Analysis of role of design in furniture production and market by applying ANP

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Introduction

The furniture industry in the world has been ranked first in the light industry due to job creation and early returns in the last two decades.

The furniture industry currently accounts for 2 percent of global trade, and this is growing.

Iran's share of global furniture trade is only 0.02 percent.

The value of furniture design in the furniture industry has been around 180 billion dollars over the past decade, with G7 countries having a share of 60% and 20% of developed countries and 20% of the rest of the developed countries.

The furniture and peripheral industries account for 10% of employment in Iran and it has a special role and is one of the early returns industries.
The necessity of doing research

-Lack of innovation and creativity in design
-Copying the works
-Increase in supply amount
-Competition is very seriously
-Distinctive design having the similar raw material and machineries is advantage
Ratnasingam and Lorass (2003) proposed criteria of designing as one of the factors influencing sustainability of Asia’s wooden furniture industry future.

Gazo (2005) presented importance of design in furniture industry of Malaysia and its role in attaining growth and higher added value.

- Swann & Birke (2005) showed that creativity and design influence R&D. As inputs, creativity and design play an important role in the innovation and performance of a business.

- A study by Gemser and Leenders (2001) on Dutch companies showed that design integration in the development projects of new product has a significant positive impact on the company performance (profit, turnover, sales, and exports).
Research Design/Methodology

The analytic network process (ANP)

• ANP is most suitable technique for our study
• ANP provides a broad framework for decision making in complicated environments.
• ANP extends dependence and feedback and generalization of the super-matrix approach. It allows interactions and feedback within clusters (inner dependence) and between clusters (outer dependence).
The ANP is a coupling of two parts
• Control hierarchy
• Network of influences among the elements and clusters

• The network varies from criterion to criterion and a super-matrix of limiting influence is computed for each control criterion.

• Finally, each of these super-matrices is weighted by the priority of its control criterion and the results are synthesized through addition for all the control criteria.
To determine how to study the role of design and provide appropriate solutions,
Reviewing the internal and external resources,
Interviewing the producers and academicians,
Describing the work and demands of the researcher,
A comprehensive list of effective criteria was developed to enable us to understand all the important criteria on decision making in relation to the role of design.
To do this, the views of more than 40 furniture industry experts were used.

Finally, 296 sub-criteria in 31 intermediate criteria were identified and in five general groups or control criteria were designed.
Overall structure of decision making

1 SuperGoal

2 Strategic criteria

1 Political factors
2 Legal factors
3 Cultural and social factors
4 The factors of development and technology
5 Economic factors

BOCR MERITS

Benefits
Opportunities
Costs
Risks

Subnet
Subnet
Subnet
Subnet
The Alternatives

There are four potential alternatives for role of design:

• Using fashion design in furniture production (S1),
• Using engineering design in furniture production (S2),
• Using a combination of fashion and engineering designs in furniture production (S3),
• Applying leading countries’ design capability with an outsourcing approach in furniture production (S4).
Strategic criteria

In this research the merits of benefits, costs, opportunities, and risks are weighted by five general factors, liable to one of the following broad categories:

- Development and technological
- Cultural & social
- Economic
- Politic
- Legal
The economic criteria (0.299) has the highest priority
For selecting the most appropriate alternatives, the best approach is to categorize the criteria into favorable and unfavorable categories.

• The decision maker considers the favorable criteria as benefits and the unfavorable criteria as costs.

• The possible events are also divided into opportunities and risks criteria, depending whether they are considered to be positive or negative (Saaty, 2001a).
Prioritizing BOCR

Rating of the model to obtain BOCR weighing values very high (1), high (0.51), medium (0.252), low (0.124), very low (0.065)

<table>
<thead>
<tr>
<th></th>
<th>Benefits</th>
<th>Costs</th>
<th>Opportunities</th>
<th>Risks</th>
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<tbody>
<tr>
<td>Economic (0.299)</td>
<td>Very high</td>
<td>medium</td>
<td>Very high</td>
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<td>Politic (0.246)</td>
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<td>Very high</td>
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<td>Legal (0.154)</td>
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<tr>
<td>Cultural &amp; social (0.105)</td>
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<td>low</td>
<td>high</td>
<td>medium</td>
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<tr>
<td>Development and technological (0.193)</td>
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<td>medium</td>
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<td>high</td>
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<td>Overall priorities</td>
<td>0.313</td>
<td>0.146</td>
<td><strong>0.332</strong></td>
<td>0.207</td>
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</tbody>
</table>

