calculation (Method I)

Calculate row averages, then normalize the average values.

OR Calculate the sum of each row, then normalize the sums.

1	5	6	7	19	0.5111
1/5	1	4	6	11.2	0.3013
1/6	1/4	1	4	5.42	0.1457
1/7	1/6	1/4	1	1.56	0.0419
				37.18	

Eigenvector calculation (Method II)

Calculate the sum of each column, invert the summations (1/sum of the column), then normalize inverse values

1	5	6	7	1/1.51	0.66	0.6881
1/5	1	4	6	1/6.42	0.16	0.1619
1/6	1/4	1	4	1/11.3	0.09	0.0923
1/7	1/6	1/4	1	1/18	0.06	0.0577
1.51	6.42	11.3	18		0.96	

Eigenvector calculation (Method III)

Normalize each column, then calculate row averages of normalized matrix

1	5	6	7	0.66	0.78	0.53	0.39	0.5910
1/5	1	4	6	0.13	0.16	0.36	0.33	0.2443
1/6	1/4	1	4	0.11	0.04	0.09	0.22	0.1151
1/7	1/6	1/4	1	0.09	0.03	0.02	0.06	0.0496
1.51	6.42	11.3	18					

Use this method for paper-and-pencil solutions

Eigenvector calculation (Method IV)

Calculate geometric mean of each row, then normalize geometric mean values.

1	5	6	7	3.8068	0.6136
1/5	1	4	6	1.4802	0.2386
1/6	1/4	1	4	0.6389	0.1030
1/7	1/6	1/4	1	0.2778	0.0448
				6.2036	

Eigenvector calculation (Method V)

Raise the pairwise comparison matrix to a sufficiently large power.

Calculate row averages of the new matrix, then normalize the average values (utilize method I).

Repeat this step for a larger power of the matrix.

If values of the eigenvectors are converged, stop; otherwise continue with a larger power

Eigenvector calculation (Method V)

A^2

4.00	12.67	33.75	68.00	118.42	0.6247
1.92	4.00	10.70	29.40	46.02	0.2428
0.95	2.00	4.00	10.67	17.62	0.0930
0.36	1.11	2.02	4.00	7.49	0.0395
				189.56	

A^4

97.12	244.32	543.15	1276.40	2160.99	0.6180
36.21	94.41	210.03	480.15	820.80	0.2347
15.33	39.93	91.21	209.06	355.54	0.1017
6.95	17.50	40.24	94.75	159.45	0.0456
				3496.78	

Eigenvector calculation (Method V)

A^6	1837.505	4710.734	10647.84	24686.44	41882.52	0.6187
	700.1895	1789.385	4044.129	9398.821	15932.52	0.2354
	300.65	768.4613	1732.738	4025.894	6827.748	0.1009
	134.0778	343.743	774.6437	1795.547	3048.012	0.0450
					67690.8	

A^8	35483.48	90818.56	204972.7	475768.6	807043.3	0.6187
	13494.66	34548.67	77975.75	180953.4	306972.5	0.2353
	5787.54	14816.84	33448.23	77623.39	131676	0.1009
	2584.887	6615.85	14935.6	34668.39	58804.73	0.0451
					1304497	

I	II	III	IV	V
0.5111	0.6881	0.5910	0.6136	0.6187
0.3013	0.1619	0.2443	0.2386	0.2353
0.1457	0.0923	0.1151	0.1030	0.1009
0.0419	0.0577	0.0496	0.0448	0.0451

Consistency

	.3202		.9667		3.0186
w	.5571	Aw	1.6881	Aw / w	3.0300
	.1226		.3687		3.0065
				average →	3.0183 λ_{max}

n	RI
3	0.52
4	0.89
5	1.11
6	1.25
7	1.35
8	1.40
9	1.45

$$CI = \frac{\lambda_{max} - n}{n - 1} = 0.0092$$

Consistency index

RI = SEE TABLE = 0.52

Random consistency index

$$CR = \frac{CI}{RI} = 1.76\%$$

Consistency ratio

Group Decision Making

- Consensus judgment
- Aggregating individual opinion: *Geometric Mean*

Group Decision Making

MOTHER: "Learning" is strongly more important than "Friends"

	Learning	Friends	School life	Vocational training	College prep.	Music classes	Priorities
Learning	1	5					
Friends		1					
School life			1				
Vocational training				1			
College prep.					1		
Music classes						1	

FATHER: "Friends" is strongly more important than "Learning"

	Learning	Friends	School life	Vocational training	College prep.	Music classes	Priorities
Learning	1	1/5					
Friends		1					
School life			1				
Vocational training				1			
College prep.					1		
Music classes						1	

Group Decision Making

MOTHER: "Learning" is strongly more important than "Friends"

FATHER: "Friends" is strongly more important than "Learning"

	Learning	Friends
Learning	1	5
Friends	1/5	1

→

	Learning	Friends
Learning	1	X
Friends	1/X	1

←

	Learning	Friends
Learning	1	1/5
Friends	5	1

Use <u>arithmetic mean</u> to combine decisions?

NO

$X = (5+0.2)/2 = 2.6 \neq 1$

$1/X = (0.2+5)/2 = 2.6 \neq 1/2.6$

Use <u>geometric mean</u> to combine decisions?

YES

$X = \sqrt{(5 \times 0.2)} = 1$

$1/X = \sqrt{(0.2 \times 5)} = 1$

Group Decision Making

DM1
very strongly (7)

	A	B
A	1	X
B	1/X	1

DM2
moderately (3)

Use arithmetic mean to combine decisions?

NO

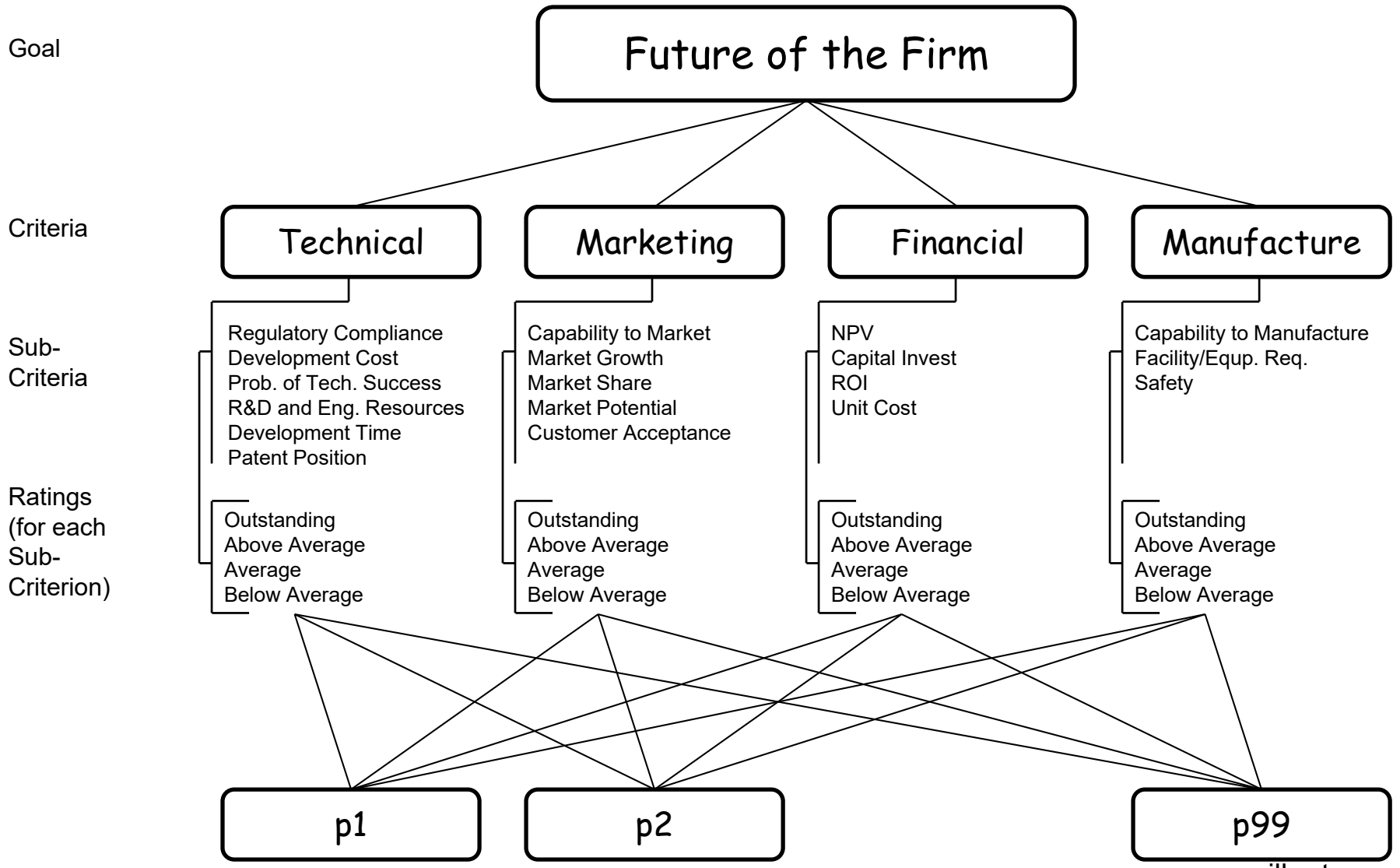
$X = (7+3)/2 = 5$
$1/X = (1/7+1/3)/2 = 0.24 \neq 1/5$

Use geometric mean to combine decisions?

YES

$X = \sqrt{(7*3)} = 4.58$
$1/X = \sqrt{(1/7*1/3)} = 0.22 = 1/4.58$

R&D Project Selection (*Rating*)



CRITERIA PRIORITIZATION

Pairwise Comparisons

PROJECT RATING

What is the contribution / impact of a project on a criterion?

Contribution of Project on Criterion	
Very high	1
High	0.8
Average	0.6
Low	0.4
Very low	0.2
No impact	0

Project	Total Points	Difference
7	0.888	
9	0.831	5.7
3	0.816	1.5
5	0.815	0.1
4	0.782	3.3
1	0.722	6.0
10	0.693	2.9
6	0.678	1.5
8	0.652	2.6
2	0.590	6.2

1. Select predetermined number of projects; *e.g. 3*
2. Select projects getting total points higher than a predetermined threshold; *e.g. 0.7*
3. Find a breakpoint, select projects getting total points higher than that breakpoint; *depends on results*

AHP Rating

Evaluating Employees for Raises

Dependability **15.50%**	
Outstanding	1
Very good	.58
Good	.33
Average	.10
Unsatisfactory	.06

Education **24.00%**	
Doctorate	1
Masters	.42
Bachelors	.19
High school	.08

Experience **13.80%**	
> 15 years	1
6 – 15 years	.41
3 – 5 years	.16
< 3 years	.07

Attitude **17.20%**	
Enthused	1
Very good	.53
Good	.29
Average	.16
Bad	.06

Leadership **29.50%**	
Good	1
Average	.44
Bad	.08

AHP Rating

Evaluating Employees for Raises

Candidate	Dependability 15.50%	Education 24.00%	Experience 13.80%	Attitude 17.20%	Leadership 29.50%
1	Outstanding	Doctorate	> 15 years	Enthused	Good
2	Average	Masters	< 3 years	Enthused	Good
3	Good	Bachelors	> 15 years	Very good	Bad
4	Good	Masters	3 - 5 years	Very good	Good
5	Average	Bachelors	3 – 5 years	Good	Average
6	Outstanding	Masters	< 3 years	Very good	Average
7	Outstanding	Bachelors	6 – 15 years	Good	Average
8	Very good	Masters	6 – 15 years	Average	Good
9	Outstanding	Masters	3 – 5 years	Very good	Average
10	Very good	Doctorate	6 – 15 years	Good	Average
11	Unsatisfactory	Bachelors	6 – 15 years	Good	Average
12	Very good	Bachelors	3 – 5 years	Enthused	Good
13	Good	Doctorate	> 15 years	Enthused	Good
14	Good	High school	3 – 5 years	Very good	Average
15	Outstanding	Doctorate	< 3 years	Very good	Average

AHP Rating

Evaluating Employees for Raises

Candidate	Dependability 15.50%	Education 24.00%	Experience 13.80%	Attitude 17.20%	Leadership 29.50%	Total Points
1	1	1	1	1	1	1
2	.10	.42	.07	1	1	.59
3	.33	.19	1	.53	.08	.35
4	.33	.42	.16	.53	1	.56
5	.10	.19	.16	.29	.44	.26
6	1	.42	.07	.53	.44	.49
7	1	.19	.41	.29	.44	.44
8	.58	.42	.41	.16	1	.57
9	1	.42	.16	.53	.44	.50
10	.58	1	.41	.29	.44	.57
11	.06	.19	.41	.29	.44	.29
12	.58	.19	.16	1	1	.62
13	.33	1	1	1	1	.90
14	.33	.08	.16	.53	.44	.32
15	1	1	.07	.53	.44	.62

AHP Rating

Evaluating Employees for Raises

Candidate	Total Points
1	1
13	.90
12, 15	.62
2	.59
8, 10	.57
4	.56
9	.50
6	.49
7	.44
3	.35
14	.32
11	.29
5	.26

Why Network?

