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Evaluation of Iranian Textile and Leather Industries

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A B S T R A C T

In 1932, the first leather manufacturing industry was established in Hamedan, Iran. The textile industry sets up in Iran about 3000 BC. Nowadays, both of aforementioned industries have appeared with a variety of technologies and facilities over the world. By current cluster study of Iranian Textile and Leather Industries (ITLI) the raw data have empirically come through of the decision-making techniques pertaining to main criteria and number of industries; rely on their nominal capacity. The initial resource of data used in present research gets back to the preliminary assessment of ITLI by both of Iranian industries organization and Iranian environment protection agency once before giving license to implement industries individually. SPSS and EXCEL 2013 software have used to process raw data. Using Vlse Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR) and Simple Additive Weighting (SAW) resulted in two different kinds of classification for ITLI. The findings of input materials stream exploited energy and existing facilities in ITLI are introduced to identify the materials cycles, energy demand and machines, and devices employed in the subject of industrial ecology and industry 4.0, respectively.

1. Introduction

In 1311, the first modern leather manufacturing industry was established in Hamedan. Since then, the industry has gradually developed and the number of leather factories increased from a factory in 1932 to 22 factories in 1943. But the history of the use of textiles gets back to about five thousand years BC. Globally, ITLI classified as (1) Apparel & textile products comprising, knit outerwear mills, knitting mills, men's, youths ' and boys' suits, coats and overcoats, shirts and nightwear, underwear, neckwear, separate trousers, work clothing, clothing, juniors' blouses, waists, shirts, juniors ' dresses, juniors ' suits, skirts, coats, juniors' outerwear, children's and infants' underwear and nightwear, brassieres, girdles and allied garments, girls', children's and infants' dresses, blouses, and shirts; girls', children's and infants' coats and suits; girls', children's and infants' outerwear; dress and work gloves, except knit and all-leather; robes and dressing gowns; raincoats and other waterproof outer garments; apparel and accessories, curtains and draperies; house furnishings, except curtains and draperies; textile bags; pleating, decorating and novelty stitching; automotive trimmings, apparel findings and related products; schiffli machine embroideries; fabricated textile products, not elsewhere classified; broad woven fabric mills, wool; hosiery, except women's full length and knee length hosiery; knit underwear mills; finishers

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of broad woven fabrics of man-made fiber and silk; finishers of textiles and not elsewhere classified; yarn mills, wool, including carpet, and rug yarn; canvas and related products. (2) Miscellaneous textile products such as circularly knit fabric mills; finishers of broad woven fabrics of cotton; thread mills; lace goods; coated fabrics and not rubberized; mattresses and bedsprings; luggage; wood household furniture and upholstered; house slippers; rubber and plastics footwear; orthopaedic, prosthetic, and surgical supplies; dolls. (3) Leather apparel encompassing apparel belts; leather gloves and mittens; women's handbags and purses; personal leather goods, except women's handbags and purses; leather and sheep-lined clothing; leather goods; boot and shoe cut stock and findings; men's footwear, except athletic; footwear, except rubber; women's footwear, except athletic. But ITLI included around 38 industries such as bag, carpet yarn, cotton spinning, jeans, leather artifacts, leather shoes, quilts, mattresses and pillows, raw leather, sewing and embroidery yarn, spinning, tannery, underwear (embroidered series), wicker oil burner, spinning the woolen yarn, knitting cotton, synthetic fibers, band and medical wound texture gas, rachel curtain fabrics, mink blankets, woolen blanket, spinning wool, palash and blanket, winter clothing, clothing (shirt), knitted tricot, fishing net, stringed mosquito net, socks, crust leather, cotton gloves, leather gloves, wipes (cleansing), weaving ribbon, carpet coverage, spinning silk, zipper, animal skin pickle, raw silk fabrics, layer on diapers, and sanitary pads [1].