Opportunities has obtained the highest priority with weighting value 0.332
Control criteria network

Network of control criteria under benefits, costs, opportunities and risks are as follows:

• Economic and marketing
• The man force and technical
• Supply and production
• Social, cultural & political
• Environmental
Control criteria network under benefits
Control criteria network under opportunities
Control criteria network under costs
Control criteria network under risks
Sub network under benefits/ economics

- Taking advantage of scientific and technological infrastructure of universities
- Taking advantage of the capacity of clusters of factories
- The use of tax and social security protection

- Export
  - Cancel export tax fee
  - Stimulation of demand by foreign buyers
- Undermine and remove foreign competitors are active in the country's market

- Competitiveness
  - Access and mastery of knowledge
  - Share capital and technology
  - The expansion of cooperation between businesses
  - The possibility of creating static competition

- Alternatives
  1. The use of fashion design
  2. The use of engineering design
  3. The use of combining fashion design and engineering design
  4. Taking advantage of the outsourcing approach with leading countries design

- Investment
  - Access to technology
  - Access to management techniques
  - Lower prices and upgrade competitiveness
Sub network under benefits/ technical

- Maximum use of the capacity of the machines
- The creation of wealth and value added
- Wood consumption optimization
- The savings resulting from transportation
- Remove the method of trial and error in the production of a new product
- The correct advice in the field of furniture layout
- Increase the apparent charm combined with suitable colors
- Build products tailored to consumer space

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under benefits/ man force

Management
- The proper management of human resources
- Increase employee satisfaction
- Enhance enterprise communications outsourcing
- The correct management of expectations
- Reducing complaints

Innovation and creativity
- Increase creativity and innovation
- The possibility of correct modeled (the lack of a working copy)

Manpower
- Activating the market of academic disciplines
- Rest of the labour force (easier to understand how to cut and assemble structures)
- No need to research and use of force skilled in the design (in the case of outsourcing the design section)

Education (University and industry Association)
- University professors to the consulting services industry
- The possibility of making product prototypes for industry
- The supply of technical manpower for industry
- The possibility of internships for students in the industry
- Art and architecture students encouraged to fashion design in the field of fur
- Engineering and industrial design students are encouraged to design engineering

1 Alternatives
1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under benefits/ supply

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under benefits/production

Quality control
- Increased accuracy and quality in work
- Product rating
- Becoming mechanized quality control
- Ease of control and inspection during production
- Connect the control unit with the purchase process, warehouse, production

Productivity
- Improve the performance
- Reduce the time to build a product
- High speed Assembly
- Reduce duplication

Packaging
- The possibility of packaging design with economical

R&D
- Move the boundaries of design knowledge
- Create welfare for human beings
- Increasing belief next to simplify and expedite matters
- Increased competitive power
- Improve the quality of the product

Efficiency
- Reduce waste or leftovers
- Create a good working environment
- Increase the efficiency of the production
- Enhance the ability of individual skills and

The production process
- Increased accuracy in the work machine
- Ease of manufacture
- Reduce the production cost
- The speed of the production of new products on the market (reverse engineering)
- Keep track of production strategy ETO
- Keep track of production strategy MTO
- Keep track of production strategy MTS
Sub network under benefits/social cultural & politic

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design

Restoring the credibility of the Iranian furniture

The ability to meet the needs of the customer
Sub network under benefits/environmental

- Reduce energy consumption in the use of new technology
- The principle of operation of forests
- The possibility of green supply chain management (GSCM)
- Reducing the use of chemicals and contaminants
- Reduce the production of carbon (using less resources, recycle more and reduce waste production)

1. Alternatives

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under opportunities/ economics
Sub network under opportunities/marketing

Marketing
- Contribute to the marketing of products
- The possibility of segmenting the market
- Contribute to product pricing strategy
- The possibility of the creation, Exchange and provide value to customers
- The opportunity to design and compile program performance measurement

Advertising
- Contribute to the effective and targeted advertising of the product
- Taking advantage of the appropriate headline in advertising
- Possibility of receiving awards and certifications (development of advertising)

Warranty
- Product warranty

Brand
- Branding the Iranian furniture
- Contribute to the development of the brand
- Customer loyalty to the brand
- Possibility of receiving awards and certifications (boost brand)
- The development of cultural branding and look

After sales service
- Customer relationship management (CRM)
- Increase in after sales service
- The feedback of the product by the customer

1. Alternatives
   1. The use of fashion design
   2. The use of engineering design
   3. The use of combining fashion design and engineering design
   4. Taking advantage of the outsourcing approach with leading countries design