In a hierarchy, alternatives affect (depend on) the criteria, criteria affect goal

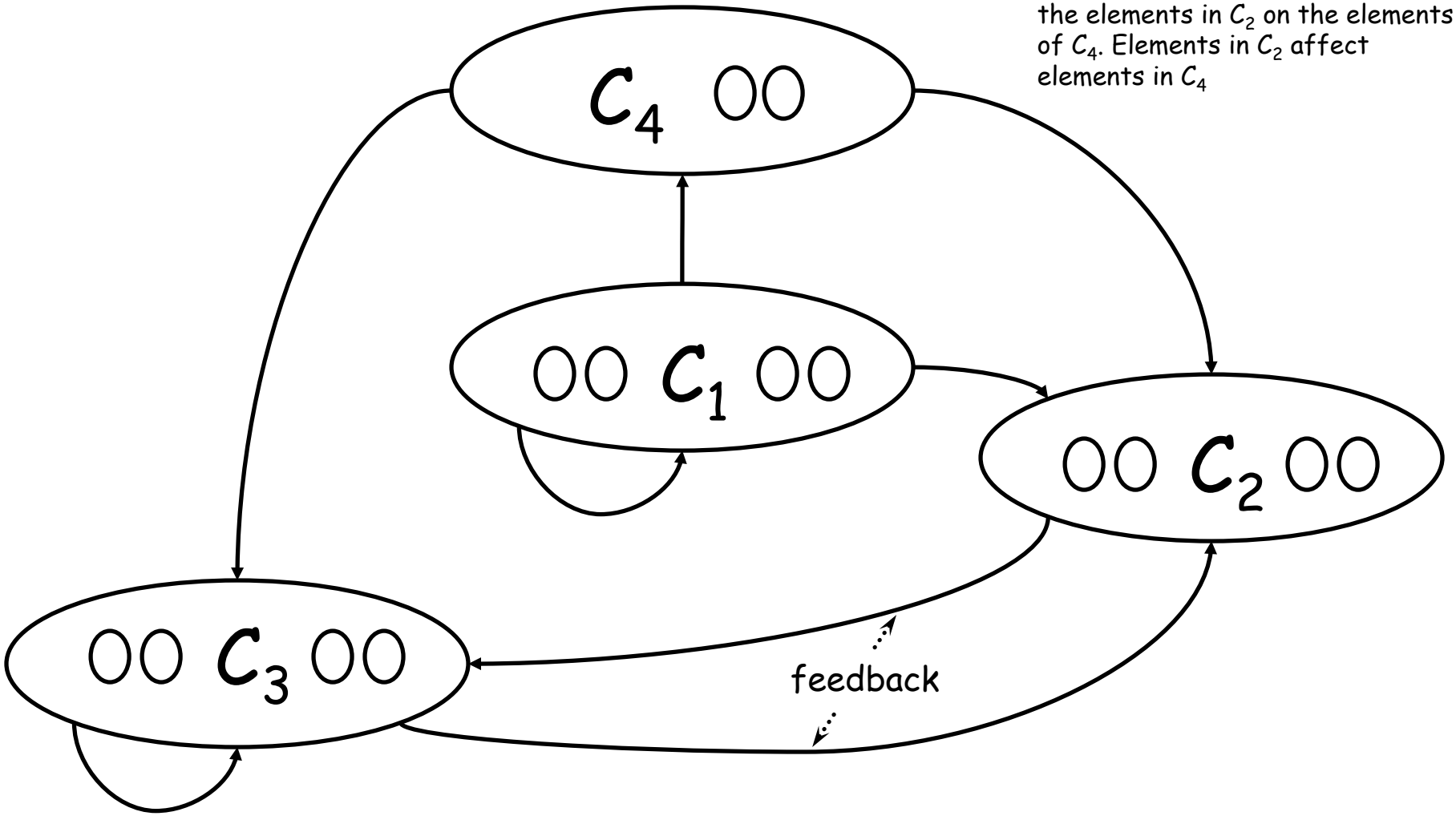
It is assumed that

- criteria do not affect alternatives
- criteria do not depend on each other
- alternatives do not depend on each other

In complex decisions, there may be dependence and feedback

Network model with dependence and feedback improves the priorities derived from judgments and makes prediction much more accurate

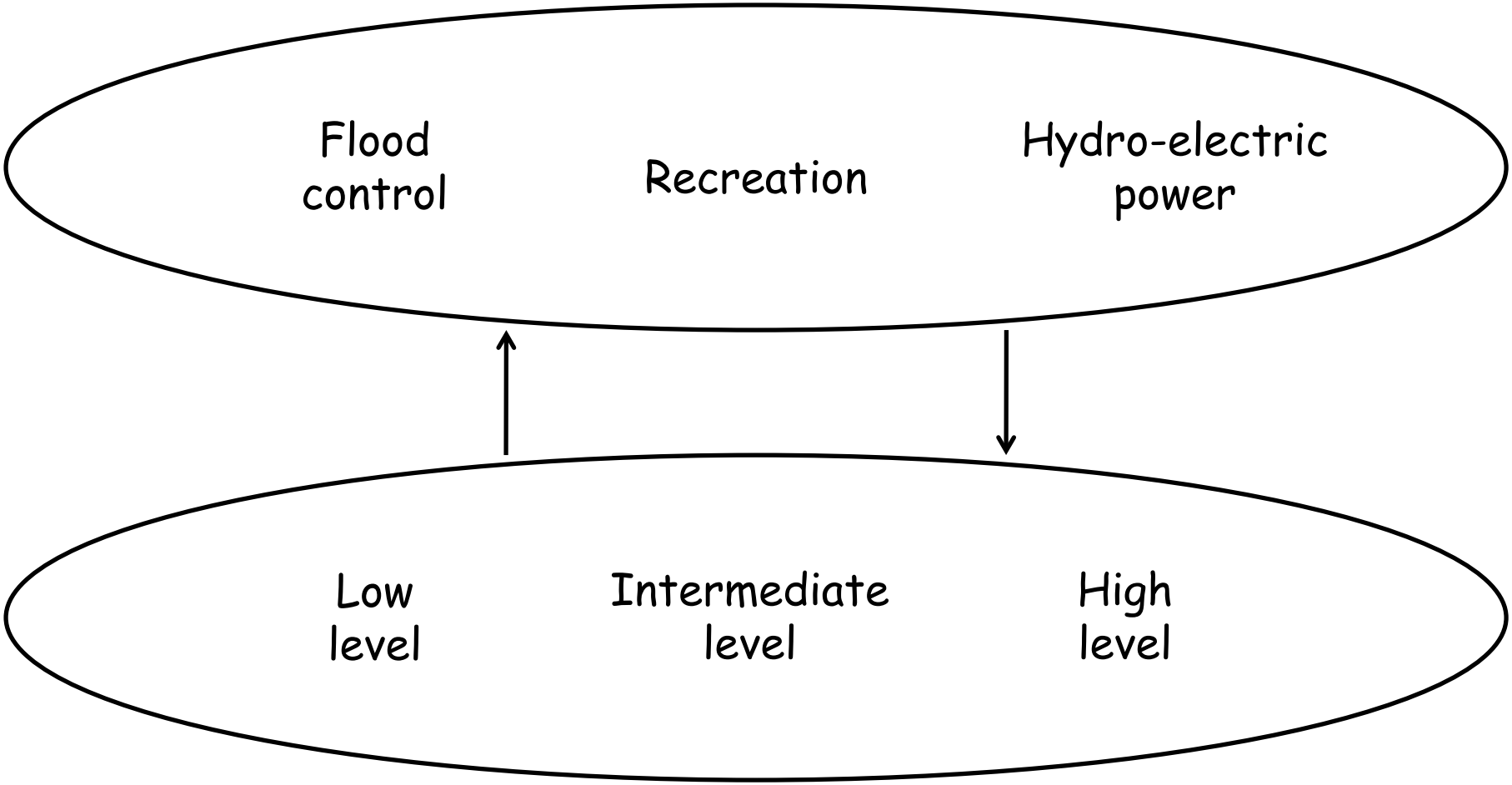
Network



Arc from cluster C_4 to C_2 indicates outer dependence of the elements in C_2 on the elements of C_4. Elements in C_2 affect elements in C_4

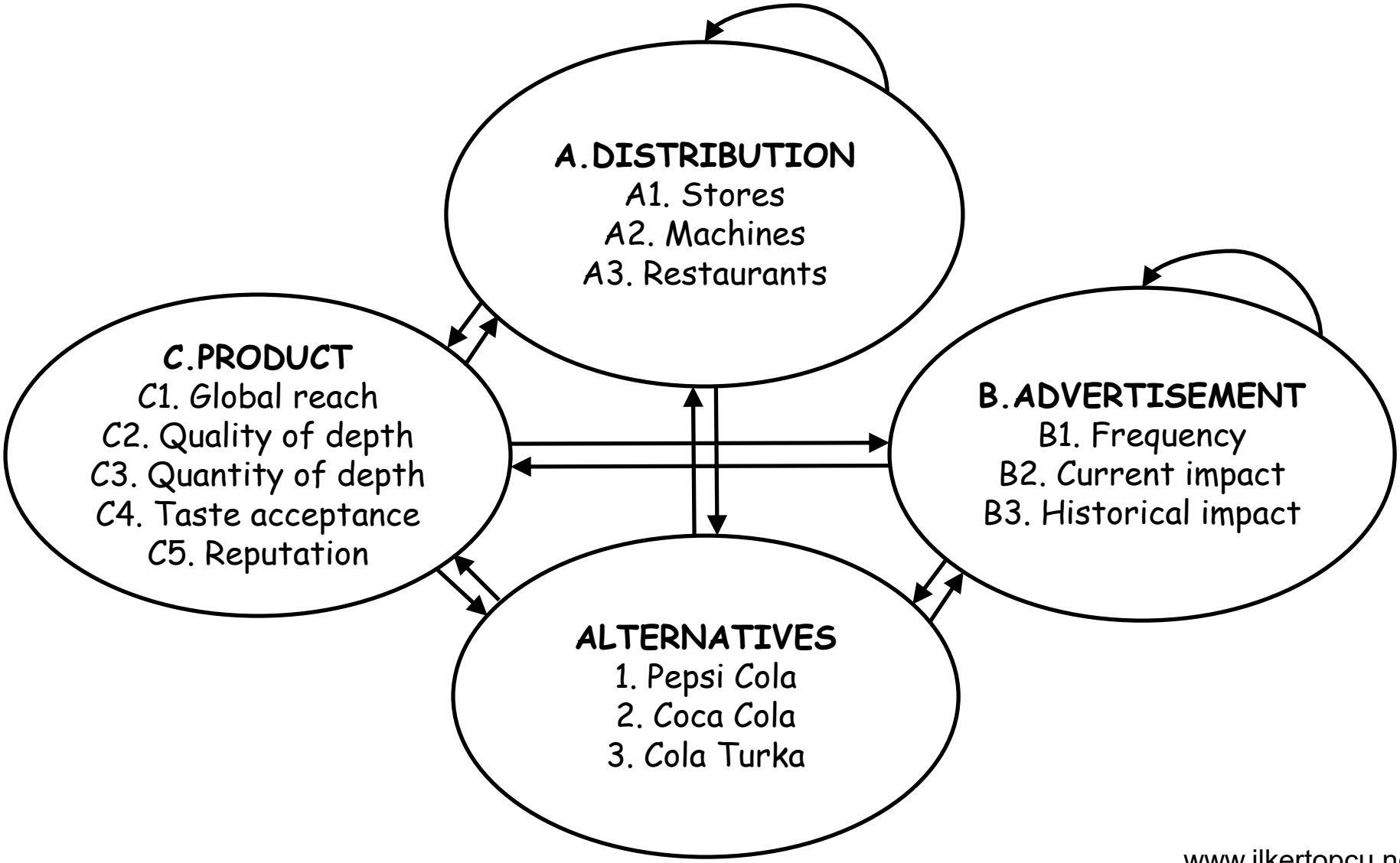
Loop in a cluster indicates inner dependence of the elements in that cluster.
Elements affect other elements of the same cluster