The present study comprised enough information about ITLI in order to evaluate industries as the objective of this research. In the present study, ITLI are studied as a cluster study in Iran. As we know, the initial assessments about the construction of the industry are made as a comprehensive plan before the establishment and installation of facilities and obtaining production permits. This assessment includes the preliminary flow of input and output materials in industries, the quantity of energy needed, the number of employees and the area of required land to build the industry. The results of this assessment are unprocessed data and provide relevant media for the economic and financial assessments as well as a determination of the acceptability of the project and move towards the project's sustainability stages. The sustainability of any industrial project is a promising process for future plans and developments. The sustainable development of industries demands sufficient knowledge about type and quantity of output and input streams and circumstances of handling and managing them in the best way, etc. The knowledge of energy flow in industries sought the energy supply networks to thrift the outlays. However, there is no valid and valuable reference for the input and output, energy, materials, facilities connections, and networks.

A collection of various factors and criteria obtained from preliminary assessments need to come through the decision making systems to classify the availability. Lots of decision-making systems developed to sort out the multi-criteria alternatives. By the way, the current study assigned the VIKOR and SAW methods to develop a valuable reference about initial screening data of ITLI. VIKOR is a multi-criteria decision-making method. This method is used to sort various options and more for solving the discrete decision difficulties based on conflicting criteria. In this model, there are always several alternatives along with some criteria, independently. They are evaluated and finally ranked according to their values. According to a review article published by Mardani et al. [2], the VIKOR method has got more publicity in Taiwan among 22 countries which utilized this technique to prioritize alternatives in various studies. SAW method is one of the easiest multi-attribute decision-making methods, which can easily be used to calculate the weights of the indexes. It needs similar scales found with unbalanced measurements that can be compared with each other. In this way, the options are ranked according to the magnitude of the weights between 0 to 1 [3].

2. Literature Review

Mirahmadi and Teimoury [4], Memariani et al. [5], Jayalath et al. [6], and Roostaee et al. [7] utilized VIKOR, SAW, VIKOR, and VIKOR techniques to weight and rank suppliers selection difficulties, sensitivity analysis, supply chain management, and development trend of Ardabil province in terms of health situation, respectively.

Yadani et al. [8] studied the VIKOR technique using entropy method supported by Excel and SPSS software to evaluate the development trend of Ardabil province in terms of the health situation. Based on weighting and ranking systems Ardabil County placed the first rank and Sarein County the last rank. Thipparat and Thaseepetch [9] investigated to offer a strategy in order to avoid expanding pollution and hazards raised from research projects in Thailand via the VIKOR method. By the way, the sustainability index had calculated using VIKOR technique as well as ranking and weighting values. Yalcin et al. [10] used a performance analysis from Turkish manufacturing industry via fuzzy (unearth the weights), Technique for the Order of Preference by Similarity to the Ideal Solution (TOPSIS) and VIKOR, techniques to rank industries, respectively. The obtained results revealed the same classification style for both methods. Mazdeh et al. [11] utilized the VIKOR method to rank around 22 Iranian state universities along with analytic network process. Farrokh et al. [12] exploited VIKOR technique for assessing the basic metals producing industries. Weighting system developed by fuzzy analytical hierarchy and processed via the VIKOR method represented the same results with the TOPSIS in terms of ranking options.