Profit
- High profit margins for products designed
Sub network under opportunities/ technical

Design
- The revision of the beauty and elegance of the product
- The development of multi-purpose modular furniture
- Differentiate the product with other competitors
- Possibility to customize the product
- The possibility of using handmade ECO-CHIC pieces
- The possibility of design in imitation of nature-bionetic
- How to manage and use the amount of textiles and furniture accessories

Technology
- Conversion of knowledge and technology to the new product
- The opportunity to use the new machines
- The possibility of the use of new know-how
- The possibility of export of technical and engineering services to other countries

1. Alternatives
- The use of fashion design
- The use of engineering design
- The use of combining fashion design and engineering design
- Taking advantage of the outsourcing approach with leading countries design

Ergonomics
- How to apply more frequently
- The possibility research on raw materials
- The possibility research on fashion and style furniture
- Increase the safety of furniture
- The feasibility analysis of human body system
- The possibility of assessing the physical dimensions (Anthropometry)
- Taking advantage of bio-mechanics in furniture design
Sub network under opportunities/man force

- The design of an appropriate structure for supporting creativity
- The possibility of innovation in process, product and services
- The possibility of innovation in marketing
- Increase of culture of teamwork
- The promotion of the position of the innovation in corporate strategy
- The possibility to encourage individuals to innovation

Education (University and Industry Association)
- The possibility of research contracts with universities
- The possibility of consultations and the implementation of industry research (increasing the contribution of universities)
- The possibility of knowledge and technological change has founded companies founded by alumni
- The industry's access to University Labs
- Enhance the role of universities in the creation of new high-tech industries have

Management
- Take advantage of outsourcing opportunities
- Development of application of physical capital
- Improve employee motivation, beliefs and thoughts
- Ease of management of human resources
- Promote strategic management practices

1. Alternatives
   1. The use of fashion design
   2. The use of engineering design
   3. The use of combining fashion design and engineering design
   4. Taking advantage of the outsourcing approach with leading countries design

Manpower
- Increase the level of employing
- Increasing the expertise and skills of the labour force
Sub network under opportunities/ supply

- The use of new raw materials
- The right choice of materials for construction
- Use the proper fabric and accessories
- Development of auxiliary industries

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under opportunities/ production

- R&D
  - The possibility of the establishment of the unit R&D in companies
  - The feasibility of researching aesthetic furniture
  - Optimize processes
  - New product design
  - The transfer and uptake of technology
  - Defensive strategy formulation

- Efficiency
  - Ease employees' performance evaluation
  - Improve the production per capita
  - The possibility of the full time to produce
  - The possibility of a capacity assessment of the production line

- Productivity
  - Full use of production technologies
  - The growth of productivity

- The production process
  - The development of mass production approach
  - Timely delivery
  - In terms of consumer financial conditions in production (variety)
  - The flexibility of the machines, production lines, task force
  - Track production strategy OEM
  - Track production strategy ODM
  - Track production strategy OBM

- Alternatives
  1. The use of fashion design
  2. The use of engineering design
  3. The use of combining fashion design and engineering design
  4. Taking advantage of the outsourcing approach with leading countries design

- Quality control
  - The feasibility analysis of various experiments
  - POSSIBILITY to record test results
  - Documentation and records management quality tests
  - Taking advantage of previous experience in the testing of
  - The possibility to support a variety of measuring methods
  - Possibility to define quality indicators and the types of acceptable

- Packaging
  - Contributing to the low volume packaging
  - Ease of Assembly by the consumer
  - Ease of visualizing and understanding the contents of the package
  - The identity of the building in the packaging design
  - Help to maintain healthy goods
  - The possibility of using different packaging shapes (squares, etc.)
Sub network under opportunities/ social cultural & politic

- Cultural
  - The Islamic Iranian culture by design
  - The production of culture and the need of the society
  - The change and development of consumption pattern

- Social
  - Improving quality of life
  - Upgrading the level of industrial unions
  - The growth of consumption of household furniture
  - Increase the sense of national confidence

- Political
  - Increase political influence (with the design of a new product)
  - Boost political relations
  - Taking advantage of the strategic advantage

1. Alternatives
   - 1. The use of fashion design
   - 2. The use of engineering design
   - 3. The use of combining fashion design and engineering design
   - 4. Taking advantage of the outsourcing approach with leading countries design
Sub network under opportunities/ environmental