Management of a Water Reservoir

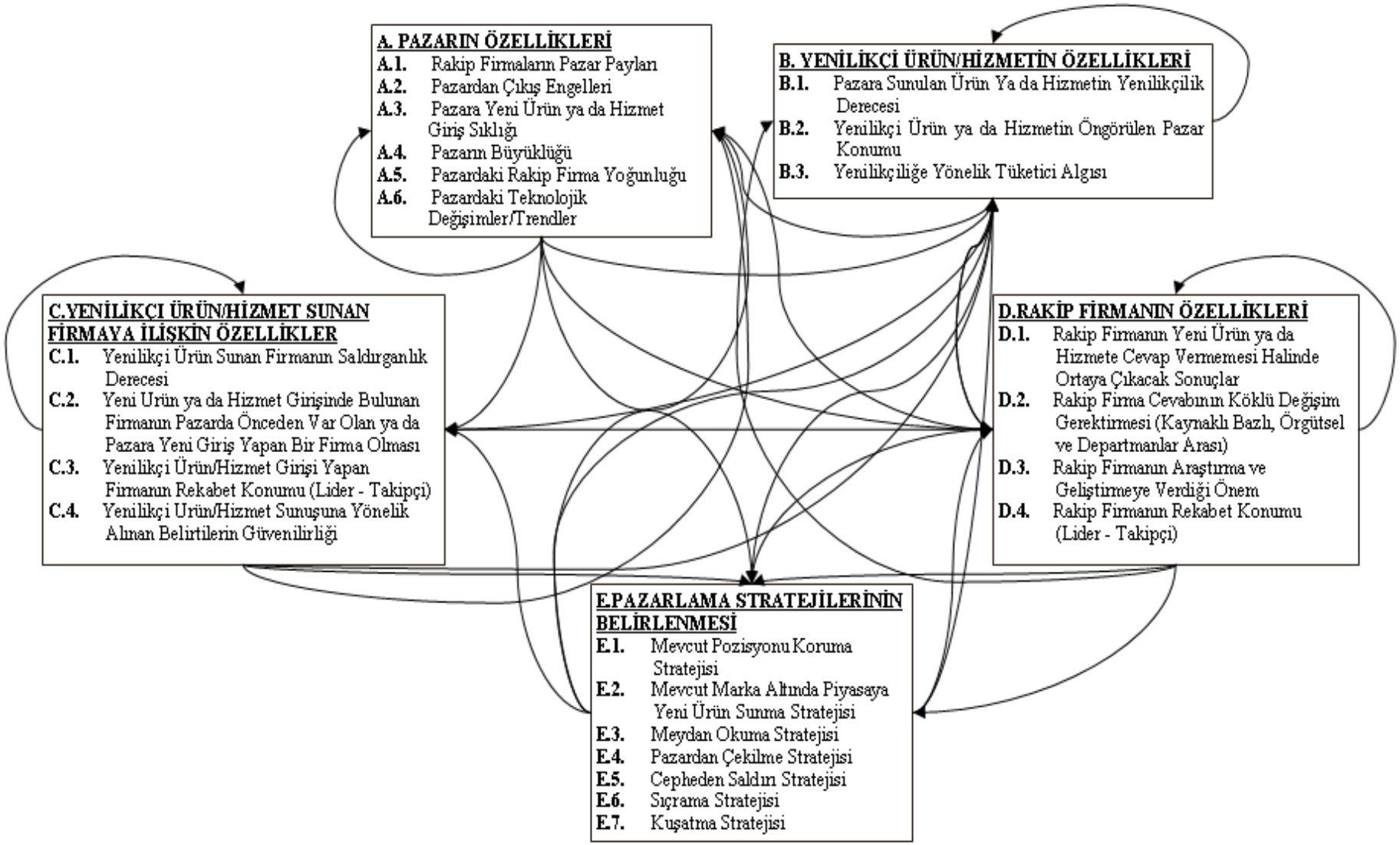


A Feedback System with Two Components

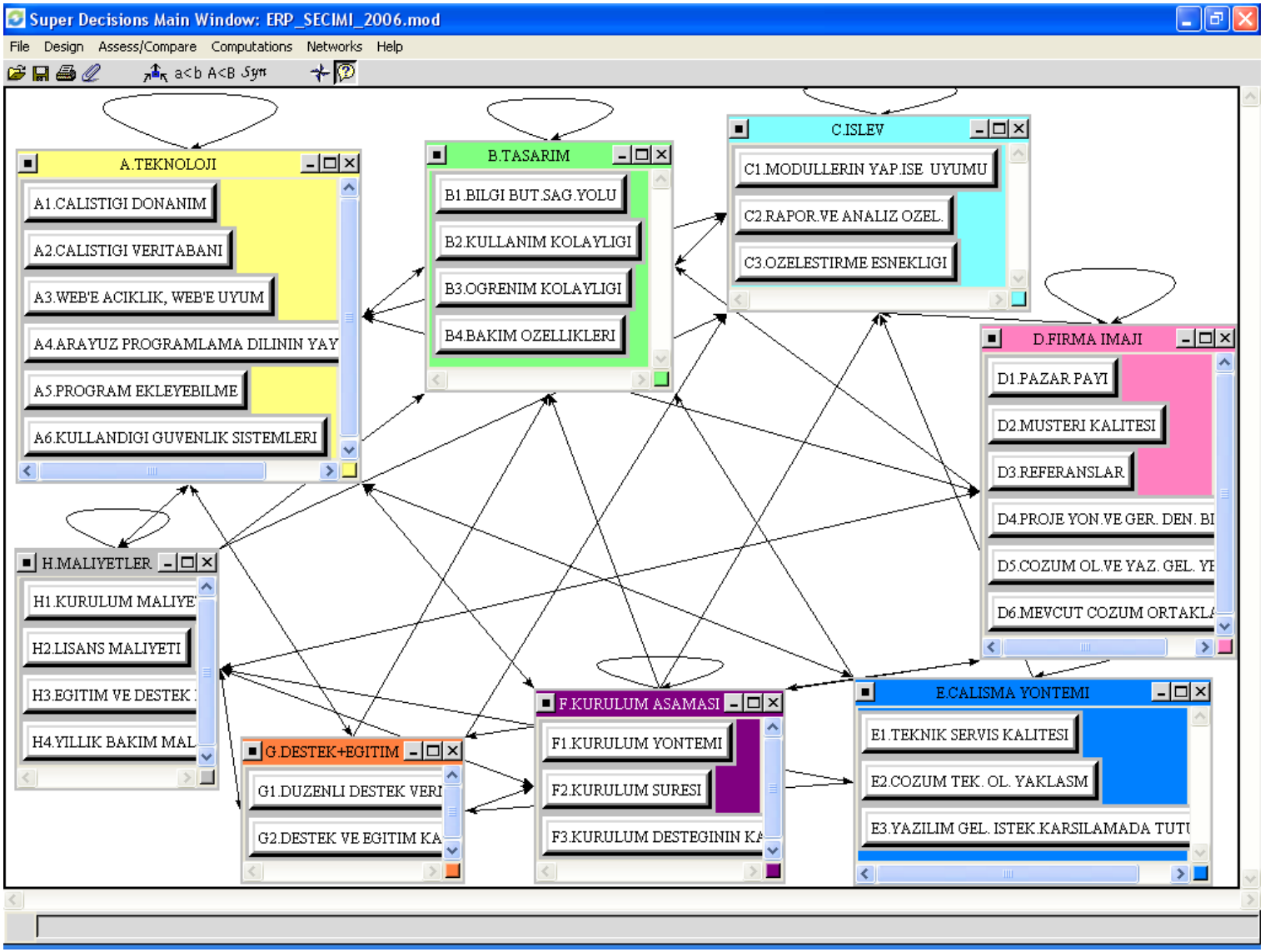
Cola Industry



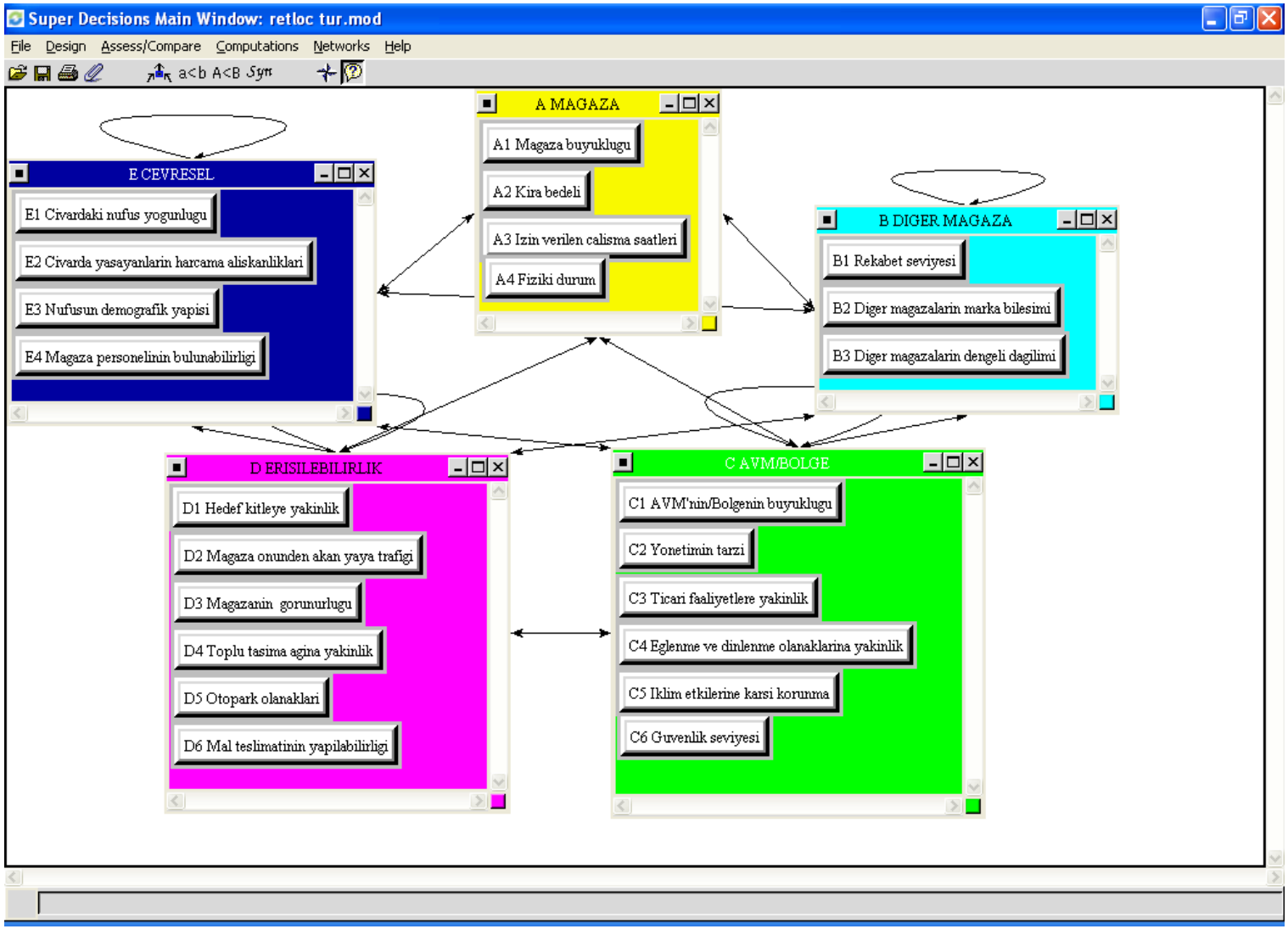
Reaction of Competitor Companies to Innovative Product/Service



ERP Selection



Retail Location Selection



Organic Farming

A. ÜRÜN GRUBU

- **A1**- Ekolojik sebze/meyve
- **A2**- Ekolojik bakliyat
- **A3**- Ekolojik kuruyemiş
- **A4**- Ekolojik bal/reçel
- **A5**- Ekolojik et ve et ürünleri
- **A6**- Ekolojik sıvı yağ
- **A6**- Ekolojik süt ve süt ürünleri

B. ÜRÜN ÖZELLİKLERİ

- **B1**- Yapay ilaç ve yapay gübre kullanılmadan üretilen ürün
- **B2**- Kontrollü ve sertifikalı ürün
- **B3**- Ekolojik dengeyi korumaya yönelik (çevre dostu) ürün
- **B4**- Ürün miktarı yerine ürün kalitesi esas alınarak üretilen ürün

C. ÜRÜN DAĞITIM KANALI

- **C1**- Süpermarket/Hipermarket
- **C2**- Ekolojik ürün mağazaları
- **C3**- Pazar/Manav
- **C4**- Doğrudan satış (Internet, telefon yoluyla)
- **C5**- Üretim yerinde satış noktaları
- **C6**- Şarküteri

D. İLETİŞİM KANALI

- **D1**- TV
- **D2**- Radyo
- **D3**- Gazete/Popüler dergiler
- **D4**- Sektörlere özel dergi
- **D5**- Broşür
- **D6**- Alternatif kanallar (açık hava, araç üstü, vb. farklı medya kullanımı)
- **D7**- Ağızdan ağıza (tüketicilerin birbirlerine tanıtması, anlatması)
- **D8**- Internet

E. PROJELER/EYLEMLER

- **E1-** Ekolojik ürünler hakkında etkin tanıtım yapılması
- **E2-** Genç nesli hedef alan eğitim ve bilgilendirme çalışmalarının yapılması
- **E3-** Sivil toplum örgütleri ve diğer ilgili kurumlar ile işbirliği yapılması
- **E4-** Talebi arttırmaya yönelik promosyon stratejilerinin geliştirilmesi ve uygulanması
- **E5-** Gıda mühendislerinin sektördeki rolünün arttırılması
- **E6-** Çiftçiler ile iletişim ve işbirliğinin sağlanması ve çiftçiye mali destek verilmesi
- **E7-** Ekolojik gıdaların yeme içme platformuna yayılmasına yönelik çalışmaların yapılması

