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Article

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OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

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Proposing a decision model for privatization of newsprint paper industry by applying ANP

Majid Azizi^{1*} and Charles Ray²

Abstract: This study proposes a decision model for privatization of newsprint paper industry. Newsprint paper has very demanding market requirements, ones that must be adapted in quality and quantity with consumers' media preferences. In Iran, there is one newsprint paper producer that supplies 70% of domestic use. Privatization of this producer will enable increased production and reduce the necessity of imported newsprint. Four possibilities are examined as possible solutions: Encouragement for investment; Reformation of rules and regulation; Reformation of firms' structure; and Liberalization of prices. The Analytical Network Process was used to synthesize and analyze the model. A value-weighted competency model was calculated with the influence of external factors on the competency model. Paired comparison matrices associated with the degree of importance of each of the competencies were achieved. Finally, subsets of competencies' weighted values and their suboptions were identified through combination of the competencies and the best solution was obtained.

ABOUT THE AUTHORS

Majid Azizi is a professor of wood and paper sciences and industries at the University of Tehran. His research articles have appeared in *Forest Policy and Economics*, *Environment protection engineering*, *Ocean & Coastal Management*, *International Journal of Production Research*, *International Journal of Sustainable Engineering*, etc. Azizi's research areas include Analytic Hierarchy Process, Analytic Network Process, Multi Criteria Decision-Making, Forecasting, Industrial Management, and Wood Products Marketing.

Charles D. Ray is an associate professor of Wood Products Operations at The Pennsylvania State University. Ray's specialty is in the area of operations research, specifically those operational issues that confront the majority of the wood products sector. He spent 15 years in research and quality management for 2 large building products corporations, Temple-Inland and Louisiana-Pacific. Ray has published research on wood energy and drying; operational simulation, analysis, and performance measurement; process control; and forest industry microeconomics in journals such as *Renewable Energy*, *Journal of Applied Packaging Research*, *Journal of Forest Products Business Research*, *Forest Products Journal*, and *Wood and Fiber Science*.

PUBLIC INTEREST STATEMENT

This perspective article describes using a decision model for privatization of Iran newsprint paper industry. Based on the reports, the production of Iran newsprint paper is very low. Experience in other countries shows that proper execution of privatization in the newsprint paper industry can result in increased production. Decision-making model shows encouragement for investment is the most suitable solution for privatization of the industry. Attraction of domestic and foreign investment and growth of privatized companies lead to improvement in their profitability. Encouragement for investment promotes competitiveness of newsprint paper industry relative to foreign newsprint paper products, probability of societal evolution in legal relations of the society and structures, and acquisition and maintenance of customers from other countries.

Subjects: Organizational Change; Printing, Packaging & Reprographic Industry; Strategic Management

Keywords: privatization; newsprint paper; ANP; competency

1. Introduction

Newsprint paper is an economically important product in comparison with other industries, and it also serves a special role in press activities. Experience in other countries shows that proper execution of privatization in the newsprint paper industry can result in increased production. World production of newsprint paper in 2007 was 38 million tons (FAO, 2007) of which the maximum amount was produced by United States of America, Canada, China, Japan, Germany, and France (Table 1). In Iran, the Mazandaran Wood and Paper Industry is the only factory which produces newsprint paper, producing only about 46,000 tons per year.

Past experiences in Southeast Asian countries indicate that privatization of governmental firms and the resulting decrease of government's role in a country's economy cause sustainable economic growth in the country (www.daneshju.ir/forum, 2010).

The Canadian paper industry is an historical example of one that has evolved from one dominated by government regulatory oversight to a largely privatized industry. Canada is the second largest paper producer in the world and the first in the world in the field of pulp production and export of paper (Mooj News Agency, 2008). But at the turn of the twentieth century, Canada's annual production of newsprint stood at only 60,000 tons, just slightly more than Iran produces now.

Due to the British North America Act, Canada's provincial governments were given control over crown resources (i.e. public land, timber, minerals, water power, etc.). This meant that governments in Ontario, Québec, and British Columbia, whose large holdings of lands were blessed with abundant supplies of trees and water power, held potentially enormous authority over the industry, and regulations on timber harvest and exportation were severe. However, as the market for newsprint exploded in the United States and drove prices up, the provincial governments, sensing opportunity, relaxed existing restrictions on exportation of pulp, as well as timber harvests, so that the consolidating industry giants could grow to meet demand. As a result, the 60,000-ton production of 1900 had grown to 65 times that amount by 1930 due to tremendous amounts of private capital invested by these large companies (Historica Canada, 2014).

Privatization has continued to be a major force in world politics and economics for the past 25 years, and has dramatically reduced the role of state owned enterprises (SOEs) in both developed and developing countries. The cumulative value raised through privatization programs now probably exceeds \$1.25 trillion, and the vast bulk of this money has flowed directly to governments, rather than to the SOEs themselves. This is clearly one important reason that governments have so enthusiastically embraced privatization, since these programs raise large sums without having to increase taxes or cut spending on existing government programs (Megginson, 2005).

Table 1. Amount of newsprint paper production in selected countries (1,000 ton)

Country	China	Japan	Indonesia	Germany	USA	France	Canada	Iran	World
Production	4,579	3,802	557	2,333	4,464	1,088	6,640	46	38,096
Percent of World production	12.0	10.0	1.5	6.1	11.7	2.9	17.4	0.1	

Source: FAO, 2007.

Alex, Yuce, and Chen (2009) showed privatization to be a major tool for economic reform. Benefits of privatization of public sector industries include maximizing productivity and value via market-appropriate decision-making criteria of private sector management, and the receipt of cyclical revenues to the state treasury. Prokopenko (2001) states that the first goal of privatization is an increase in effectiveness of the national economy with respect to national and public needs.