Fallahpour and Moghassem [13] employed the VIKOR method to solve parameters selection difficulties based on some factors such as yarn hairiness followed by unevenness, thick places, nep, thin places, tenacity, and elongation. So, weighting and ranking system resulted in values ranged between 0-0.4 and 0-1, respectively. Alimardania et al. [14] exploited a novel method based on VIKOR technique to select supplier pertaining to 4 factors such as performance, outlays, flexibility, and technology. Step-wise weight assessment ratio analysis and VIKOR technique have assigned to estimate the criteria weights and ranks from the best to the worst, respectively. Obtained results had shown weights values around 0.713, 0.472, 0 and 1 for 4 suppliers. Liu et al. [15] used a new fuzzy VIKOR technique to sort out difficulties of risk assessment processes via uniting Analytical Hierarchy Process (AHP), entropy and VIKOR procedures to weight, rank, and prioritize items. So, findings classified criteria base on weights in the AHP and entropy and then VIKOR technique collected alternatives in a ranking system valued from 0-1. Ebrahimnej et al. [16] employed VIKOR technique to make a decision with 5 criteria and 10 factors to prioritize in an Iranian power plant. The findings ranged between 0-1 in VIKOR system. Amiri et al. [17] applied VIKOR technique to make the decision about some difficulties raised from supplier priority in materials chain supply networks supported with fuzzy sets theory. The weights for criteria (15 types) are estimated by fuzzy sets and ranking system (for 5 suppliers of the same company) developed by VIKOR method in Mehrcam Pars company supplier of internal parts of the automobile, Iran. Pourebrahim et al. [18] employed both techniques of AHP and VIKOR to assess conservation priority in coastal zones based on 17 factors and 6 alternatives in Khuzestan, Iran. AHP method was used to figure out the weights of factors and VIKOR method for ranking process. The results were found in the range of 0-1 when the VIKOR method assigned to rank alternatives. Mohsen and Fereshteh [19] achieved to classify around 25 various types of equipment failures by weighting system of Shannon entropy and VIKOR technique to rank with four existing alternatives. Azar et al. [20] assigned entropy approach to determine the weights for the criterion (6 criteria), VIKOR, and TOPSIS techniques to rank them in supplier selection (24 suppliers) program. Findings revealed that Saze Pouyesh Company got the highest rank in the TOPSIS method while Kosar Sanat Abzar Company reached the highest rank in VIKOR technique.

Rezaei et al. [21] used SAW method to prioritize some trace elements in the soil of around Sarcheshmeh Copper Mine in Kerman province, Iran. By the way, 5 elements of Pb, Ni, Se, Mo, and Zn have been prioritized based on risk factor as Ni> Pb > Mo > Zn > Se. Jaberidoost et al. [22] found around 86 major risk factors in the pharmaceutical supply chain classified in 11 sections via the analytic hierarchy process and SAW method. Zolfani et al. [23] determined the weights and ranks values for 3 rural ICT institutes via AHP and SAW methods in Golestan, Iran, respectively.

3. Methodology

3.1 Friedman Test and VIKOR Method

Friedman test was used to estimate the weights in the matrix ([Xij] n×k with n rows, k columns; rij is the rank of Xij within block i) supported by SPSS software according to equation 1 to 5. Matrix was composed of data of initial assessment done by both of Iranian industries organization and Iranian environment protection agency once before implementing industries individually. Existing data was normalized through the following formula (6 and 7), in which Xij is the values of each criterion for each option. Then, the special vector obtained by Freidman test was used to calculate the weights [24].

$$\hat{r}.j = \frac{1}{n}\sum_{i=1}^{n} rij \ , \tag{1}$$

$$\hat{r} = \frac{1}{nk}\sum_{i=1}^{n}\sum_{j=1}^{k} rij \ , \tag{2}$$

$$SSt = n\sum_{j=1}^{.}(\hat{r}.j - \hat{r})^2 \ , \tag{3}$$

$$SSe = \frac{1}{n(k-1)}\sum_{i=1}^{n}\sum_{j=1}^{k}(rij - \hat{r})^2 \ , \tag{4}$$

$$Q = \frac{SSt}{SSe}, \tag{5}$$

$$Pij = \frac{Xij}{\sum_{i=1}^{n} Xij} \ , \qquad i = \Gamma, m; \ \ j = \Gamma, n \tag{6}$$

$$rij = \frac{Xij}{\sqrt{\sum_{i=1}^{m} Xij^2}} \ . \tag{7}$$

To determine the highest and lowest values of the normal weight matrix, the largest and smallest number of each column was distinguished. Here the meaning of the largest number, that is, the number has the highest positive value, and the smallest is the highest negative value. So if our benchmark is negative, the largest number is reversed, that is, the lowest value and the smallest becomes the highest value and vice versa according to Eq. (8). In the next step, the determination of both indices of (S) and (R) was done according to Eqs. (9) and (10).

$$fi *= \max j\ f\,ij\ ;\ f\,i-=\ \min j\ f\,ij\ , \tag{8}$$

$$Sj = \sum_{i=1}^{n} wi \frac{fi * - f\,ij}{fi * - (fi-)}, \tag{9}$$

$$Rj = \max i\ [wi.\frac{fi * - f\,ij}{fi * - (fi-)}]\ . \tag{10}$$

fi * = The largest number of normal weight matrices for each column.

fij = The number of options for each criterion in the normally weighted matrix.

fi- = The smallest normal Zn matrix for each column.