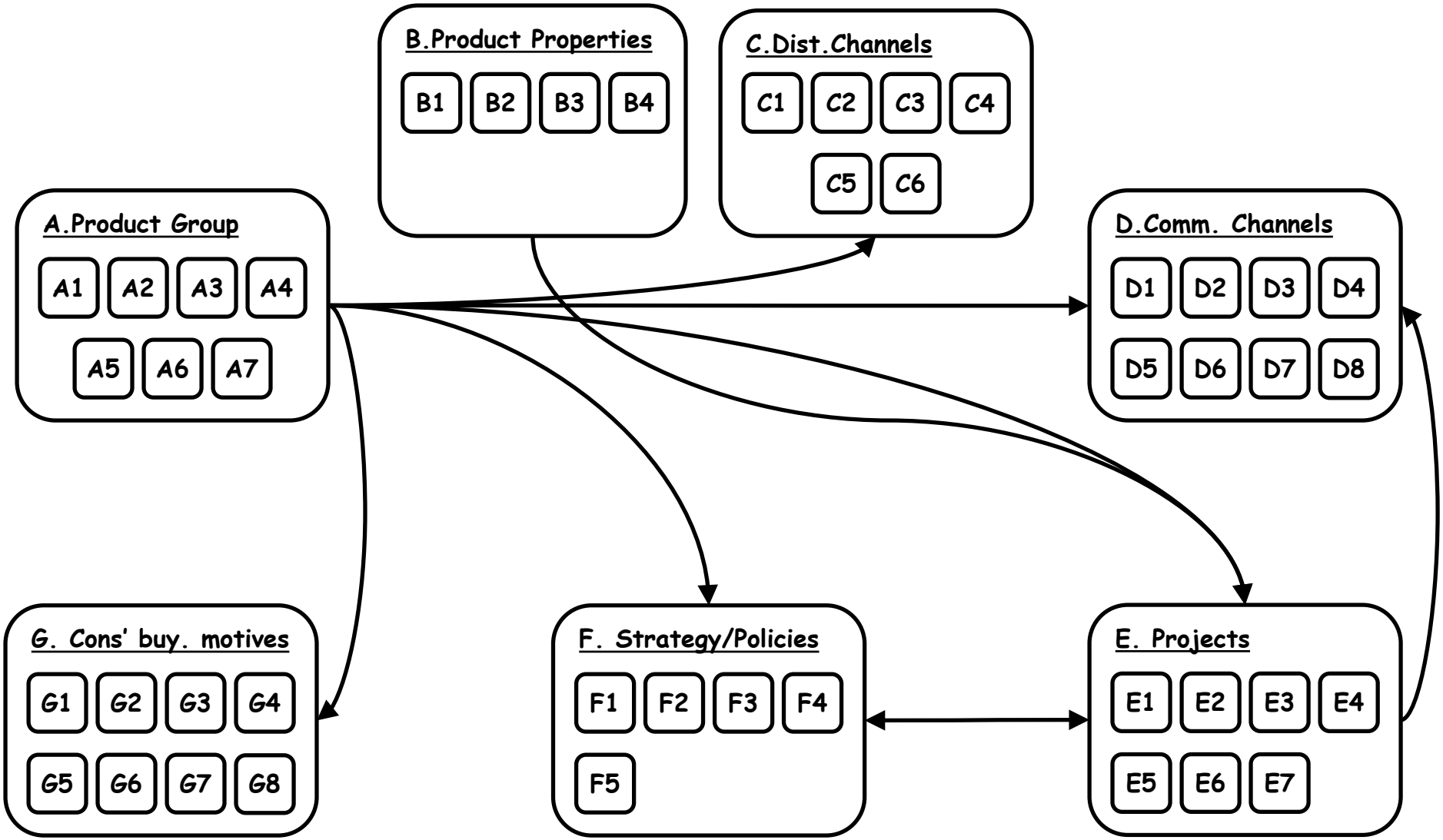
F. STRATEJİ/POLİTİKA

- **F1**- Tüketicilerin ekolojik ürünler hakkında bilinçlendirilmesi
- **F2**- Ekolojik ürünlere duyulan güvenin arttırılması
- **F3**- Ekolojik ürünlerin fiyatlandırılmasında indirim yapılması
- **F4**- Tüketiciye ekolojik ürün çeşitliliğinin sunulması
- **F5**- Tüketicilerin ekolojik ürünlere erişiminin kolaylaştırılması

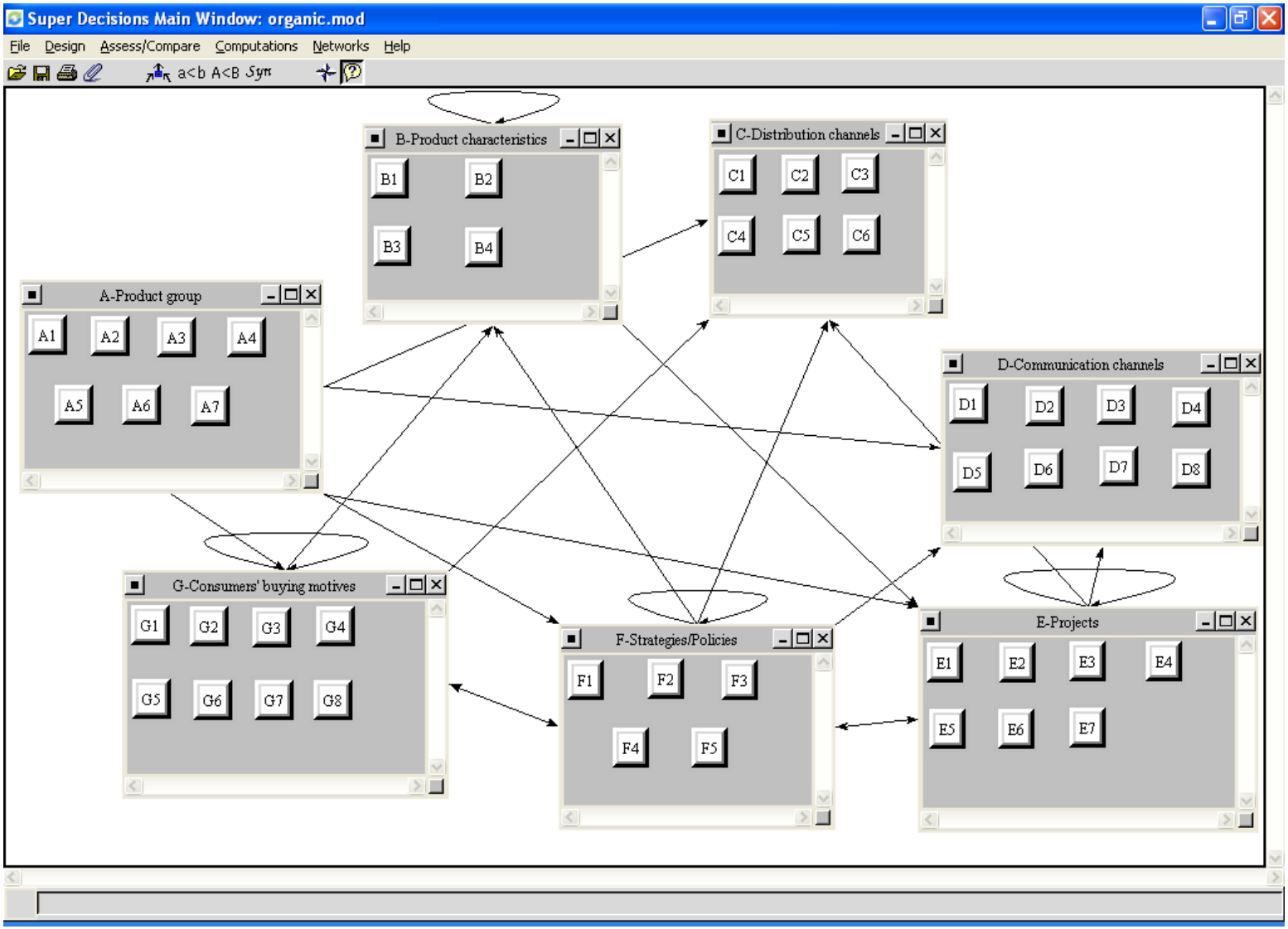
G. SATIN ALMAYA İLİŞKİN TUTUMLAR

- **G1**- Ekolojik ürünlerin daha sağlıklı olduğu düşüncesi
- **G2**- Ekolojik ürünlerin daha lezzetli olduğu düşüncesi
- **G3**- Ekolojik ürünlerin besin değerinin daha yüksek olduğu düşüncesi
- **G4**- Ekolojik ürünlerin katkı maddesi içermediği düşüncesi
- **G5**- Ekolojik ürünlerin tüketicinin mevcut sağlık problemlerine fayda sağlayacağı düşünc
- **G6**- Ekolojik ürünlerin çevre dostu ürünler olduğu düşüncesi
- **G7**- Aile/çocukların sağlığına önem verilmesi
- **G8**- Geçmişe duyulan özlemin tatmin edileceği düşüncesi

Organic Farming



Organic Farming



The Analytic Network Process is

a methodology that allows groups or individuals to deal with the interconnections (dependence and feedback) between factors of complex structure in decision making process

a Multi Criteria Decision Making method for complicated and unstructured problems

an approach that uses a network model having clusters of elements (criteria and alternatives)

Pairwise Comparison Questions

"of the sub-elements, which one influences the parent element more and how much more?"

or

"of the dependent factors, which one influnces the common factor more and how much more?"

Supermatrix

Each element is represented at one row and one respective column

The computed eigenvector of the sub-elements with respect to their parent element is placed to the column representing the parent element and the rows representing the sub-elements.

Weighted Supermatrix

If the column sum of any column in the composed supermatrix is greater than 1 (i.e. there are more than one eigenvector), the eigenvectors are weighted by the corresponding cluster importance:

- *when all clusters are equally important*, that column will be just normalized, i.e. the eigenvectors are multiplied by 1/n (n is the number of eigenvectors at that column)
- *when the clusters are not equally important*, cluster comparisons are made to reveal importance of clusters

Such a supermatrix for which column sums of each column are 1 (i.e. the matrix is column stochastic) is called as weighted supermatrix

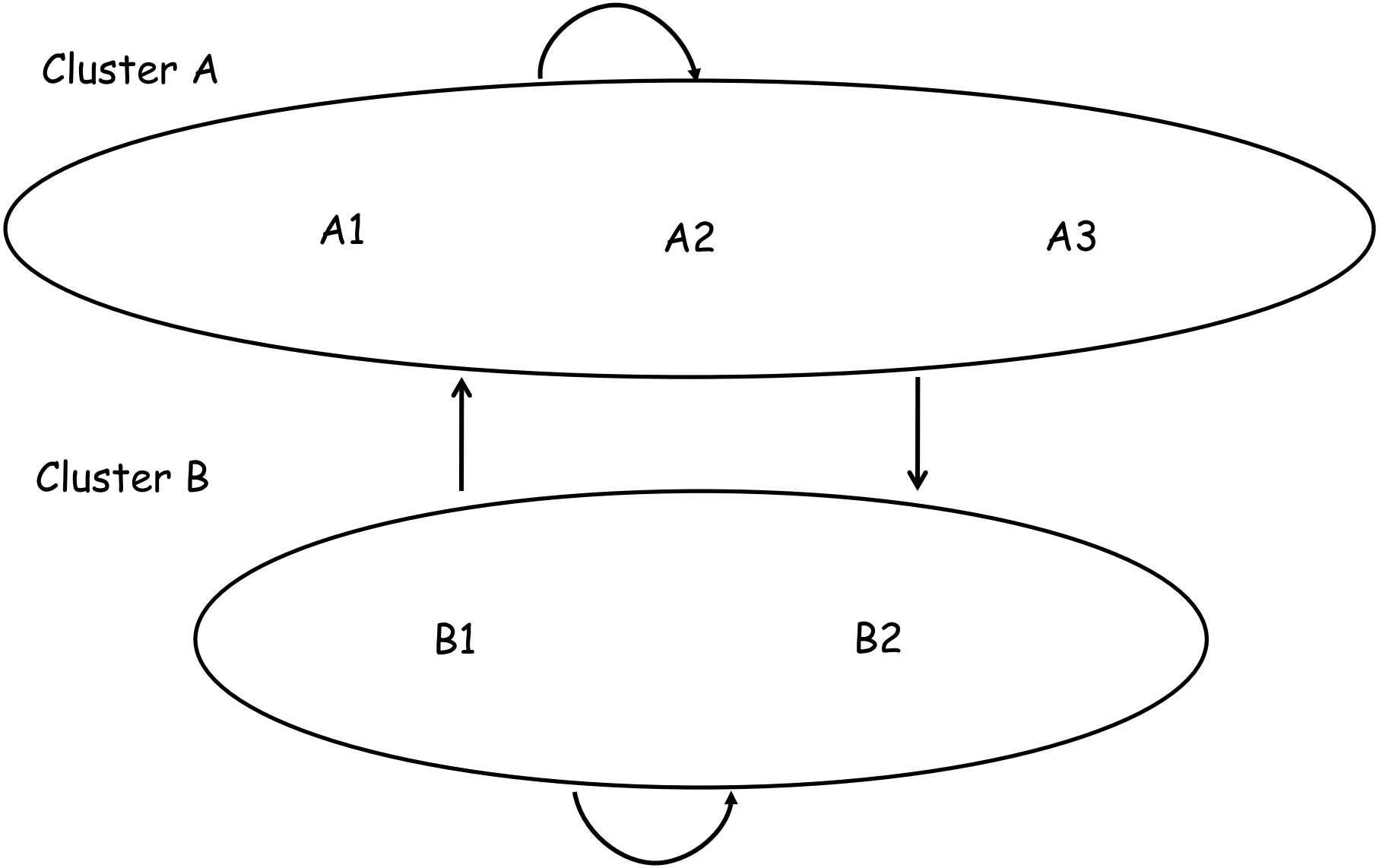
Limit matrix

Limiting Supermatrix

The weighted supermatrix is then raised to a significantly large power in order to have the converged or stable values: All the columns of the matrix are identical