- The possibility of recycling of furniture (biological degradation)
- The lack of the use of plastic packaging
- The effective use of energy and resources available
- Possible to get environmental certificates for export to Europe
- To optimize the exploitation of raw materials
- The possibility of the return of the products to the company for recycling

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under costs/economics

- Transference of foreign markets to leading competitors
- The cost analysis of the export target markets
- Global furniture exports will decline
- Negative competition between domestic exporters
- Lack of awareness of the export target markets

- The sharp rise of imports
- The currency of the country of departure

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under costs/ marketing

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design

The cost of creating continuous shops for sale
Sub network under costs/ technical
Sub network under costs/ man force
Sub network under costs/supply

1. The increase in the cost of raw materials
2. Sudden cessation of the supply of raw materials
3. Dependency to the suppliers of raw materials
4. The drop in the quality of the supply of raw materials

1. Alternative
   1. The use of fashion design
   2. The use of engineering design
   3. The use of combining fashion design and engineering design
   4. Taking advantage of the outsourcing approach with leading countries design
Sub network under costs/ production

- The financial problems there, worn out machines and equipment
- The cost of an aggressive strategy (the development of a new product and technological change has)

1. Alternatives

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under costs/ social cultural & politic

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design

Lack of attention to the Islamic Iranian culture in the production
Sub network under costs/ environmental

- Taking indiscriminate sources of wood (the destruction of the forests)
- Increase in greenhouse gas emissions
- The accumulation of waste resulting from the lack of flexibility of the recycling
- The ban on exports to the European Union due to disagree with the Green supply chain

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under risks/economics

1. Export
   - The risk of increasing the price of finished products
   - Lack of liquidity and working capital for export products
   - The lack of understanding of the tools and machines in the production of furniture

2. Investment
   - The powerful presence of foreign competitors
   - The risk of net use of the investment market
   - The mere use of risk capital resources for the axis to axis performance
   - The possibility of increasing the competition level

3. Competitiveness
   - Fierce competition among domestic manufacturers
   - Risk information in the market rent
   - Anti-competitive practices such as import
   - Anti competitive cartel action, risk
   - The absence of codified rules and regulations regarding competition

4. Alternatives
   - 1. The use of fashion design
   - 2. The use of engineering design
   - 3. The use of combining fashion design and engineering design
   - 4. Taking advantage of the outsourcing approach with leading countries design
Sub network under risks/ marketing

- Rising foreign brands of furniture within the country
- Loss of trust to produce furniture inside

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under risks/ technical
Sub network under risks/ man force

1. The lack of training and experience in the field of furniture design graduates
2. The lack of compliance with industry needs of university training
3. The lack of ability to protect the investment in the sector of design and creativity
4. The lack of flexibility of the managers
5. The company’s lack of dexterity and buoyancy

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design

The lack of a skilled workforce stability design
Sub network under risks/ supply
Sub network under risks/ production

- Lack of copyright law
- Lack of trust to the degree of being helpful
- A lack of logical and scientific applications

1. Alternatives

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Sub network under risks/social cultural & politic

Cultural

Promoting the culture of consumption of foreign brand furniture

Political

- Limiting the risks of economic sanctions
- The risk of becoming transformed the economic policies and the orientation of Government
- Back guarantee and security risks of foreign investment

Alternatives

1. The use of fashion design
2. The use of engineering design
3. The use of combining fashion design and engineering design
4. Taking advantage of the outsourcing approach with leading countries design
Result of benefits/ Control criteria

Economics and marketing has the highest priority
Result of opportunities/ Control criteria

Economics and marketing has highest priority
Economics and marketing has highest priority
### Result of risks/ Control criteria

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<th>Category</th>
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<td>Social</td>
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<td>Supply</td>
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<td>Human</td>
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**Economics and marketing** has highest priority
Economics and marketing are very important criteria in current research due to following reasons:

- Motivation of economic activity
- Success in decision making
- Profitability of economic activity
Result of Marketing and economics control criteria of Opportunities

• The results show Marketing and Sale (0.604) has higher priority in comparison with Economics (0.395)

• In sub-network of Marketing and Sale, Branding has highest priority.