Naturally, for an option per criterion, an index was obtained that its sum was the final Sj parameter of the option. The largest Sj of each option for each criterion, the dissatisfaction index (R) of that option. To calculate the Qi and the final ranking of the options were employed Eq. (11).

$$Qi = V.\frac{Sj - (S-)}{S * - (S-)} + (1 - V).\ \frac{Rj - (R-)}{R * - (R-)}. \tag{11}$$

V = constant number of 0.5.
Sj = Total sum of S for each option.
S- = the largest index number S for each option.
S * = the smallest index number S for each option.
Rj = Total amount of R for each option.
R- = The largest index of R for each option.
R * = The smallest index of R for each option.

3.2 SAW Technique

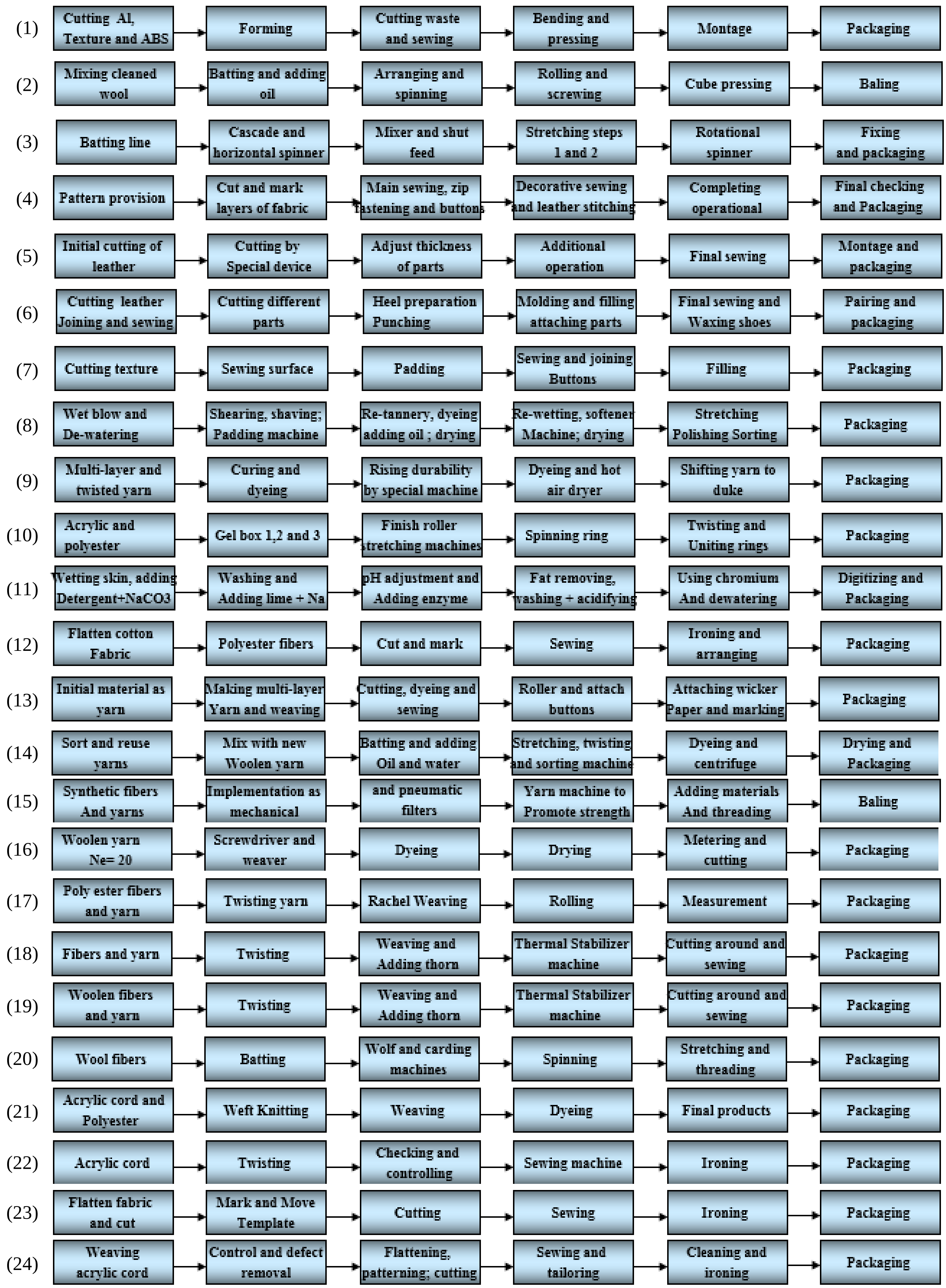
By the Eqs. (12) and (13), Xij and W are the values and weighted values, respectively. Normalization of the decision matrix was done based on Eq. (13). To calculate final weights the special vector obtained by Freidman test that was introduced to unit the weights [4-13].