Some of the effects of privatization on a nation's economy are as follows (Rahimi Boroujerdi, 2010):

- Guaranteed government loans to the firms decrease, thereby decreasing government costs and improving the national budget.
- Faster growth in preferred industrial sectors.
- Foreign investors will have higher motivation for transferring their resources and capitals to the country, and flow of capital to the country will be facilitated.
- Conditions for expansion of internal market will be improved and an increase in exported product will be possible.
- Exploitation of new technologies in production process will be possible with new capital.
- Job creation will be increased as industry is expanded.
- Capital inflows will stimulate the economy and finances of the people will be absorbed in productive activities of the economy.
- Services to customers will have higher quality and provide more satisfaction.
- Products in high volume and different varieties will be received by the customers and opportunity of selection in the economy will improve.

The fundamental research questions examined in this paper is as follows: How can specific criteria and subcriteria related to the privatization of the newsprint paper industry be categorized, and what is the best solution for privatization of Iranian newsprint paper industry? To determine the answers to these questions, Mazandaran wood and paper industries (MWPI) and researchers at the University of Tehran provide the data and theoretical and practical contributions.

The research is structured in the following stages. Section 1 provides an introduction to the challenges of the pulp and paper industries and the issue of privatization, and a background of the techniques of the Analytic Hierarchy Process (AHP) and the Analytic Network Process (ANP) which are used in this work to examine the issue. In Section 2, four potential alternative strategies for the privatization of the Iranian pulp and paper industry are stated, and strategic criteria for examining each of the alternatives are given. Then, the benefits, costs, opportunities, and risks methodology is detailed for examination of the strategic criteria under the assumption of each of the alternatives. Also in Section 2, the data collection methodology is explained. In Section 3, the objectives of prioritizing strategic criteria, BOCR, and the carious criteria and alternatives is performed as the first stage of the AHP. In Section 4, the Analytical Network Process (ANP) is utilized to conduct an analysis of overall factors and BOCR, and to make the resulting determination of the priorities of the individual alternative strategies. Validation of the results is explained at the end of Section 4. In Section 5, a sensitivity analysis is conducted to determine how robust the results of the analytical techniques are with regard to the issues examined. Finally, in Section 6 of the paper, conclusions of the research are provided.

1.1. The Analytic Hierarchy Process

The AHP for decision-making is a theory of relative measurement based on paired comparisons used to derive normalized absolute scales of numbers whose elements are then used as priorities (Saaty, 2000). Metrics of pairwise comparisons are formed either by providing judgments to estimate dominance using absolute numbers from one to nine fundamental scales of the AHP or by directly constructing the pairwise dominance ratio using actual measurements. The AHP can be applied to both

tangible and intangible criteria based on the judgments of knowledgeable and expert individuals, although how to measure the intangibles is its main concern. The weighting and adding model of synthetic process applied in the hierarchy structure of the AHP combines multi-dimensional scales of measurement a single “uni-dimensional” scale of priority. Finally, the model must be qualified with descriptive process experience for practical interpretation (Saaty, 2007).

To evaluate importance of privatization factors, the authors conducted a three-phased study, comprised of: (1) identifying the elements (criteria and subcriteria) and planning a hierarchy model for prioritization, (2) constructing the questionnaire and collecting information, and (3) determining the normalized weights. Opinions coming from different experts including managers and engineers specializing in paper making and privatization were collected via carefully designed questionnaires and then synthesized and analyzed using an AHP software device.

1.2. The Analytical Network Process

The ANP, a generalization of the AHP method for multi-criteria decision-making, provides a broader framework for decision-making in complicated environments. The advantage of this theory over the AHP is its ability to extend to the cases of dependence and feedback and generalization of the supermatrix approach. It allows interactions and feedback within clusters (inner dependence) and between clusters (outer dependence). The ANP is a coupling of two parts. The first consists of a control hierarchy or network of criteria and subcriteria that control the interactions in the system under study. The second is a network of influences among the elements and clusters. The network varies from criterion to criterion and a supermatrix of limiting influence is computed for each control criterion. Finally, each of these supermatrices is weighted by the priority of its control criterion and the results are synthesized through addition for all the control criteria.

A model aiming the usage of ANP in supplier selection is developed and implemented in an electronic company (Gencer & Gürpınar, 2007). ANP models are also used for locating facilities strategically (Partovi, 2006), selection of the appropriate energy policy for Turkey (Ulutaş, 2005), and for product mix planning in semiconductor fabricator (Chung, Lee, & Pearn, 2005). A decision-making model has been developed for selecting an appropriate location to establish plywood and veneer plants in Iran (Azizi & Modarres, 2007). ANP was also used to determine the best alternative raw material mix for Iranian facial tissue plants; results showed using virgin pulp mixed with rejected paper makes the production more efficient. Furthermore, long fibers of the pulp prevent harming the environment, and benefits and costs are more sensitive than opportunities and risks in this study (Azizi & Modarres, 2010).

2. Methodology

The aim of this study was to develop a decision network model to address the possibility of privatization of the newsprint paper industry in Iran. In the network model, merits are divided into four subsections as (1) benefits, (2) opportunities, (3) costs, and (4) risks. These merits are influenced by overall factors to obtain weighting values for each. This process follows the principle of ANP.

The research method in this study is comprised of subcomponents of the ANP modeling process which are as follows: alternatives, strategic criteria, or overall factors; criteria of benefits, costs, opportunities, and risks; prioritizing overall factors; prioritizing merits; prioritizing criteria and alternatives; final outcome; analysis; sensitivity analysis; and conclusion.

2.1. The alternatives

Four potential alternatives for privatization of Iran newsprint paper industry are analyzed:

- Encouragement for investment.
- Reformation of rules and regulation.

- Reformation of structure of firms.
- Liberalization of prices.