The values of this limit matrix are the desired priorities of the elements with respect to the goal

An illustrative example



An illustrative example

		A			B	
		A1	A2	A3	B1	B2
A	A1		x		x	x
	A2	x			x	x
	A3	x			x	
B	B1	x		x		x
	B2	x	x	x		

e.g. A2 affects A1

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	1	0	0.6	0.75
	A2	0.8	0	0	0.2	0.25
	A3	0.2	0	0	0.2	0
B	B1	0.75	0	0.8	0	1
	B2	0.25	1	0.2	0	0

Cluster A →

	A1	A2	A3	
A2	1	4		0.8
A3	0.25	1		0.2

A3	B1	B2	
B1	1	4	0.8
B2	0.25	1	0.2

Cluster B →

	A1	B1	B2	
B1	1	3		0.75
B2	0.33	1		0.25

B1	A1	A2	A3	
A1	1	3	3	0.6
A2	0.33	1	1	0.2
A3	0.33	1	1	0.2

A2	~~A1~~
~~A1~~	1

B2	A1	A2	
A1	1	3	0.75
A2	0.33	1	0.25

An illustrative example

Two clusters are equally important

Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	1	0	0.6	0.75
	A2	0.8	0	0	0.2	0.25
	A3	0.2	0	0	0.2	0
B	B1	0.75	0	0.8	0	1
	B2	0.25	1	0.2	0	0

Weighted Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	0.5	0	0.6	0.375
	A2	0.4	0	0	0.2	0.125
	A3	0.1	0	0	0.2	0
B	B1	0.375	0	0.8	0	0.5
	B2	0.125	0.5	0.2	0	0

Limiting Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	.3103	.3103	.3103	.3103	.3103
	A2	.1950	.1950	.1950	.1950	.1950
	A3	.0828	.0828	.0828	.0828	.0828
B	B1	.2590	.2590	.2590	.2590	.2590
	B2	.1529	.1529	.1529	.1529	.1529

An illustrative example
Two clusters are equally important

Limiting Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	.3103	.3103	.3103	.3103	.3103
	A2	.1950	.1950	.1950	.1950	.1950
	A3	.0828	.0828	.0828	.0828	.0828
B	B1	.2590	.2590	.2590	.2590	.2590
	B2	.1529	.1529	.1529	.1529	.1529

A1	52.75%
A2	33.16%
A3	14.08%

B1	62.89%
B2	37.11%

An illustrative example

Two clusters are not equally important

Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	1	0	0.6	0.75
	A2	0.8	0	0	0.2	0.25
	A3	0.2	0	0	0.2	0
B	B1	0.75	0	0.8	0	1
	B2	0.25	1	0.2	0	0

Cluster Comparison

A	A	B	
A	1	4	0.8
B	0.25	1	0.2

B	A	B	
A	1	3	0.75
B	0.33	1	0.25

Weighted Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	0.8	0	0.6	0.56
	A2	0.64	0	0	0.2	0.19
	A3	0.16	0	0	0.2	0
B	B1	0.15	0	0.8	0	0.25
	B2	0.05	0.2	0.2	0	0

Limiting Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	.3749	.3749	.3749	.3749	.3749
	A2	.2881	.2881	.2881	.2881	.2881
	A3	.0904	.0904	.0904	.0904	.0904
B	B1	.1522	.1522	.1522	.1522	.1522
	B2	.0944	.0944	.0944	.0944	.0944

An illustrative example

Two clusters are not equally important

Limiting Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	.3749	.3749	.3749	.3749	.3749
	A2	.2881	.2881	.2881	.2881	.2881
	A3	.0904	.0904	.0904	.0904	.0904
B	B1	.1522	.1522	.1522	.1522	.1522
	B2	.0944	.0944	.0944	.0944	.0944

A1	49.76%
A2	38.24%
A3	12.00%

B1	61.71%
B2	38.29%

Convergence check

Before asking pairwise comparison questions to DM

Assume influences of sub elements on parent are equal

Compute the limit matrix to check for convergence

		A			B	
		A1	A2	A3	B1	B2
A	A1		x		x	x
	A2	x			x	x
	A3	x			x	
B	B1	x		x		x
	B2	x	x	x		

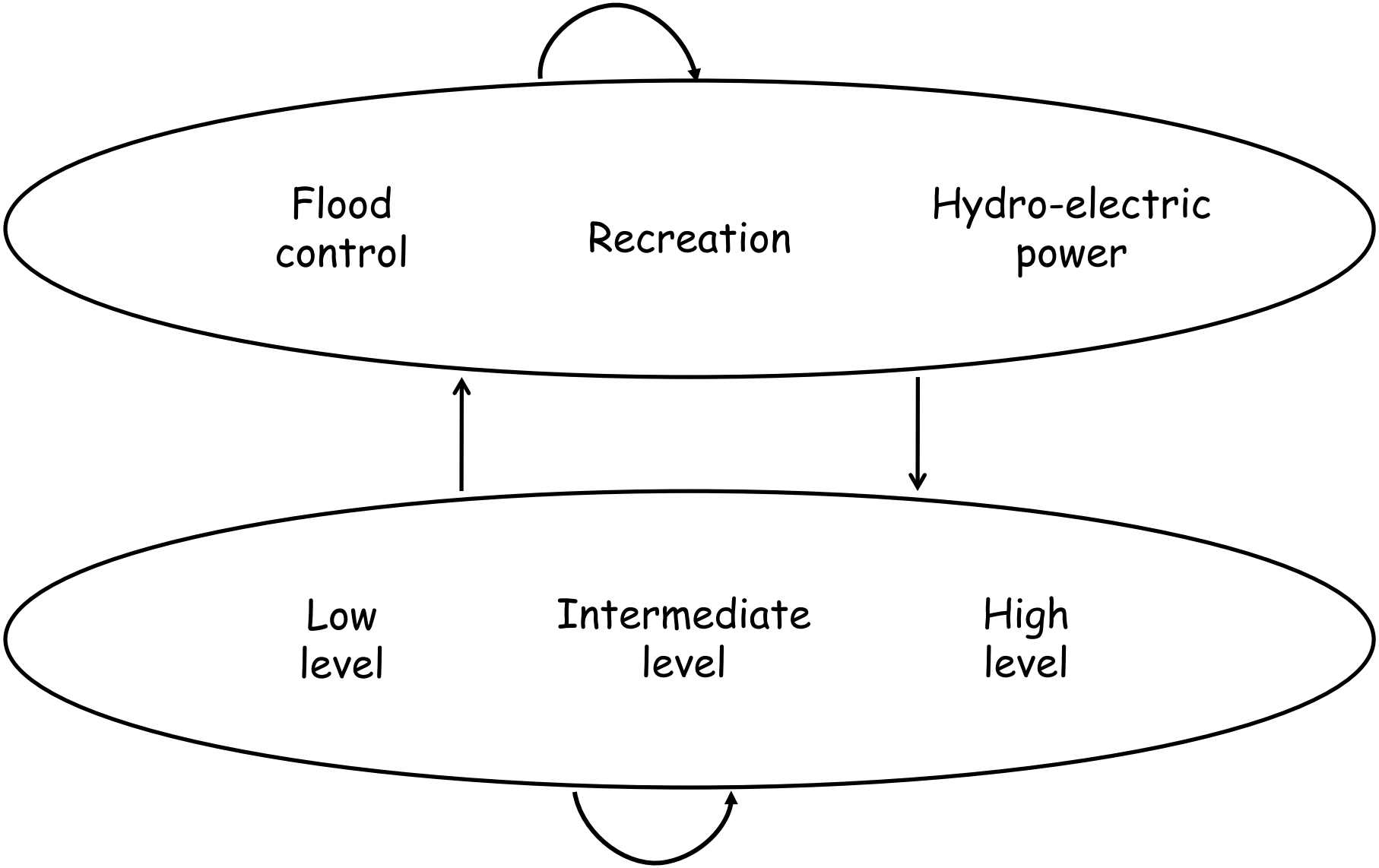
Supermatrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0	1	0	0.33	0.5
	A2	0.5	0	0	0.33	0.5
	A3	0.5	0	0	0.33	0
B	B1	0.5	0	0.5	0	1
	B2	0.5	1	0.5	0	0

Limit matrix

		A			B	
		A1	A2	A3	B1	B2
A	A1	0.2264	0.2264	0.2264	0.2264	0.2264
	A2	0.1887	0.1887	0.1887	0.1887	0.1887
	A3	0.1342	0.1342	0.1342	0.1342	0.1342
B	B1	0.2327	0.2327	0.2327	0.2327	0.2327
	B2	0.2180	0.2180	0.2180	0.2180	0.2181

Management of a Water Reservoir



Which level is best for **flood control**?

	Low	Medium	High	Eigenvector
Low	1	5	7	**.7093**
Medium	1/5	1	4	**.2141**
High	1/7	1/4	1	**.0766**

CR = 12%

Which level is best for **recreation**?

	Low	Medium	High	Eigenvector
Low	1	1/7	1/5	**.0738**
Medium	7	1	3	**.6434**
High	5	1/3	1	**.2828**

CR = 6%

Which level is best for **hydro-electric power**?

	Low	Medium	High	Eigenvector
Low	1	1/5	1/9	**.0612**
Medium	5	1	1/5	**.2157**
High	9	5	1	**.7231**

CR = 12%

At **Low Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	3	5	**.6333**
Recreation	1/3	1	3	**.2605**
Hydro-electric power	1/5	1/3	1	**.1062**

CR = 4%

At **Intermediate Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	1/3	1	**.2000**
Recreation	3	1	3	**.6000**
Hydro-electric power	1	1/3	1	**.2000**

CR = 0%

At **High Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	1/5	1/9	**.0623**
Recreation	5	1	1/4	**.2364**
Hydro-electric power	9	4	1	**.7013**

CR = 7%

Which level is best for **flood control**?

	Low	Medium	High	Eigenvector
Low	1	5	7	**.7093**
Medium	1/5	1	4	**.2141**
High	1/7	1/4	1	**.0766**

Which level is best for **recreation**?

	Low	Medium	High	Eigenvector
Low	1	1/7	1/5	**.0738**
Medium	7	1	3	**.6434**
High	5	1/3	1	**.2828**

Which level is best for **hydro-electric power**?

	Low	Medium	High	Eigenvector
Low	1	1/5	1/9	**.0612**
Medium	5	1	1/5	**.2157**
High	9	5	1	**.7231**

At **Low Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	3	5	**.6333**
Recreation	1/3	1	3	**.2605**
Hydro-electric power	1/5	1/3	1	**.1062**

At **Intermediate Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	1/3	1	**.2000**
Recreation	3	1	3	**.6000**
Hydro-electric power	1	1/3	1	**.2000**

At **High Level**, which attribute is satisfied best?

	Flood control	Recreation	Hydro-electric power	Eigenvector
Flood control	1	1/5	1/9	**.0623**
Recreation	5	1	1/4	**.2364**
Hydro-electric power	9	4	1	**.7013**

Eigenvectors are placed to columns

Supermatrix

	FC	R	HEP	L	M	H
Flood control	1	0	0	.6333	.2000	.0623
Recreation	0	1	0	.2605	.6000	.2364
Hyd-elec.power	0	0	1	.1062	.2000	.7013
Low	.7093	.0738	.0612	1	0	0
Medium	.2141	.6434	.2157	0	1	0
High	.0766	.2828	.7231	0	0	1

Columns are normalized (*all clusters are equally important*)

Weighted Supermatrix

	FC	R	HEP	L	M	H
Flood control	.5000	0	0	.3167	.1000	.0312
Recreation	0	.5000	0	.1303	.3000	.1182
Hyd-elec.power	0	0	.5000	.0531	.1000	.3507
Low	.3547	.0369	.0306	.5000	0	0
Medium	.1071	.3217	.1079	0	.5000	0
High	.0383	.1414	.3616	0	0	.5000

Raised to a high power (*e.g. 64th*)

Limit Supermatrix

	FC	R	HEP	L	M	H
Flood control	.1206	.1206	.1206	.1206	.1206	.1206
Recreation	.1895	.1895	.1895	.1895	.1895	.1895
Hyd-elec.power	.1899	.1899	.1899	.1899	.1899	.1899
Low	.1111	.1111	.1111	.1111	.1111	.1111
Medium	.1887	.1887	.1887	.1887	.1887	.1887
High	.2001	.2001	.2001	.2001	.2001	.2001

Each cluster is normalized

Priorities

Power gen	37.98%
Recreation	37.90%
Flood control	24.12%

High level	40.03%
Int. level	37.74%
Low level	22.23%

Warehouse Management

I. Stok politikaları

1. İthaf edilmiş
2. Rassal
3. Sınıf-bazlı
4. Korelasyonlu

H. Sipariş toplama politikaları

1. Tek sipariş toplama
2. Kitle toplama
3. Alan toplama

G. Toplama Sistemleri

1. Manuel
2. Yarı-otomatik
3. Otomatik

F. Sipariş özellikleri

1. Satır sayısı
2. Sipariş miktarı
3. Günlük sipariş sayısı

A. Stok bilgileri

1. Ürün çeşitliliği
2. Stok seviyeleri
3. Mal kabul karakteri (tedarik süresi, miktarı)