$$Pij = \frac{Xij}{\sum_{i=1}^{n} Xij}\ , \qquad i = \Gamma, m;\ \ j = \Gamma, n \tag{12}$$

$$Pij = \frac{Xij\ .\ W}{\sum_{i=1}^{n} Xij}\ , \qquad i = \Gamma, m;\ \ j = \Gamma, n \tag{13}$$

4. Results and Discussion

Today, the growth of technology has undeniably affected various industries. Considering the importance of technology in industry 4.0 and the increasing importance of industrial ecology, there are various views on the ways and circumstances to achieve escalated growth. Therefore, in this present research, the technologies employed have presented in Fig. 1.


(1)
Cutting Al, Texture and ABS
Forming
Cutting waste and sewing
Bending and pressing
Montage
Packaging
(2)
Mixing cleaned wool
Batting and adding oil
Arranging and spinning
Rolling and screwing
Cube pressing
Baling
(3)
Batting line
Cascade and horizontal spinner
Mixer and shut feed
Stretching steps 1 and 2
Rotational spinner
Fixing and packaging
(4)
Pattern provision
Cut and mark layers of fabric
Main sewing, zip fastening and buttons
Decorative sewing and leather stitching
Completing operational
Final checking and Packaging
(5)
Initial cutting of leather
Cutting by Special device
Adjust thickness of parts
Additional operation
Final sewing
Montage and packaging
(6)
Cutting leather Joining and sewing
Cutting different parts
Heel preparation Punching
Molding and filling attaching parts
Final sewing and Waxing shoes
Pairing and packaging
(7)
Cutting texture
Sewing surface
Padding
Sewing and joining Buttons
Filling
Packaging
(8)
Wet blow and De-watering
Shearing, shaving; Padding machine
Re-tannery, dyeing adding oil ; drying
Re-wetting, softener Machine; drying
Stretching Polishing Sorting
Packaging
(9)
Multi-layer and twisted yarn
Curing and dyeing
Rising durability by special machine
Dyeing and hot air dryer
Shifting yarn to duke
Packaging
(10)
Acrylic and polyester
Gel box 1,2 and 3
Finish roller stretching machines
Spinning ring
Twisting and Uniting rings
Packaging
(11)
Wetting skin, adding Detergent+NaCO3
Washing and Adding lime + Na
pH adjustment and Adding enzyme
Fat removing, washing + acidifying
Using chromium And dewatering
Digitizing and Packaging
(12)
Flatten cotton Fabric
Polyester fibers
Cut and mark
Sewing
Ironing and arranging
Packaging
(13)
Initial material as yarn
Making multi-layer Yarn and weaving
Cutting, dyeing and sewing
Roller and attach buttons
Attaching wicker Paper and marking
Packaging
(14)
Sort and reuse yarns
Mix with new Woolen yarn
Batting and adding Oil and water
Stretching, twisting and sorting machine
Dyeing and centrifuge
Drying and Packaging
(15)
Synthetic fibers And yarns
Implementation as mechanical
and pneumatic filters
Yarn machine to Promote strength
Adding materials And threading
Baling
(16)
Woolen yarn Ne= 20
Screwdriver and weaver
Dyeing
Drying
Metering and cutting
Packaging
(17)
Poly ester fibers and yarn
Twisting yarn
Rachel Weaving
Rolling
Measurement
Packaging
(18)
Fibers and yarn
Twisting
Weaving and Adding thorn
Thermal Stabilizer machine
Cutting around and sewing
Packaging
(19)
Woolen fibers and yarn
Twisting
Weaving and Adding thorn
Thermal Stabilizer machine
Cutting around and sewing
Packaging
(20)
Wool fibers
Batting
Wolf and carding machines
Spinning
Stretching and threading
Packaging
(21)
Acrylic cord and Polyester
Weft Knitting
Weaving
Dyeing
Final products
Packaging
(22)
Acrylic cord
Twisting
Checking and controlling
Sewing machine
Ironing
Packaging
(23)
Flatten fabric and cut
Mark and Move Template
Cutting
Sewing
Ironing
Packaging
(24)
Weaving acrylic cord
Control and defect removal
Flattening, patterning; cutting
Sewing and tailoring
Cleaning and ironing
Packaging