2.2. Strategic criteria as overall factors

The merits of benefits, costs, opportunities, and risks are weighted by four general factors or strategic criteria, categorized into one of the following broad categories:

- Economic factors:
 - (1) GDP
 - (2) Tax rules
- Cultural & social factors
- Politic factors
- Trade factors: related to the commercial regulations

2.3. Benefits, costs, opportunities, and risks

To categorize the criteria which have been used in current research, we divided them as 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).

Each of the benefits, costs, opportunities, and risks are further described below. The criteria used in the model have been justified by the Organization of privatization (2007).

(1) Benefits of privatization process in Iran newsprint paper industry

(a) Economic: financial, executive, trading, and technology

- (i) Financial—to decrease budget deficiency and national debts (BEFD), and to increase production and productivity (BEFI).
- (ii) Executive—to adjust subsidies and to decrease price changing (BEEA); gathering cash flow and generating of a discipline for regular income distribution (BEEG); and to increase competition via price discipline release (BEEI).
- (iii) Trading—to extend capital marketing (BETE), to create more ability in newsprint paper export (BETM), and to improve links with the global community through the WTO (World Trade Organization) (BETI).
- (iv) Technology—to have flexibility in production lines of newsprint paper (BETF).

(b) Social: executive, operative, and trading

- (i) Executive—provision of consumers benefits (BSEP), and to decrease governmental section size (BSED).
- (ii) Operative—to increase motivation in industry work force (BSOI).
- (iii) Trading—to have a representative process in place to deal with trade issues as they arise (BSTR).

(c) Technological: technology

- (i) Technology—to improve access to latest information and modern technology (BTIT), and to enable utilization of recycled paper furnish of newsprint paper industry (BTTE).
- (2) Costs of privatization process in Iran newsprint paper industry
 - (a) Economic: Executive-limiting rules and heavy taxes (CEEL).
 - (b) Social: Operative-decreased employment with operational efficiency, and resulting (CSWO) reduction in occupational security (CSWR).
- (3) Opportunities of privatization process in Iran newsprint paper industry
 - (a) Economic: financial and executive.
 - (i) Financial—to encourage the possibility and acquisition of foreign and internal investment (OEFE). Also, conservation of external reserve through reduced importation of foreign newsprint paper products.
 - (ii) Executive—to improve competitiveness of Iranian industry relative to foreign newsprint paper products (OEEI), and to increase production level of newsprint paper units (OEER).
 - (b) Social: executive, marketing, and employment
 - (i) Executive—probability of societal evolution in legal relations of the society and structures (OSEP).
 - (ii) Marketing—acquisition and maintenance of customers from other countries (OSMA), and timely response to customer's requirements (OSMT).
 - (iii) Employment—occupation generation in long term (OSEO).
 - (c) Technological: technology
 - (i) Technology—advances in technology realized through private capital deployment and market competition (OTTA).
- (4) Risks of privatization process in Iran newsprint paper industry
 - (a) Economic: financial, marketing, and security
 - (i) Financial—limiting regulatory costs (REFL).
 - (ii) Marketing—limiting demand and poor financial markets (REML).
 - (iii) Security—inconsistency and uncertainty of national economy (RESI).
 - (b) Social: executive, employment, and cultural
 - (i) Executive—interested groups opposition (RSEI) (e.g. managers and employees) (RSEO), and underdeveloped skill set of managers in dealing with competitive market environment (RSEU).
 - (ii) Employment—generation of social disturbance due to unemployment in short term (RSWG), and accompanying negative effect on employee's spirit and work morale (RSWN).
 - (iii) Cultural—public jealousy of private entrepreneurship (RCSP). All of the criteria and subcriteria with their abbreviations have been described in Factor table (see Table 2).

Table 2. Factor table

	Subcriteria	Abbreviation
Main criteria of benefits		
Economic/Financial	Decrease in budget deficiency and national debts	BEFD
Economic/Financial	Increase in production and productivity	BEFI
Economic/Executive	Adjustment of subsidies and decrease in price changing	BEEA
Economic/Executive	Gathering cash flow and generation of a discipline for regular income distribution	BEEG
Economic/Executive	Increase in competition via price discipline release	BEEI
Economic/Technology	Flexibility in production lines of newsprint paper	BETF
Economic/Trading	Extension of capital marketing	BETE
Economic/Trading	Improve links with global community through the WTO	BETI
Economic/Trading	More ability in newsprint paper export	BETM
Social/Executive	Provision of consumers benefits	BSEP
Social/Executive	Decrease in governmental section size	BSED
Social/Operation	Increase motivation in industry work force	BSOI
Social/Trading	Representative process in place to deal with trade issues	BSTR
Technological/Technology	Enable utilization of recycled paper of newsprint paper industry	BTTE
Technological/Technology	Improve access to latest information and modern technology	BTTI
Main criteria of costs		
Economic/Executive	Limiting rules and heavy taxes	CEEL
Social/Working	Operative decreased employment with operational efficiency and resulting	CSWO
Social/Working	Reduction in occupational security	CSWR
Main criteria of opportunities		
Economic/Financial	Encourage the possibility and acquisition of foreign and internal investment	OEFE
Economic/Executive	Improve Competitiveness of Iranian industry relative to foreign newsprint paper products	OEEI
Economic/Executive	Raise production level of newsprint paper units	OEER
Social/Executive	Probability of societal evolution in legal relations of the society and structures	OSEP
Social/Employment	Occupation generation in long term	OSEO
Social/Marketing	Acquisition and maintenance of customers from other countries	OSMA
Social/Marketing	Timely response to customer's requirements	OSMT
Technological/Technology	Advances in technology realized through private capital deployment and market competition	OTTA
Main criteria of risks		
Economic/Financial	Limiting regulatory costs	REFL
Economic/Security	Inconsistency and uncertainty of national economy	RESI
Economic/Marketing	Limiting demand and poor financial markets	REML
Social/Working	Generation of social disturbance due to unemployment in short term	RSWG
Social/Working	Negative effect on employee's spirit and working morale	RSWN
Social/Executive	Interested groups opposition	RSEI
Social/Executive	Opposition of managers and employees	RSEO
Social/Executive	Underdeveloped skill set of managers in dealing with competitive market environment	RSEU
Cultural/Security	Public jealousy of private entrepreneurship	RCSP