E. Depo Türü

1. Dağıtım
2. İmalat

C. Performans Kriterleri

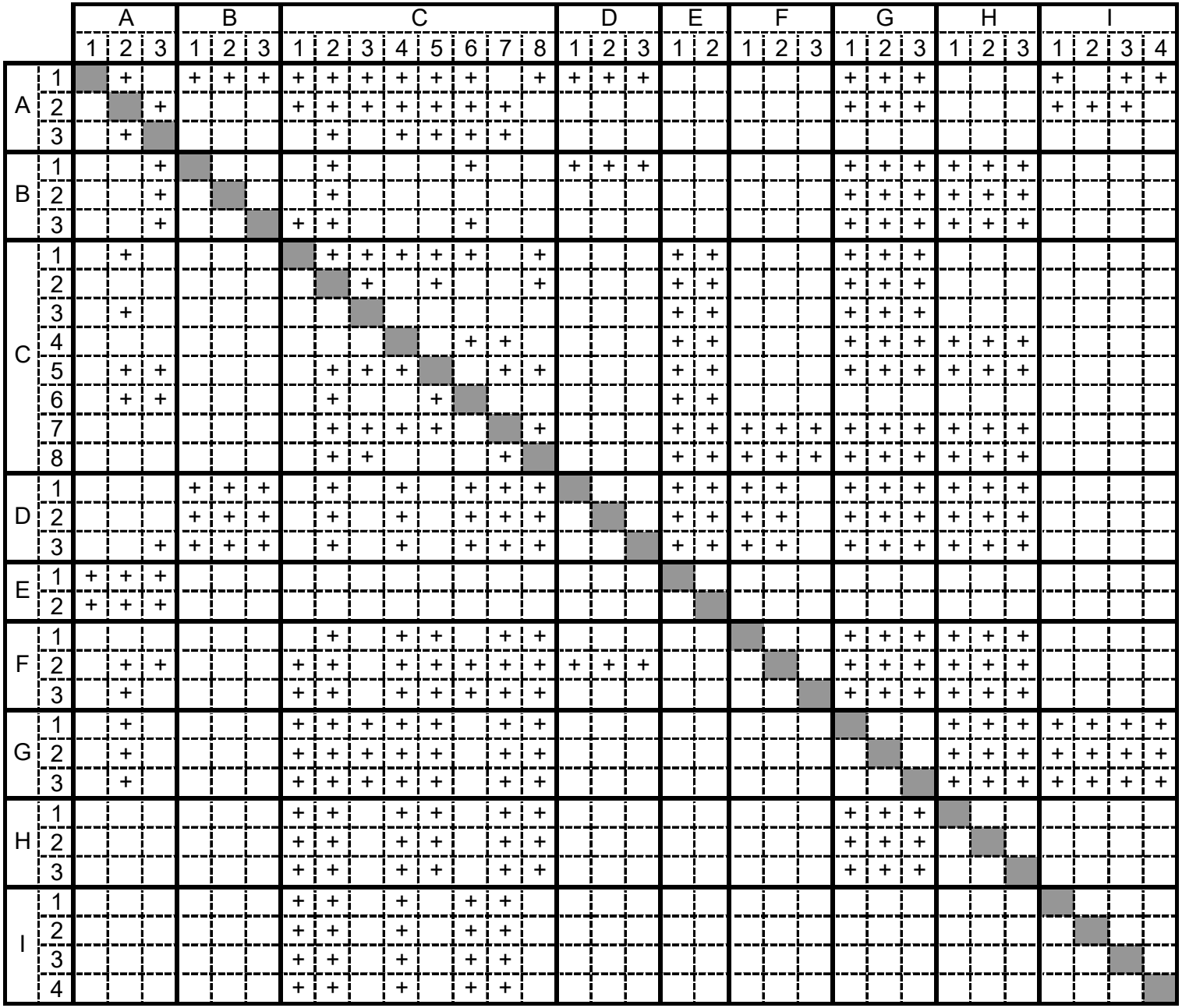
1. Yatırım maliyeti
2. Operasyonel maliyetler
3. Yatırımın geri dönüş oranı
4. Esneklik
5. İşlem Hacmi
6. Stok Kapasitesi
7. Tepki Süresi
8. Sipariş yerine getirme kalitesi

B. Birim özellikleri

1. Boyut
2. Ağırlık
3. Diğer özellikler (hassaslık,güvenlik, asimetri vb.)

D. Sipariş birimi

1. Tek-ürün
2. Koli
3. Palet



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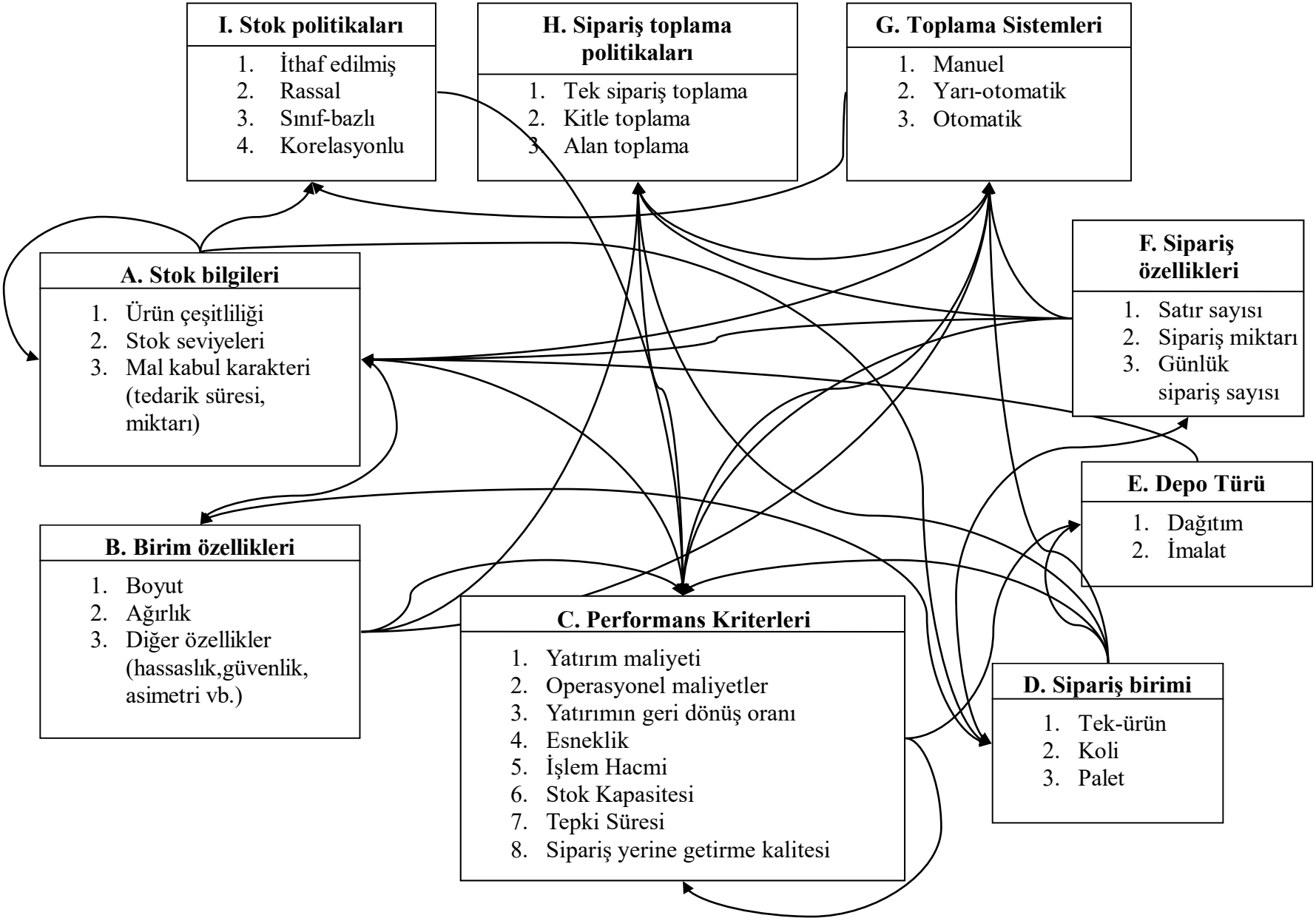
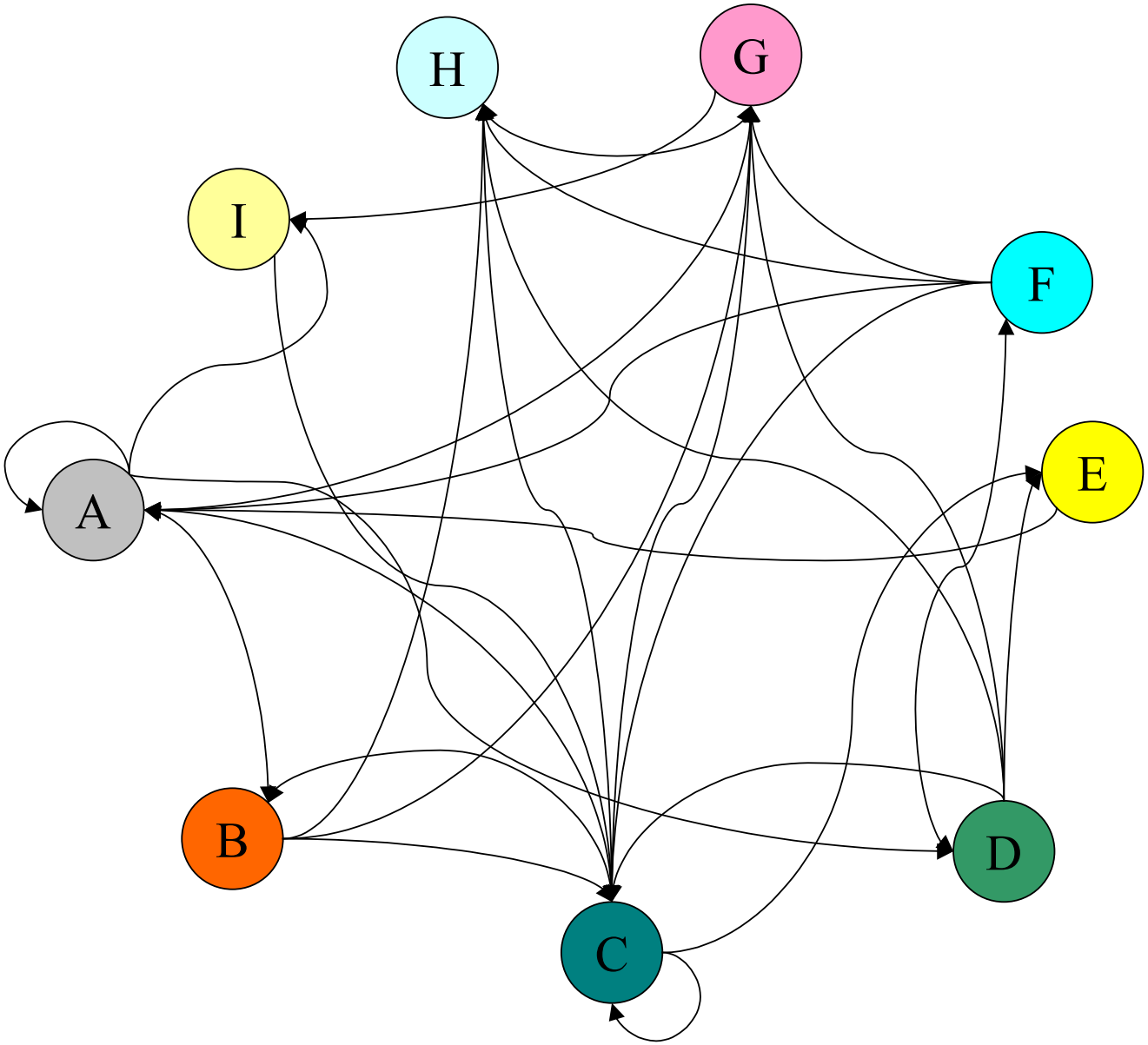
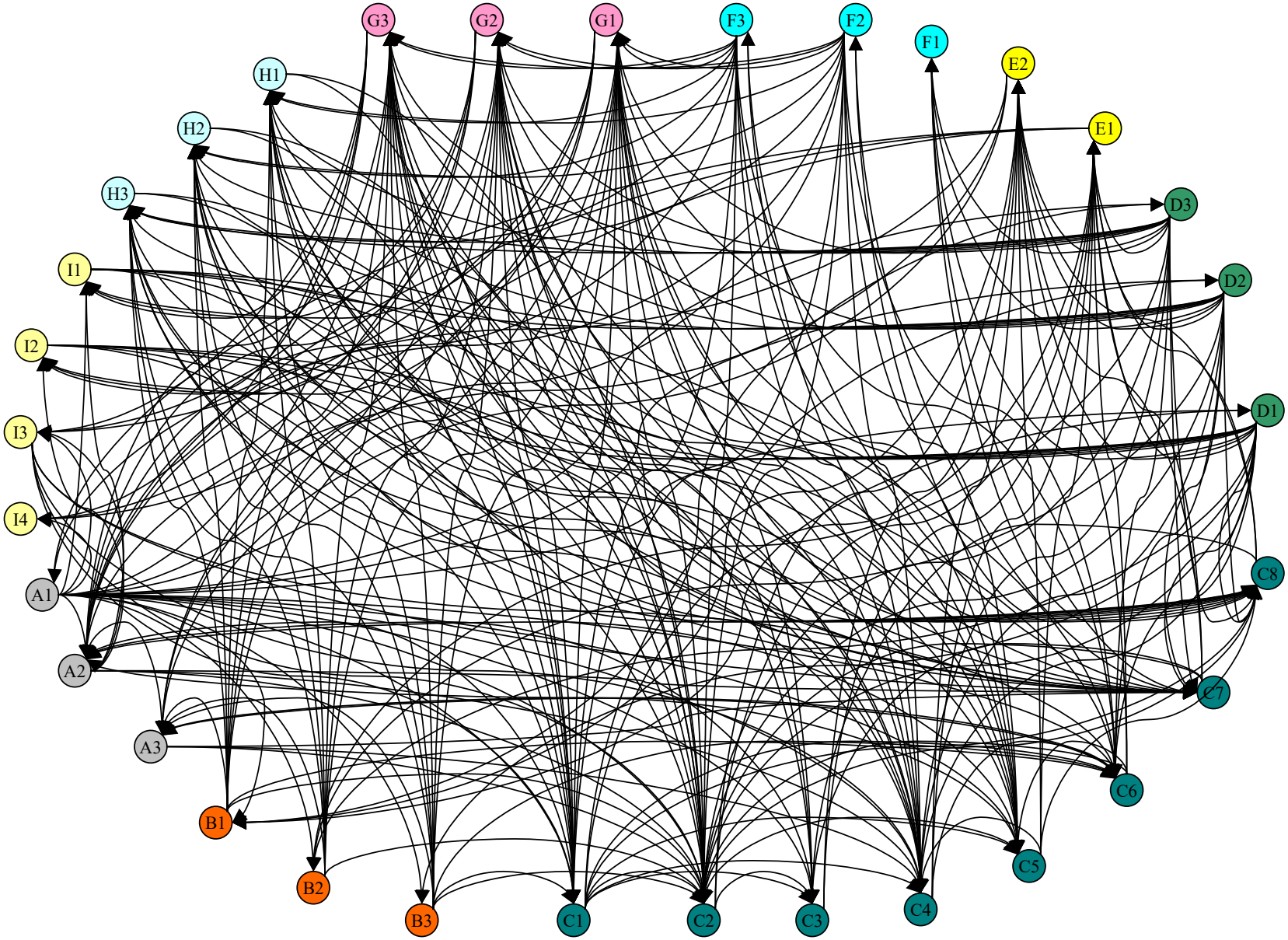