Bag (1), Carpet thread (2), Cotton spinning (3), Jeans (4), Leather artifacts (5), Leather shoes (6), Quilts, mattresses and pillows (7), Raw leather (8), Sewing and embroidery thread (9), Spinning (10), Tannery (11), Underwear (embroidered series) (12), Wicker oil burner (13), Spinning the woolen yarn (14), Knitting cotton, synthetic fibers (15), Band and medical wound texture gas (16), Rachel Curtain Fabrics (17), Mink blankets (18), Woolen blanket (19), Spinning wool (20), Palash and blanket (21), Winter clothing (22), Clothing (shirt) (23), Knitted Tricot (24), Fishing net (25), Stinger mosquito net (26), Socks (27), Crust leather (28), Cotton gloves (29), Leather gloves (30), Wipes (Cleansing) (31), Ribbon Weaving (32), Carpet coverage (33), Spinning silk (34), Zipper (35), Animal skin pickle (36), Raw silk fabrics (37), Layer on diapers and sanitary pads (38).

Fig. 1. *ITLI, and their generation processes [This study].*

The small industries included around below the 50 staff in Iran. The first proclamation about the classification of Iranian industries was outlined in 1955 called the program for Economic Development Plan (EDP). By the way, the industries were classified into 2 groups, the artisan firms and the large industries. EDP proclamation devoted about 500 staff for large group industries regardless of any definition about medium-sized industries [25]. Table 1 displays ITLI, their number of staff, land area used, and energy consumption based on the nominal capacity for each industry. The reference for the existing data gets back to the initial screening of both Iranian industries organization and Iranian protection agency in the preliminary studies of industrial projects.

Table 1. *ITLI, their number of employees, land area used and energy consumptions based on nominal capacity [This study].*