2.4. Survey and data collection

The research team studied published experiences in developed countries on privatization of different industries, and trends of organizations and factories privatization in developing countries. Following background research and specific investigation of papermaking factories specializing in newsprint

production, questionnaires were sent to 10 experts with experience in management and engineering of papermaking processes, all of whom were familiar with the concepts and activities of privatization. Distribution of the questionnaires was as follows: six experts specializing in newsprint papermaking, two members of academic institutions, and two managers and experienced experts in privatization. The surveys were conducted and collected over a three-month period through a systematic series of pairwised comparisons among the specific criteria and subcriteria.

3. Results

3.1. Prioritizing overall factors or strategic criteria

Ratings of general factors are done by pairwise comparison of the lower level factors and summing up for the main factors at the top level. Results of weighting values of overall factors obtained from the Expert Choice software are shown in Figures 1 and 2.

Based on the results in Figure 1, Economic criterion (0.626) is the most important overall factor on BOCR. Political (0.173); Trade (0.146); and Cultural & Social (0.055) respectively, are other leading factors. Economic factor weighting was split evenly between tax rules and GDP trend.

3.2. Prioritizing BOCR

Since BOCR are not equally important, it is necessary to prioritize them. Five possible ratings ranging from “very high” to “very low” are used. The results of the influence of the overall factors on the merits of benefits, costs, opportunities, risks, and the priority of the above mentioned merits are reported in Table 3.

Figure 1. Resulting weight assignments of overall factors.

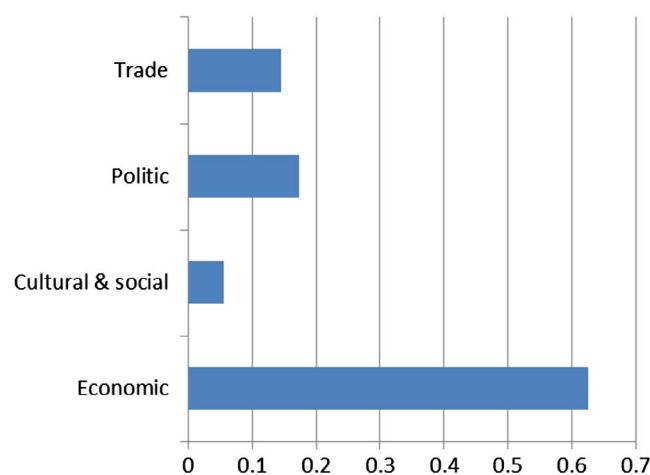


Figure 2. Resulting weight assignments of economic subsection.

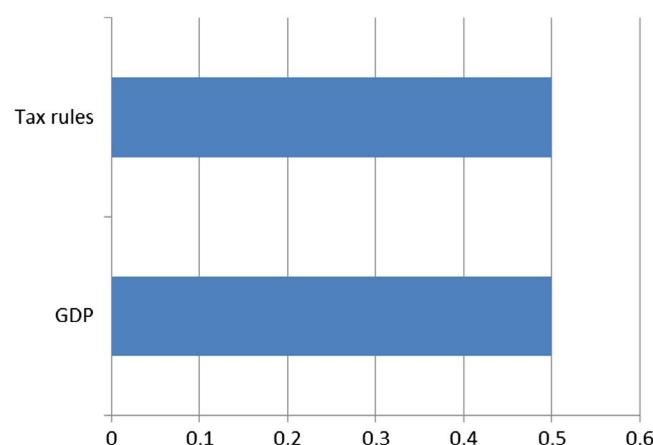


Table 3. Rating of the model to obtain BOCR weighing values very high (1), high (0.51), medium (0.252), low (0.124), very low (0.065)

		Benefits	Costs	Opportunities	Risks
Economic (0.626)	GDP (0.5)	Very high	very high	very high	Medium
	Tax regulations (0.5)	Very high	Medium	High	High
Politic (0.173)		Low	Low	Medium	Medium
Trade (0.146)		Very low	High	Medium	Medium
Cultural & social (0.055)		Medium	Medium	Low	High
Overall priorities		0.25	0.153	0.219	0.112

3.3. Prioritizing criteria and alternatives

Results of pairwise comparisons between subcriteria for benefits, costs, opportunities, and risks by ANP, as well as pairwise comparisons of the criteria and choices against each other and by the above-mentioned merits, are reported in Table 4. As Table 4 shows, decrease in BEFD (0.189), encouragement possibility and acquisition of foreign and internal investment (0.375), limiting rules and heavy taxes (0.614), and limiting regulative costs have the highest priority in terms of BOCR criteria, respectively. Regarding alternatives, encouragement to investment has the highest priority with respect to benefits (0.375), opportunities (0.385), costs (0.472), and risks (0.285).