The results are as follows:
• Marketing 0.183, Branding 0.35, Propaganda 0.231, Services after sale 0.077, Profitability 0.103 and Warranty 0.053.
Branding, provide Advertising
After-sales services Product warranty Profitability
Results of solutions with respect to merits of Opportunities/ Marketing and sale control criteria:

Using fashion design in furniture production (S1): 0.189

Using engineering design in furniture production (S2): 0.211

Using a combination of fashion and engineering designs in furniture production (S3): 0.39

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.28
Results of solutions with respect to merits of opportunities/ marketing and sale control criteria/ Branding:

Using fashion design in furniture production (S1): 0.205

Using engineering design in furniture production (S2): 0.285

Using a combination of fashion and engineering designs in furniture production (S3): 0.448

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.06
Analysis of the solutions with respect to Branding

Using a combination of fashion and engineering designs in furniture production (S3) can restore potential of the country to brand Iranian furniture at the international market level.
Result of Marketing and economics control criteria of Benefits:

The results show Economic (0.581) has higher priority in comparison with Marketing and Sale (0.418)

In subnet work of Economics, Infrastructure has highest priority

The results are as follows:

**Infrastructure** 0.341, Competitiveness 0.235, Investment 0.234, Export 0.188
Creation of
Science & technology infrastructure
Government support infrastructure
Lead to
Export
Investment
Competitiveness of the furniture industry.
Results of solutions with respect to merits of Benefits/ Economics control criteria:

Using fashion design in furniture production (S1): 0.192

Using engineering design in furniture production (S2): 0.215

Using a combination of fashion and engineering designs in furniture production (S3): 0.331

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.261
• Results of solutions with respect to merits of benefits/ economics control criteria/ Infrastructure

Using fashion design in furniture production (S1): 0.199

Using engineering design in furniture production (S2): 0.288

Using a combination of fashion and engineering designs in furniture production (S3): 0.418

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.0937
Analysis of the solutions with respect to Infrastructure

Utilizing the combination of fashion and engineering designs (S3) in furniture production, can lead to the maximum use of the capacity of the scientific and technological infrastructure of the universities.
Result of Marketing and economics control criteria of Costs:

Economics (0.604) has higher priority in comparison with Marketing and Sale (0.395)

In sub-network of Economics, Export has higher priority

The results are as follows:

Export 0.75, Import 0.25
Lack of knowledge of Export target markets

Reduces motivation of domestic producers to export
Loss of beneficial export markets
Tendency towards weak domestic markets
Negative and unhealthy competition
Results of solutions with respect to merits of Costs/Economics control criteria:

Using fashion design in furniture production (S1): 0.25

Using engineering design in furniture production (S2): 0.21

Using a combination of fashion and engineering designs in furniture production (S3): 0.22

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.318
Results of solutions with respect to merits of costs/ economics control criteria/ Export:

Using fashion design in furniture production (S1): 0.289

Using engineering design in furniture production (S2): 0.138

Using a combination of fashion and engineering designs in furniture production (S3): 0.092

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.479
Analysis of the solutions with respect to Export

The solution S4 will lead to

Loss of export markets for the benefit of leading foreign competitors,

Dependence to leading countries is a major weakness,

Market will be lead to leading competitors.
Result of Marketing and economics control criteria of Risks:

Economic (0.671) has higher priority in comparison with Marketing and Sale (0.328)

In sub-network of Economics, Export has highest priority

The results are as follows:

Export 0.555, Investment 0.275, Competitiveness 0.168
Rules & regulations regarding competition will not be clear

Risk of a monopoly of information of Iranian furniture market

Impossibility of export for a domestic investor.
Results of solutions with respect to merits of Risks/ Economics control criteria

Using fashion design in furniture production (S1): 0.205

Using engineering design in furniture production (S2): 0.25

Using a combination of fashion and engineering designs in furniture production (S3): 0.329

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.215
Results of solutions with respect to merits of risks/ economics control criteria/ Export

Using fashion design in furniture production (S1): 0.124

Using engineering design in furniture production (S2): 0.285

Using a combination of fashion and engineering designs in furniture production (S3): 0.428

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.161
Analysis of the solutions with respect to Export

With respect to high risk of Export criteria, the solution S3 will lead to,

Increased costs of skilled designer employment,
Risk of job security for skilled labor,
Risk of not using machinery related to the design of a product engineered
Is not compatible with customer's requirements.
Overall synthesized priorities for the alternatives. We synthesized from the network sub-net under **Opportunities**:

Using fashion design in furniture production (S1): 0.177

Using engineering design in furniture production (S2): 0.211

Using a combination of fashion and engineering designs in furniture production (S3): 0.362

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.249
Overall synthesized priorities for the alternatives. We synthesized from the network sub-net under **Benefits:**

Using fashion design in furniture production 
(S1): 0.218

Using engineering design in furniture production (S2): 0.227

Using a combination of fashion and engineering designs in furniture production (S3): 0.301