Industry	Nominal capacity	Employees	Power (kw)	Water (m^3)	Fuel (Gj)	Land (m^2)
(1)	120000 No	53	117	10	9	3500
(2)	600t	37	109	9	7	4900
(3)	1400t	77	722	21	109	14100
(4)	81000 No	157	317	26	7	3900
(5)	90000 No	39	44	7	4	2300
(6)	135000 pairs	94	97	19	12	9000
(7)	85000 No	72	49	14	6	4600
(8)	618300 Ft^2	23	154	38	5	3600
(9)	150t	35	158	42	45	7600
(10)	2500t	120	715	32	23	23600
(11)	45500 skin covers+214.988t	44	152	80	68	7100
(12)	350000 No	28	24	7	11	1500
(13)	620000 No	20	54	10	5	3200
(14)	306t	56	190	27	8	6800
(15)	1000 m^2	62	240	26	140	8400
(16)	1407659 No	29	77	8	4	2700
(17)	330000 m	71	141	20	22	14500
(18)	500000 m^2	63	244	13	10	7400
(19)	131500 No	67	205	16	12	9300
(20)	263.5t	28	54	6	3	2100
(21)	2250000 m^2	72	508	45	211	14200
(22)	137500 No	28	48	5	3	1900
(23)	135000 No	53	43	12	21	3000
(24)	130t	55	71	14	52	2700
(25)	270t	29	61	7	3	2900
(26)	300000 m^2	28	52	6	5	3700
(27)	243000 jeans	24	152	20	55	3800
(28)	2398000 Ft^2	27	245	7	4	4300
(29)	62400 pair	10	81	4	6	3700
(30)	70000 pair	30	30	7	4	2400
(31)	4000 yard	15	228	6	10	6500
(32)	3000 m	30	41	7	5	3200
(33)	54000 No	19	49	5	4	3000
(34)	102.8t	82	422	78	131	15800
(35)	3000 m	49	194	9	4	2500
(36)	200000 No	30	137	9	9607	6300
(37)	330000 m	25	100	8	10	6100
(38)	8750 m^2	17	237	5	5	3600

Conducting Friedman test upon existing data (Table 1) has presented mean ranks (weights) such as 2.8, 3.88, 1.7, 1.64 and 4.97 for the main criteria of employees, power, water, fuel, and land along with a value of 125.657 for Chi-Square respectively. The One sample Chi-Square test in null hypothesis has represented the categories of water and fuel have occurred with equal probabilities of about 0.675 and 0.325, respectively. By the way, the distribution of employee, power and land were obtained normally with significant values around 0.138, 0.087, and 0.096, respectively. Therefore, it was led to retain the null hypothesis. The One-Sample Kolmogorov-Smirnov test has revealed that test distribution is normal with Asymp.sig. (2-tailed) as 0.138, 0.087, 0.051, 000, and 0.096 for employees, power, water, fuel, and land, respectively. The distribution of employees, power, and land were the same based on related samples of Friedman′s two-way analysis of variance by ranks. Therefore, the null hypothesis was rejected. Pearson correlation analysis proved the highest correlation between land and power with a value of around 0.818. The t-test analysis was manifested no significant difference among parameters such as employees, power, water, and land except fuel for about 38 ITLI.

4.1 Results of Friedman Test and VIKOR Method

Friedman test was used to calculate the values for criteria such as employees, power, water, fuel and land. It was found the amounts of around 2.8, 3.88, 1.7, 1.64, and 4.97 for employees, power, water, fuel, and land via SPSS software analysis as a special vector, respectively. Then obtained special vector by Freidman test was used to sum the weights according to Tables 2 and 3. In the following, Table 4 includes the calculation of Sj, Rj, and Qi. It needs to explain that each section was used the relevant equations according to the methodology part.