To apply the ANP, the Super Decisions software was used. In BOCR structure, the following formula is used in calculations (Saaty, 2001a):

$$(\text{Benefits}) * (\text{Opportunities}) / (\text{Costs}) * (\text{Risks}) \quad (1)$$

Table 4. Synthesized priorities of the 35 criteria, subcriteria, and alternatives (Parenthesis results for weighing values of the criteria are global priorities)

Merits	Criteria	Subcriteria (abbreviation)		Encouragement for investment	Liberalization of prices	Reformation of rules and regulation	Reformation of structure of firms
Benefits (0.25)	Economic (0.672)	Financial (0.427)	BEFD (0.189)	0.435	0.288	0.188	0.089
			BEFI (0.184)	0.439	0.228	0.181	0.152
		Executive (0.257)	BEEA (0.113)	0.42	0.256	0.194	0.13
			BEEG (0.073)	0.383	0.276	0.219	0.122
			BEEI (0.07)	0.361	0.315	0.242	0.080
		Trading (0.195)	BETE (0.086)	0.544	0.208	0.178	0.070
			BETI (0.044)	0.068	0.279	0.537	0.117
			BETM (0.044)	0.334	0.342	0.236	0.088
		Technology (0.122)	BETF (0.054)	0.4	0.212	0.173	0.215
	Technological (0.182)	Technology	BTI (0.051)	0.365	0.276	0.177	0.182
			BTTE (0.014)	0.396	0.114	0.122	0.367
	Social (0.147)	Executive (0.257)	BSEP (0.041)	0.329	0.285	0.22	0.166
			BSED (0.09)	0.444	0.203	0.239	0.114
		Operation(0.223)	BSOI (0.015)	0.284	0.226	0.289	0.202
		Trading (0.166)	BSTR (0.011)	0.350	0.073	0.292	0.286
	Benefits synthesized			0.375	0.278	0.193	0.153
	Benefits normalized			0.375	0.278	0.193	0.153
Opportunities (0.219)	Economic (0.661)	Financial (0.769)	OEFE (0.375)	0.536	0.243	0.159	0.062

(Continued)

Table 4. (Continued)

Merits	Criteria	Subcriteria (abbreviation)		Encouragement for investment	Liberalization of prices	Reformation of rules and regulation	Reformation of structure of firms
	Social (0.217)	Executive (0.231)	OEEI (0.113)	0.324	0.292	0.201	0.183
			OEER (0.055)	0.557	0.162	0.162	0.119
		Executive (0.403)	OSEP (0.123)	0.323	0.159	0.431	0.086
		Marketing (0.386)	OSMA (0.118)	0.427	0.202	0.281	0.089
			OSMT (0.083)	0.348	0.170	0.232	0.250
		Employment (0.211)	OSEO (0.065)	0.103	0.051	0.258	0.588
	Technological (0.123)	Technology	OTTA (0.070)	0.161	0.062	0.323	0.455
Opportunities synthesized				0.385	0.235	0.203	0.177
Opportunities normalized				0.385	0.235	0.203	0.177
Costs (0.153)	Economic (0.769)	Executive	CEEL (0.614)	0.354	0.234	0.305	0.108
	Social (0.231)	Working	CSWO (0.201)	0.431	0.154	0.182	0.233
			CSWR (0.186)	0.452	0.163	0.170	0.215
Costs synthesized				0.472	0.175	0.168	0.184
Costs normalized				0.472	0.175	0.168	0.184
Costs reciprocal				0.109	0.297	0.309	0.283
Risks (0.112)	Economic (0.663)	Financial (0.436)	REFL (0.289)	0.124	0.241	0.411	0.224
		Security (0.361)	RESI (0.239)	0.265	0.241	0.377	0.118
		Marketing (0.202)	REML (0.134)	0.286	0.399	0.228	0.087
	Social (0.233)	Working(0.792)	RSWG (0.148)	0.36	0.346	0.137	0.157
			RSWN (0.037)	0.351	0.126	0.256	0.267
		Executive (0.208)	RSEI (0.019)	0.451	0.257	0.198	0.094
			RSEO (0.018)	0.226	0.128	0.082	0.564
			RSEU (0.012)	0.195	0.297	0.23	0.278
	Cultural (0.104)	Security	RCSP (0.104)	0.514	0.192	0.225	0.069
	Risks synthesized				0.285	0.214	0.265
Risks normalized				0.285	0.214	0.265	0.236
Risk reciprocal				0.216	0.288	0.233	0.261

3.4. Final outcome

By integration of the weights of the merits of benefits, costs, opportunities, and risks and the weights of choices against the above-mentioned merits, the final scores are reported in Table 5.

Table 5. Final outcome for priorities of the alternatives

Alter	Mer.					
	Benefits (0.25)	Opportunities (0.219)	Costs (0.153)	Risks (0.112)	Final outcome additive	Ranking
Encouragement for investment	0.375	0.385	0.109	0.216	0.218	1
Liberalization of prices	0.278	0.235	0.297	0.288	0.198	2
Reformation of rules and regulation	0.193	0.203	0.309	0.233	0.165	3
Reformation of structure of firms	0.153	0.177	0.283	0.261	0.149	4

As Table 5 shows, encouragement for investment has the highest priority, and is the most suitable choice for privatization of newsprint paper industry in Iran. Considering the merits in decision-making, Encouragement for investment has the highest priority and the second, third and fourth are Liberalization of prices, Reformation of rules and regulation and Reformation of structure of firms, respectively.

4. Analysis of the results

This part divided in two subsections which are as follows:

4.1. Analysis of overall factors and BOCR

The economic parameters (with a weight of 0.626) exert the most significant impact on structure of Benefits Opportunities Cost Risks (BOCR) in case of newsprint paper industry privatization. Of economic parameters, both tax law and GDP trend have a weight of 0.50. High taxes on wood and paper industry weaken financial supports for its privatization because high taxes create barriers against investment. GDP has influence in private sectors. The performance of privatized paper industry depends on the volume of paper production and competition in the target market.

Results with regard to benefits (see Table 4) show that an economic criterion is the most important factor which influences privatization of newsprint paper in the country. Regarding economic criteria, to improve links with the global community through the WTO (BETI) (0.582) (subsection Trading), adjustment of subsidies and decrease in price changing (BEEA) (0.442) (subsection Executive) and to decrease BEFD (0.506) (subsection Financial) have the highest priority (Figures 3–5).