Supermatrix

	A1	A2	A3	B1	B2	B3	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.0000	0.7674	0.0000	1.0000	1.0000	1.0000	0.5902	0.4639	0.6961	0.6364	0.6015	0.3439	0.0000	1.0000
A2	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.4098	0.4103	0.3040	0.1493	0.2585	0.5182	0.5902	0.0000
A3	0.0000	0.2326	0.0000	0.0000	0.0000	0.0000	0.0000	0.1259	0.0000	0.2143	0.1400	0.1380	0.4098	0.0000
B1	0.0000	0.0000	0.1981	0.0000	0.0000	0.0000	0.0000	0.3652	0.0000	0.0000	0.0000	0.7500	0.0000	0.0000
B2	0.0000	0.0000	0.1442	0.0000	0.0000	0.0000	0.0000	0.1521	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B3	0.0000	0.0000	0.6577	0.0000	0.0000	0.0000	1.0000	0.4827	0.0000	0.0000	0.0000	0.2500	0.0000	0.0000
C1	0.0000	0.3724	0.0000	0.0000	0.0000	0.0000	0.0000	0.2680	0.1033	0.3635	0.3078	0.6454	0.0000	0.3584
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2807	0.0000	0.2132	0.0000	0.0000	0.1023
C3	0.0000	0.3105	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3546	0.3118	0.0000
C5	0.0000	0.1204	0.6753	0.0000	0.0000	0.0000	0.0000	0.1787	0.0810	0.1970	0.0000	0.0000	0.1614	0.2121
C6	0.0000	0.1968	0.3247	0.0000	0.0000	0.0000	0.0000	0.1819	0.0000	0.0000	0.1735	0.0000	0.0000	0.0000
C7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2269	0.2504	0.4395	0.3056	0.0000	0.0000	0.3272
C8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1446	0.2847	0.0000	0.0000	0.0000	0.5268	0.0000
D1	0.0000	0.0000	0.0000	0.3691	0.2702	0.6147	0.0000	0.0920	0.0000	0.4300	0.0000	0.2215	0.4846	0.3469
D2	0.0000	0.0000	0.0000	0.3321	0.3291	0.2536	0.0000	0.2333	0.0000	0.3340	0.0000	0.3190	0.3207	0.3590
D3	0.0000	0.0000	1.0000	0.2988	0.4007	0.1317	0.0000	0.6747	0.0000	0.2360	0.0000	0.4595	0.1947	0.2941
E1	0.8062	0.4651	0.6564	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E2	0.1938	0.5349	0.3436	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5939	0.0000	0.5407	0.5612	0.0000	0.6007	0.5969
F2	0.0000	0.2364	1.0000	0.0000	0.0000	0.0000	0.4386	0.1567	0.0000	0.1967	0.1633	0.6753	0.1117	0.1233
F3	0.0000	0.7636	0.0000	0.0000	0.0000	0.0000	0.5614	0.2494	0.0000	0.2626	0.2755	0.3247	0.2876	0.2798
G1	0.0000	0.5418	0.0000	0.0000	0.0000	0.0000	0.3968	0.4072	0.4057	0.6608	0.0951	0.0000	0.1180	0.0800
G2	0.0000	0.2963	0.0000	0.0000	0.0000	0.0000	0.3160	0.3074	0.3199	0.2345	0.2497	0.0000	0.2783	0.2419
G3	0.0000	0.1620	0.0000	0.0000	0.0000	0.0000	0.2872	0.2854	0.2744	0.1047	0.6552	0.0000	0.6037	0.6780
H1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4155	0.3889	0.0000	0.4660	0.1829	0.0000	0.3649	0.5251
H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2194	0.2022	0.0000	0.1920	0.4363	0.0000	0.1640	0.1631
H3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3651	0.4089	0.0000	0.3421	0.3808	0.0000	0.4711	0.3118
I1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3198	0.2486	0.0000	0.1876	0.0000	0.3438	0.2604	0.0000
I2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1047	0.2153	0.0000	0.4811	0.0000	0.0974	0.1097	0.0000
I3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2542	0.2949	0.0000	0.2255	0.0000	0.2070	0.4432	0.0000
I4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3213	0.2412	0.0000	0.1057	0.0000	0.3518	0.1867	0.0000

Supermatrix

	D1	D2	D3	E1	E2	F1	F2	F3	G1	G2	G3	H1	H2
A1	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6961	0.7908	0.8062	0.0000	0.0000
A2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3040	0.2092	0.1938	0.0000	0.0000
A3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2906	0.4763	0.4889	0.3333	0.4429
B2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2899	0.2731	0.2852	0.3333	0.2786
B3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4195	0.2506	0.2258	0.3333	0.2786
C1	0.0000	0.0000	0.0000	0.0440	0.2596	0.0000	0.0000	0.0000	0.2666	0.0969	0.1207	0.0000	0.0000
C2	0.0000	0.0000	0.0000	0.0771	0.1403	0.0000	0.0000	0.0000	0.0873	0.1938	0.0861	0.0000	0.0000
C3	0.0000	0.0000	0.0000	0.1213	0.0659	0.0000	0.0000	0.0000	0.1251	0.0620	0.1263	0.0000	0.0000
C4	0.0000	0.0000	0.0000	0.2332	0.0354	0.0000	0.0000	0.0000	0.1596	0.1558	0.0611	0.2613	0.1664
C5	0.0000	0.0000	0.0000	0.1788	0.0554	0.0000	0.0000	0.0000	0.1038	0.1029	0.1573	0.1843	0.5092
C6	0.0000	0.0000	0.0000	0.0412	0.2642	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C7	0.0000	0.0000	0.0000	0.1544	0.1062	0.5902	0.6753	0.6753	0.1427	0.2220	0.1771	0.2605	0.2250
C8	0.0000	0.0000	0.0000	0.1501	0.0729	0.4098	0.3247	0.3247	0.1150	0.1667	0.2715	0.2940	0.0994
D1	0.0000	0.0000	0.0000	0.5549	0.2480	0.6105	0.5150	0.0000	0.4623	0.5298	0.5152	0.2815	0.5781
D2	0.0000	0.0000	0.0000	0.2360	0.3523	0.2701	0.2936	0.0000	0.3521	0.3184	0.2857	0.2212	0.1910
D3	0.0000	0.0000	0.0000	0.2091	0.3997	0.1195	0.1913	0.0000	0.1857	0.1518	0.1992	0.4973	0.2309
E1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5023	0.5846	0.6256	0.2301	0.5577
F2	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2197	0.1244	0.1167	0.4486	0.1191
F3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2780	0.2910	0.2577	0.3213	0.3232
G1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3333	0.3333
G2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3333	0.3333
G3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3333	0.3333
H1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2271	0.2469	0.3899	0.0000	0.0000
H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3946	0.3409	0.1806	0.0000	0.0000
H3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3783	0.4122	0.4295	0.0000	0.0000
I1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
I4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Supermatrix

	H3	I1	I2	I3	I4
A1	0.0000	0.2591	0.0000	0.7807	1.0000
A2	0.0000	0.7409	1.0000	0.2193	0.0000
A3	0.0000	0.0000	0.0000	0.0000	0.0000
B1	0.3333	0.0000	0.0000	0.0000	0.0000
B2	0.3333	0.0000	0.0000	0.0000	0.0000
B3	0.3333	0.0000	0.0000	0.0000	0.0000
C1	0.0000	0.0000	0.0000	0.0000	0.0000
C2	0.0000	0.0000	0.0000	0.0000	0.0000
C3	0.0000	0.0000	0.0000	0.0000	0.0000
C4	0.1778	0.0000	0.0000	0.0000	0.0000
C5	0.2662	0.0000	0.0000	0.0000	0.0000
C6	0.0000	0.0000	0.0000	0.0000	0.0000
C7	0.3183	0.0000	0.0000	0.0000	0.0000
C8	0.2378	0.0000	0.0000	0.0000	0.0000
D1	0.5388	0.0000	0.0000	0.0000	0.0000
D2	0.2314	0.0000	0.0000	0.0000	0.0000
D3	0.2298	0.0000	0.0000	0.0000	0.0000
E1	0.0000	0.0000	0.0000	0.0000	0.0000
E2	0.0000	0.0000	0.0000	0.0000	0.0000
F1	0.4733	0.0000	0.0000	0.0000	0.0000
F2	0.1227	0.0000	0.0000	0.0000	0.0000
F3	0.4040	0.0000	0.0000	0.0000	0.0000
G1	0.3333	0.3333	0.3333	0.3333	0.3333
G2	0.3333	0.3333	0.3333	0.3333	0.3333
G3	0.3333	0.3333	0.3333	0.3333	0.3333
H1	0.0000	0.0000	0.0000	0.0000	0.0000
H2	0.0000	0.0000	0.0000	0.0000	0.0000
H3	0.0000	0.0000	0.0000	0.0000	0.0000
I1	0.0000	0.0000	0.0000	0.0000	0.0000
I2	0.0000	0.0000	0.0000	0.0000	0.0000
I3	0.0000	0.0000	0.0000	0.0000	0.0000
I4	0.0000	0.0000	0.0000	0.0000	0.0000