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.252
Overall synthesized priorities for the alternatives. We synthesized from the network sub-net under **Costs**:

Using fashion design in furniture production (S1): 0.217

Using engineering design in furniture production (S2): 0.233

Using a combination of fashion and engineering designs in furniture production (S3): 0.222

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.327
Overall synthesized priorities for the alternatives. We synthesized from the network sub-net under **Risks**:

Using fashion design in furniture production (S1): 0.188

Using engineering design in furniture production (S2): 0.227

Using a combination of fashion and engineering designs in furniture production (S3): 0.296

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.287
Overall synthesized priorities for the alternatives. We synthesized from the network Super Decision Main Window:

Using fashion design in furniture production (S1): 0.225

Using engineering design in furniture production (S2): 0.217

Using a combination of fashion and engineering designs in furniture production (S3): 0.396

Applying leading countries’ design capability with an outsourcing approach in furniture production (S4): 0.161
In terms of selection, Using a combination of fashion and engineering designs in furniture production (S3) in the marketplace and furniture manufacturing is considered the best solution.

We analyze S3 with respect to 8 main control criteria which are as follows:

Economic
Marketing and sale
Supply
Production
Technical
Man force
Social, cultural, and political
Environmental
Economic

If S3 is planned and implemented
Maximum use of available capacities in the scientific and technological infrastructure of universities

Protection of the share of the country's furniture and furniture market in favor of domestic power.

Foreign investment
High value added products
Transferring technical knowledge.
Marketing and sale

Using S3 in the market and furniture industry

Restore the potential of the country to brand Iranian furniture

Emergence and prosperity of Iranian brands in the international market,

Strong and reputable brands in their global markets and gain a good
market share.
Supply

S3 can be used to design and manage the use of *indigenous* and even *non-indigenous* materials in design.

One work reliably and will not be concerned about the cessation of its supply,

*Suitable alternatives* could be found
Production

S3 leads to the creation of R & D
Overwhelming with the benefits and interests for companies,

Accuracy and quality of work increases,
Production time decreases,
Lower production costs
Increased margins,
Raising competitiveness of the product,
Timely scheduling and delivery
Technical

Using S3, a design change can always be made to a product that is not in line with competitors' products, distinction and difference with other products. Market share be achieved by differentiating the design Development of design and ergonomics
Man force

S3 offers
Job creation (architecture, art, industrial design, and wood industry)
Establishing new knowledge-based companies
Designing and producing new products
Social, cultural, and political
Using S3, a sense of self-confidence is created in the domestic producer
Respond to customer needs
Designing with respect to culture of the community
Applying beauty, quality, precision, elasticity, and elegance
Environmental

Using S3, we can use the optimal amount of raw materials available to reduce the harvest and utilization of forest resources.

Possibility of recycle
Decrease in waste of production
Green supply chain management
Sensitivity analysis

Since there may be different judgments about the comparison of priority rates of benefits, opportunities, costs, and risks or their sub-criteria, a sensitivity analysis of the results is called for (Saaty, 2001d).

The results are illustrated in table 6.
Table 6: The results of sensitivity analysis

<table>
<thead>
<tr>
<th>Merits</th>
<th>Basic Weight</th>
<th>Number of changes</th>
<th>New Weight</th>
<th>New Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>0.313</td>
<td>1</td>
<td>0.134</td>
<td>S3 &gt; S2 &gt; S1 &gt; S4</td>
</tr>
<tr>
<td>Costs</td>
<td>0.146</td>
<td>1</td>
<td>0.255</td>
<td>S3 &gt; S4 &gt; S2 &gt; S1</td>
</tr>
<tr>
<td>Opportunities</td>
<td>0.332</td>
<td>2</td>
<td>0.06</td>
<td>S3 &gt; S2 &gt; S1 &gt; S4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.42</td>
<td>S3 &gt; S1 &gt; S2 &gt; S4</td>
</tr>
<tr>
<td>Risks</td>
<td>0.207</td>
<td>1</td>
<td>0.294</td>
<td>S3 &gt; S4 &gt; S2 &gt; S1</td>
</tr>
</tbody>
</table>

With respect to the result, opportunities is more sensitive than benefits, costs and risks with two times changes of alternatives priorities.
Sensitivity analysis with respect to benefits
Sensitivity analysis with respect to costs
Sensitivity analysis with respect to opportunities
Sensitivity analysis with respect to risks
References


Thank you for your attention