Figure 3. Prioritizing subcriteria with respect to economic criteria (subsection trading).

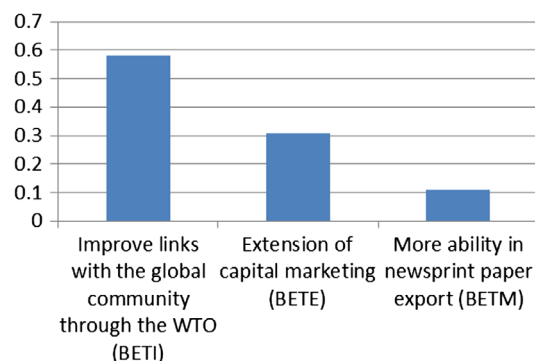


Figure 4. Prioritizing subcriteria with respect to economic criteria (subsection executive).

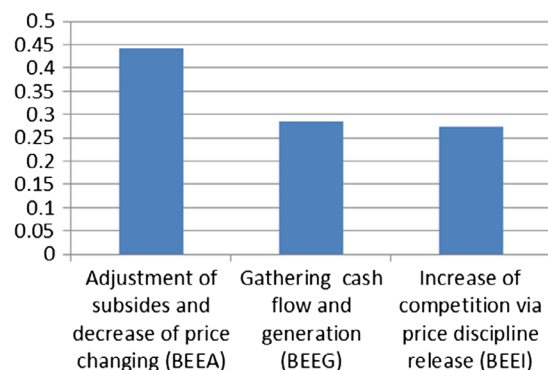
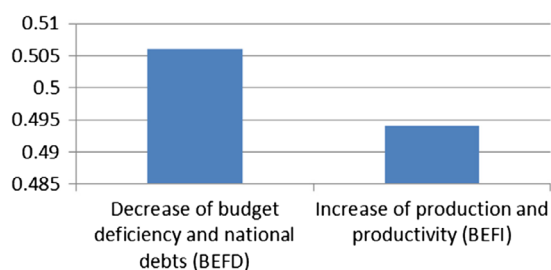


Figure 5. Prioritizing subcriteria with respect to economic criteria (subsection financial).



One of the reasons to accelerate privatization in Iran is membership of the WTO. After joining WTO, competition with other firms which produce the same product will occur, so increase in production, quality, and profitability becomes an immediate objective of industry management. By applying privatization rules, the amount of incoming and outgoing of foreign exchange from the country decreases; also, by privatizing low-income and low-productivity firms, economic productivity will improve and the national debt should be reduced through the resulting transfer of capital and tax burden to the private sector. Of course, the result of final processing (inconsistency ratio 0.06) indicates to decrease BEFD (weighing value 0.189) has the highest priority among 15 subcriteria of benefits (see Table 4).

Economic criteria have the highest priority (0.661) with regard to Opportunities (see Table 4). Final processing (inconsistency ratio: 0.08) shows encouragement of the possibility and acquisition of foreign and internal investment (OEFE) (subsection of Financial) weighting value of 0.375 to have the highest priority. Privatization of the newsprint paper industry needs high investment due to the high costs of machines and modern technology. Privatization generates proper opportunity for the investors so that they can solve their problems via acquisition of foreign and internal investment which will lead to technology transfer of building, planning, research, and development.

Probability of societal evolution in legal relations of the society and structures (OSEP) (0.123) has obtained second priority. The type of management has a high effect on the behavior of the employers. Privatization with changing ownership and management will improve customary structure in the industry. With regards to social criteria (subsection of marketing), acquisition and maintenance of customers from other countries (OSMA) (0.118) have the third priority. Privatization is carried out successfully in product marketing via acquisition of customers, new investors, and keeping present customers. Using capital acquisition, achieving the goal of improving and accelerating privatization of newsprint paper industry will take place much quicker.

With respect to costs, economic criteria (0.769) have the highest priority (see Table 4) in comparison with social criteria (0.231). Final result (inconsistency ratio: 0.00) shows regard to economic criteria limiting rules and heavy taxes (CEEL) (subsection of *Executive*) have the highest priority (0.614) which indicate legislation has an important function in newsprint paper industry. Limiting rules and heavy taxes have a preventive role in executing the privatization process in Iran newsprint paper industry and heavy customs tariffs is one of these rules. Operative decreased employment with operational efficiency and resulting (CSWO) (subsection of Social) has second priority (0.201) with respect to costs criteria. Psychological and economic significance of a decrease in employment is very important due to mental and financial influences on the work force. Given an initial condition of over-employment, one can thus assume that upon privatizing a state-run industry, the workforce will experience a reduction in numbers, as the new owner improves the efficiency of the production process (Bhaskar & Khan, 1995). According to Davis, Richardson, Ossowski, and Barnett (2000), privatization tends to be associated with a reduction in both contemporaneous and lagged unemployment rates. It should be mentioned that these results might stem from combined effects of many policies encouraging growth and reducing unemployment. They believe privatization typically leads

to unemployment in some sectors and has an adverse impact on some groups of workers but aggregate unemployment actually decreases in the long term following privatization.

With respect to risks (see Table 4), economic criteria (0.663) have more priority in comparison with social and cultural criteria. After final synthesizing (inconsistency ratio: 0.05), regard to economic criteria limiting regulatory costs (REFL) (subsection of Financial) (0.289) have the highest priority. Once more in part of economic criteria, inconsistency and uncertainty of national economy (RESI) (subsection of security) have the second priority (0.239). Change of foreign currency in internal marketing is one of the most important economic risks for foreign investment in the country. Intense change of foreign currency causes capital loss of foreign investors who had the opportunity to invest in the country. In part of social criteria generation of social disturbance due to unemployment in the short term (RSWG) (subsection of working) has the third priority (0.148). Privatization leads to disposal of the work force and decrease in employment in the short term and, at the same time, social welfare will reduce and generate a negative effect on work force morale. Ultimately, without proper compensatory or replacement pressure in the labor market, the situation may lead to social disturbance.