Weighted Supermatrix

	A1	A2	A3	B1	B2	B3	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.0000	0.1535	0.0000	0.5000	0.5000	0.5000	0.0984	0.0580	0.2320	0.0909	0.1203	0.0573	0.0000	0.1667
A2	0.0000	0.0000	0.1667	0.0000	0.0000	0.0000	0.0683	0.0513	0.1013	0.0213	0.0517	0.0864	0.0843	0.0000
A3	0.0000	0.0465	0.0000	0.0000	0.0000	0.0000	0.0000	0.0157	0.0000	0.0306	0.0280	0.0230	0.0586	0.0000
B1	0.0000	0.0000	0.0330	0.0000	0.0000	0.0000	0.0000	0.0457	0.0000	0.0000	0.0000	0.1250	0.0000	0.0000
B2	0.0000	0.0000	0.0240	0.0000	0.0000	0.0000	0.0000	0.0190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B3	0.0000	0.0000	0.1096	0.0000	0.0000	0.0000	0.1667	0.0603	0.0000	0.0000	0.0000	0.0417	0.0000	0.0000
C1	0.0000	0.0745	0.0000	0.0000	0.0000	0.0000	0.0000	0.0335	0.0344	0.0519	0.0616	0.1076	0.0000	0.0597
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0936	0.0000	0.0426	0.0000	0.0000	0.0171
C3	0.0000	0.0621	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0591	0.0445	0.0000
C5	0.0000	0.0241	0.1126	0.0000	0.0000	0.0000	0.0000	0.0223	0.0270	0.0281	0.0000	0.0000	0.0231	0.0354
C6	0.0000	0.0394	0.0541	0.0000	0.0000	0.0000	0.0000	0.0227	0.0000	0.0000	0.0347	0.0000	0.0000	0.0000
C7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0284	0.0835	0.0628	0.0611	0.0000	0.0000	0.0545
C8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0181	0.0949	0.0000	0.0000	0.0000	0.0753	0.0000
D1	0.0000	0.0000	0.0000	0.1846	0.1351	0.3074	0.0000	0.0115	0.0000	0.0614	0.0000	0.0369	0.0692	0.0578
D2	0.0000	0.0000	0.0000	0.1661	0.1645	0.1268	0.0000	0.0292	0.0000	0.0477	0.0000	0.0532	0.0458	0.0598
D3	0.0000	0.0000	0.1667	0.1494	0.2004	0.0658	0.0000	0.0843	0.0000	0.0337	0.0000	0.0766	0.0278	0.0490
E1	0.8062	0.0930	0.1094	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E2	0.1938	0.1070	0.0573	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0742	0.0000	0.0772	0.1122	0.0000	0.0858	0.0995
F2	0.0000	0.0473	0.1667	0.0000	0.0000	0.0000	0.0731	0.0196	0.0000	0.0281	0.0327	0.1126	0.0160	0.0206
F3	0.0000	0.1527	0.0000	0.0000	0.0000	0.0000	0.0936	0.0312	0.0000	0.0375	0.0551	0.0541	0.0411	0.0466
G1	0.0000	0.1084	0.0000	0.0000	0.0000	0.0000	0.0661	0.0509	0.1352	0.0944	0.0190	0.0000	0.0169	0.0133
G2	0.0000	0.0593	0.0000	0.0000	0.0000	0.0000	0.0527	0.0384	0.1066	0.0335	0.0499	0.0000	0.0398	0.0403
G3	0.0000	0.0324	0.0000	0.0000	0.0000	0.0000	0.0479	0.0357	0.0915	0.0150	0.1310	0.0000	0.0862	0.1130
H1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0693	0.0486	0.0000	0.0666	0.0366	0.0000	0.0521	0.0875
H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0366	0.0253	0.0000	0.0274	0.0873	0.0000	0.0234	0.0272
H3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0609	0.0511	0.0000	0.0489	0.0762	0.0000	0.0673	0.0520
I1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0533	0.0311	0.0000	0.0268	0.0000	0.0573	0.0372	0.0000
I2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0175	0.0269	0.0000	0.0687	0.0000	0.0162	0.0157	0.0000
I3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0424	0.0369	0.0000	0.0322	0.0000	0.0345	0.0633	0.0000
I4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0536	0.0302	0.0000	0.0151	0.0000	0.0586	0.0267	0.0000

Limit Supermatrix

	A1	A2	A3	B1	B2	B3	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413	0.1413
A2	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165
A3	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059
B1	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754	0.0754
B2	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048
B3	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086	0.0086
C1	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150
C2	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099
C3	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099
C4	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197
C5	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192	0.0192
C6	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082	0.0082
C7	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626	0.0626
C8	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407	0.0407
D1	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950	0.0950
D2	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585	0.0585
D3	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501	0.0501
E1	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161	0.1161
E2	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295	0.0295
F1	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212
F2	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777	0.0777
F3	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156	0.0156
G1	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135
G2	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140
G3	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204
H1	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128
H2	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079
H3	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135
I1	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044
I2	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030
I3	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059
I4	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036

Limit normalization

	Limit values	Normalized values
A1	.1413	.8632
A2	.0165	.1008
A3	.0059	.0360
B1	.0754	.8491
B2	.0048	.0541
B3	.0086	.0968
C1	.0159	.0810
C2	.0099	.0535
C3	.0099	.0535
C4	.0197	.1064
C5	.0192	.1037
C6	.0082	.0443
C7	.0626	.3380
C8	.0407	.2198
D1	.0950	.4666
D2	.0585	.2873
D3	.0501	.2461

	Limit values	Normalized values
E1	.1161	.7974
E2	.0295	.1449
F1	.0212	.1852
F2	.0777	.6786
F3	.0156	.1362
G1	.0135	.2010
G2	.0140	.2923
G3	.0204	.4259
H1	.0128	.3743
H2	.0079	.2310
H3	.0135	.3947
I1	.0044	.2604
I2	.0030	.1775
I3	.0059	.3491
I4	.0036	.2130

Priorities

A) Stok Bilgileri	Öncelik
A1) Ürün çeşitliliği	86.32%
A2) Stok seviyeleri	10.08%
A3) Mal kabul karakteri	3.60%

B) Birim Özellikleri	Öncelik
B1) Boyut	84.91%
B3) Diğer özellikler	9.68%
B2) Ağırlık	5.41%

C) Performans Kriterleri	Öncelik
C7) Tepki süresi	33.80%
C8) Sipariş yerine getirme kalitesi	21.98%
C4) Esneklik	10.64%
C5) İşlem hacmi	10.37%
C1) Yatırım maliyeti	8.10%
C2) Operasyonel maliyetler	5.35%
C3) Yatırımın geri dönüş oranı	5.35%
C6) Stok kapasitesi	4.43%

D) Sipariş Birimi	Öncelik
D1) Tek-ürün	46.66%
D2) Koli	28.73%
D3) Palet	24.61%

E) Depo türü	Öncelik
E1) Dağıtım	79.74%
E2) İmalat	14.49%

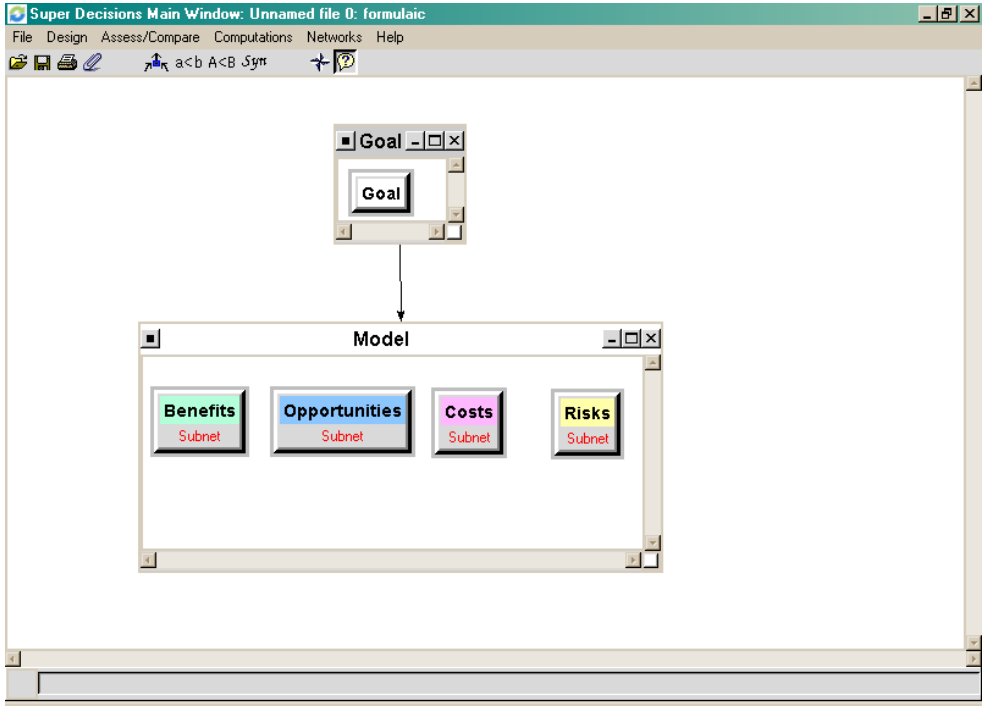
F) Sipariş Özellikleri	Öncelik
F2) Sipariş miktarı	67.86%
F1) Satır sayısı	18.52%
F3) Günlük sipariş sayısı	13.62%

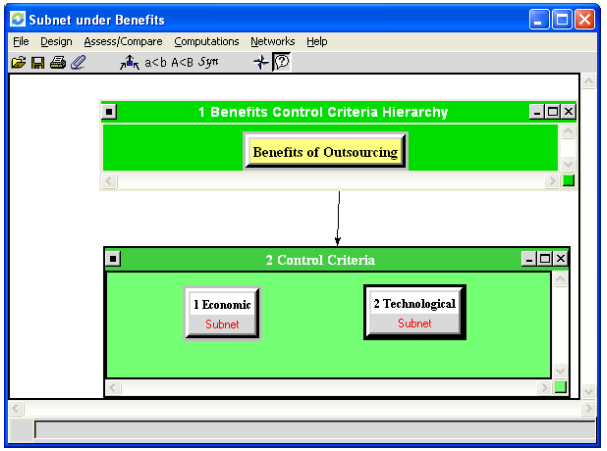
⋮

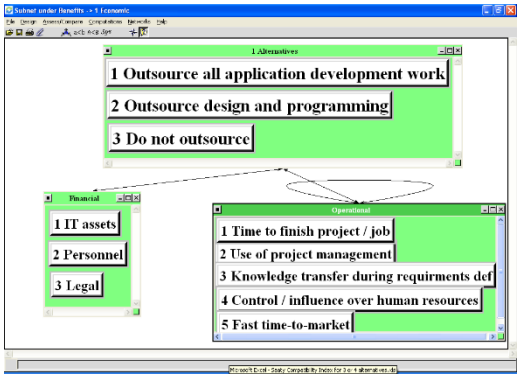
I) Stok politikaları	Öncelik
I3) Sınıf-bazlı	34.91%
I1) İthaf edilmiş	26.04%
I4) Korelasyonlu	21.30%
I2) Rassal	17.75%

Benefit Opportunity Cost Risk

- a top level network containing the BOCR nodes (the merits)
- control criteria hierarchy subnet (attached to each node)
- decision subnets (attached to selected control criterion)







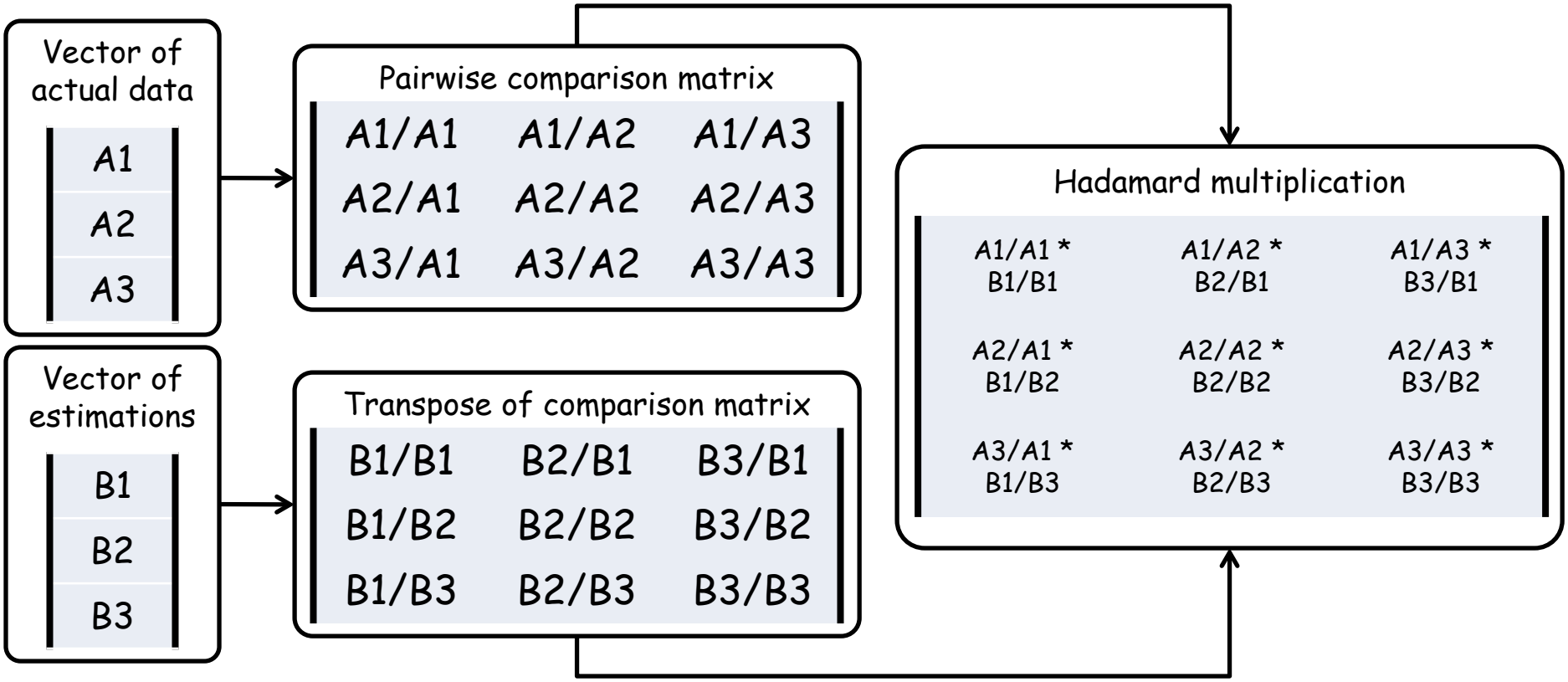
Saaty Compatibility Index (SCI)

SCI

is used to find how close the estimations revealed using ANP model are to actual data

(e.g. market shares)

SCI Calculation



$$\mathbf{SCI} = \frac{\text{Sum of Hadamard multiplications}}{\text{number of entries}}$$

Softwares

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