4.2. Analysis of highest priority

4.2.1. Option of encouragement for investment

As Table 5 shows, encouragement for investment has the highest priority (0.218) and is the most useful alternative for privatizing the Iranian newsprint paper industry. Encouragement for investment has the highest priority in terms of benefits, opportunities, costs, and risks (respectively, with values of 0.375, 0.385, 0.472, and 0.285). Encouragement for participating in privatization and developing the related public culture realizes the biggest benefits. It makes the most considerable impact on decrease of BEFD (0.189) as well. In other words, attraction of domestic and foreign investment, and growth of privatized companies lead to increase in their profitability and reduction in budget deficit and capital loss.

Encouragement for investment promises the highest opportunities. Indeed, this alternative provides plenty of opportunities for privatization and economic activities (0.661). Inversely, as privatization occurs, encouragement for investment provides considerable opportunities. The most significant parameters of opportunity subsets are: to encourage the possibility and acquisition of foreign and internal investment (OEFE), to improve competitiveness of Iranian industry relative to foreign newsprint paper products (OEI), probability of societal evolution in legal relations of the society and structures (OSEP), and acquisition and maintenance of customers from other countries (OSMA).

Similarly, as far as costs are concerned, encouragement for investment has the highest priority. The greatest costs are associated with limiting rules and heavy taxes (CEEL) which are subsets of executive criteria. In other words, after taking place as the result of encouragement for investment, privatization process deals with administrative costs such as limiting rules and heavy taxes.

The alternative of encouragement for investment involves the highest risks in case of privatization. As the greatest weight among risk parameters relates to economic criterion, it involves the highest risk with respect to privatization process in newsprint paper industry. Perhaps, this condition results from capital-based capacity of this industry, expensive prices of related machinery, and great sensitivity to privatization.

In risk subsets, limiting regulatory costs (REFL), inconsistency, and uncertainty of national economy (RESI), generation of social disturbance due to unemployment in short term (RSWG), limiting demand and poor financial markets (REML), and public jealousy of private entrepreneurs (RCSP) will have the highest effect on encouragement for investment.

For implementation of economic structure improvement program and enhancement of economic development, access to foreign financial resources is as significant as access to domestic capital. In order to attract this requisite foreign investment, policy aimed at reducing investment risk should be implemented. Privatization is the most effective policy that the governments implement in order to attract foreign investment. Stability of rules, tariff system, insurance, employer–employee relations, investment security, special supports of banking system, and social security laws are the most important principles in this regard.

Jafari (2009) explained that the main problem in paper industry is the private section. According to FAO reports, the amount of paper consumption is more than one million tons, but since investing on this section is often heavy, private section is not able to found large unit of paper making like Chuka and Mazandaran Wood and Paper. Therefore, investing is the main challenge in paper industry and it is needed to help this section to be more active for removing infections and increasing production.

4.2.2. Option of releasing prices system: Obligation to compete in international level (liberalization of prices)

Privatization provides foreign investors not only the possibility to purchase privatized companies shares, but also opportunities to invest and participate in infrastructure projects such as building roads and powerhouses, or providing infrastructural services like contacts, water, and electricity, to enter new invests and to increase direct foreign investing in the country. Here, we address the narrow relations between these two types of opportunities.

Releasing prices system, after the option of encouragement to investing, is the second priority. Releasing prices system, among profits indexes, has the largest impact of alternatives on decreasing budget fraction, national debts and increasing production, decreasing BEFD, and increasing production and productivity (BEFI). By releasing prices system, Iran will be better positioned to compete at an international level via membership in WTO; in this way, the country's paper industry can compete with foreign competition and result in a positive change in the paper industry of Iran.

In costs, the first priority is limiting rules and heavy taxes (CEEL). Certainly, the option of releasing prices system is affected mainly by this index, because these laws prevent executing privatization and having competition with other countries.

In opportunities, the index to encourage the possibility and acquisition of foreign and internal investment (OEFE) has the highest priority. Certainly, with economical releasing of the market, the possibility of entering foreign investors into the paper industries will increase.

This option effects on the risks index (limiting regulatory costs) (REFL)) helps to reduce current government-induced production constraints, thus playing an important role in privatization success.

Davis et al. (2000) worked on the factor of competition in privatization and stated that in countries which have privatized an industry and have a constant economical asset, the private section is more efficient, especially when they work in competitive sections. Our analysis confirms that having competition (subindex of profits index) is a positive effect of the privatization process. Davis et al. (2000) also confirmed that privatization can often result in a decrease in employment in some sections, but in general it decreases unemployment in the long term through the strengthening of the economy.

4.2.3. Option of rules and laws reformation (reformation of rules and regulation)

Reforming tax system, creating reserve currency account and reforming foreign investing, are some of the fundamental reformations in accelerating the privatization process. The main problems which discourage foreign investment are inconsistent state policies in different economical sections and sudden major change in the country's macro-economic program, because economic instability may

destroy investor value by changing the assumptions under which the investments were made. Methods inconsistency, incompatibility, and instability in providing and editing laws, regulations and principles related to the privatization process were considered as a constraining factor, and instead of simplifying the process causes the process to be more complicated to complete.

Inefficiency of state companies is not just the result of state property. Limiting laws are the main preventions of dynamics and flexibility of economic activities. Deregulation and law reformation are the first steps in providing competitive conditions.

4.2.4. *Option of reforming company's structure respecting labors, machines, and assets (reformation of structure of firms)*

The structure of private industry is such that all actors and resources should contribute to profit and all work should be done as a function of the profit potential. However, governmental structure of the firms, confronting (face) to the difficulty, receive some financial and credit help from the government. As it is noted before, considering the structure of governmental firms like large number of stuffs, the price of materials, products market, etc., these firms need reformations before linking to private section, because without any reformations, these firms make some problems in private section.

With reformation, profit will be increased and decreasing BEFD, which are the main benefits indices, will be improved. In addition, attracting domestic and foreign investment, reforming technology, and organizing the company are simpler.

Most experts and authorities agree that in most countries, privatization increases foreign investing. The country of Iran would be well served to follow the experiments of successful countries to successful application of privatization.

4.3. **Validation**

Validation of the model results was performed by presenting the results of the research to an additional set of 10 industry and academic experts. Among this group, eight persons accepted the results entirely; two agreed with the change of encouragement for investment alternative (first alternative) and liberalization of prices Alternative (second alternative) priority because encouragement for investment needs a competitive environment and liberalization of prices, then the investors can invest for the firms.

5. **Sensitivity analysis**

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

It can be shown that by increasing or decreasing the weight of one criterion, the ratios of the weights of other three criteria (with respect to each other) remain unchanged, although the sum of their weights changes accordingly (Equation (2)). For example, if the weight of benefit increases from 0.34 to 0.5, then the new weights of costs, opportunities, and risks will be 0.158, 0.226, and 0.117, respectively. Although the sum of these weights is decreased to 0.5, they are proportional to the previous ones, that is, 0.153, 0.219, and 0.112 (see Table 3).

$$C + O + R = 0.484 \text{ Total weight of criteria} \quad (2)$$

C: Costs, O: Opportunities, R: Risks

$$\frac{C}{0.484} = 0.316$$

Table 6. The results of sensitivity analysis

Merits	Basic Weight	Number of changes	New weight	New priorities
Benefits	0.25	–	–	–
Costs	0.153	2	0.736	E-L-RS-RR
			0.899	E-RR-RS-L
Opportunities	0.219	–	–	–
Risks	0.112	2	0.405	E-RR-L-RS
			0.702	E-RS-L-RR

$$0.316 = \frac{C'}{(1 - 0.5)}$$

$$C' = 0.158$$

C': New weight of costs

To perform sensitivity analysis, we apply the software developed by Saaty and Cho (2001). The results are illustrated in Table 6. From Table 5, the priorities are encouragement for investment (E), liberalization of prices (L), reformation of rules and regulation (RR), and reformation of structure of firms (RS).

After changing the weights of one criterion, the priorities also change, as shown in Table 6.

Main priority is as follows:

Encouragement for investment (E), Liberalization of prices (L), Reformation of rules and regulation (RR), Reformation of structure of firms (RS)

With respect to this table, costs and risks are more sensitive than benefits and opportunities.

6. Conclusion

To present the best solution for privatization in the Iranian newsprint paper industry, the four following options were analyzed through a combination of multi-criteria decision techniques.

- Encouragement for investment.
- Reformation of rules and regulation.
- Reformation of structure of firms.
- Liberalization of prices.

In the first stage, the overall strategic factors were identified, and based on those factors, the weighing values of BOCR (benefits, opportunities, costs, and risks) were determined. Weighting values of the criteria of BOCR were derived by applying the AHP in the second stage. In the third stage, the weighted values of the alternatives derived in the prior stages were synthesized using the ANP and Super Decision software.

Our conclusion of this research is that the APN shows option 1, encouragement for investment, is an appropriate solution to privatize the Iranian newsprint paper industry. Encouragement for investment returns the highest determined priority in parts of each of benefits, opportunities, costs, and risks criteria. Encouragement for investment would create a situation leading to the increased attraction of domestic and foreign investment in the Iranian newsprint paper industry. Encouragement for investment provides plenty of opportunities for privatization and economic activities. After implementation, resulting investment in private venture opens doors to the opportunities of reducing

administrative costs such as limiting rules and heavy taxes, as government regulators are presented with tangible proof of increased profits and state revenues, made possible by the increased efficiencies of private sector management.

However, encouragement for investment involves the highest risk with respect to privatization process in newsprint paper industry. This condition results from capital-based capacity of this industry, expensive prices of related machinery and great sensitivity to privatization. Results of sensitivity analysis revealed that costs and risks are more sensitive than benefits and opportunities, but the resulting two changes in priorities do not change the conclusion of encouragement for investment as the best solution. In other words, even though the strategy of actions taken to increase private sector investment contain significant risk both to the investor and the state, the expected value of taking this strategic action with the higher risks incurred is greater than the other options with lower risk.

- (1) However, there are several current limitations of the newsprint paper industry in Iran that must be dealt with prior to, and concurrently with, encouraging private investment. The size of the domestic market for newsprint is small and shrinking as electronic technologies replace printed news distribution. Domestic markets must be analyzed and market research conducted to determine whether future news consumer trends will support some baseline level of newsprint consumption, and if alternative new products could be produced from the facilities that are more in line with changing consumer demand.
- (2) A low per capita income and fast decrease in purchasing power is also depressing consumer demand for information products of all types. Recent changes in trade and currency restrictions may help improve this situation, as will the positive contribution made by a healthier pulp and paper industry revitalized by an influx of private investment.
- (3) The existence of economic privileges and special credits to existing managing entities works against international investment confidence. As much as possible, the industry must be allowed to operate on an open and transparent basis according to international accounting and reward standards.
- (4) As currently and traditionally operated, the poor performance of governmental firms, especially in newsprint paper industry, constrains the performance of existing facilities and works against management and operator morale.
- (5) The high costs of implementation of privatization in the industry due to capital intensive technology in newsprint paper industry limits the ability of all but the most well-capitalized to undertake such a major project. Therefore, the planning, formulation, and execution of partner strategies will be time-consuming and technically difficult, and experts with international finance experience will be necessary to successful implementation of the strategy.

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