Table 2. *Normalized matrix [This study].*

Industry	Employees	Power	Water	Fuel	Land
(1)	0.153105032	0.079014852	0.063954256	0.000936268	0.074090545
(2)	0.106884645	0.073612127	0.05755883	0.000728208	0.103726762
(3)	0.222435613	0.487595925	0.134303937	0.011339245	0.298479051
(4)	0.453537549	0.214082976	0.166281065	0.000728208	0.082558035
(5)	0.112662194	0.029714987	0.044767979	0.000416119	0.048688072
(6)	0.271544774	0.06550804	0.121513086	0.001248357	0.190518543
(7)	0.207991742	0.03309169	0.089535958	0.000624179	0.097376144
(8)	0.066441807	0.104002455	0.243026172	0.000520149	0.076207417
(9)	0.101107097	0.106703817	0.268607874	0.00468134	0.160882325
(10)	0.346652904	0.482868541	0.204653619	0.002392685	0.499581958
(11)	0.127106065	0.102651774	0.511634047	0.007074024	0.150297962
(12)	0.080885677	0.016208175	0.044767979	0.001144327	0.031753091
(13)	0.057775484	0.036468393	0.063954256	0.000520149	0.067739927
(14)	0.161771355	0.128314717	0.172676491	0.000832238	0.143947344
(15)	0.179104	0.162081748	0.166281065	0.014564168	0.177817307
(16)	0.083774452	0.052001227	0.051163405	0.000416119	0.057155563
(17)	0.205102968	0.095223027	0.127908512	0.002288655	0.306946542
(18)	0.181992774	0.164783111	0.083140533	0.001040298	0.15664858
(19)	0.193547871	0.138444826	0.102326809	0.001248357	0.196869161
(20)	0.080885677	0.036468393	0.038372553	0.000312089	0.044454327
(21)	0.207991742	0.343073033	0.287794151	0.021950281	0.300595924
(22)	0.080885677	0.03241635	0.031977128	0.000312089	0.040220581
(23)	0.153105032	0.029039647	0.076745107	0.002184625	0.063506181
(24)	0.158882581	0.047949184	0.089535958	0.005409548	0.057155563
(25)	0.083774452	0.041195778	0.044767979	0.000312089	0.061389308
(26)	0.080885677	0.035117712	0.038372553	0.000520149	0.07832429
(27)	0.069330581	0.102651774	0.127908512	0.005721637	0.080441163
(28)	0.077996903	0.165458451	0.044767979	0.000416119	0.091025526
(29)	0.028887742	0.05470259	0.025581702	0.000624179	0.07832429
(30)	0.086663226	0.020260219	0.044767979	0.000416119	0.050804945
(31)	0.043331613	0.153977661	0.038372553	0.001040298	0.137596726
(32)	0.086663226	0.027688965	0.044767979	0.000520149	0.067739927
(33)	0.05488671	0.03309169	0.031977128	0.000416119	0.063506181
(34)	0.236879484	0.28499374	0.498843195	0.0136279	0.334465887
(35)	0.141549936	0.13101608	0.05755883	0.000416119	0.052921818
(36)	0.086663226	0.092521665	0.05755883	0.999413985	0.13336298
(37)	0.072219355	0.067534062	0.051163405	0.001040298	0.129129235
(38)	0.049109161	0.160055726	0.031977128	0.000520149	0.076207417

Because of limited space, the column of Nominal capacity was ignored to appear in this Table.

Table 3. *Weighted matrix [This study].*

Industry	Employees	Power	Water	Fuel	Land
(1)	0.4286941	0.306577626	0.108722235	0.001535479	0.368230007
(2)	0.299277	0.285615054	0.097850011	0.001194262	0.515522009
(3)	0.6228197	1.89187219	0.228316693	0.018596361	1.483440884
(4)	1.2699051	0.830641945	0.282677811	0.001194262	0.410313436
(5)	0.3154541	0.11529415	0.076105564	0.000682435	0.241979719
(6)	0.7603254	0.254171195	0.206572246	0.002047306	0.94687716
(7)	0.5823769	0.128395758	0.152211129	0.001023653	0.483959437
(8)	0.1860371	0.403529525	0.413144493	0.000853044	0.378750864
(9)	0.2830999	0.414010812	0.456633387	0.007677397	0.799585157
(10)	0.9706281	1.873529939	0.347911152	0.003924003	2.482922331
(11)	0.355897	0.398288882	0.869777879	0.0116014	0.746980871
(12)	0.2264799	0.062887718	0.076105564	0.001876697	0.15781286
(13)	0.1617714	0.141497366	0.108722235	0.000853044	0.336667435
(14)	0.4529598	0.497861103	0.293550034	0.001364871	0.715418299
(15)	0.5014912	0.628877182	0.282677811	0.023885235	0.883752016
(16)	0.2345685	0.201764763	0.086977788	0.000682435	0.284063148
(17)	0.5742883	0.369465345	0.21744447	0.003753394	1.525524314
(18)	0.5095798	0.639358469	0.141338905	0.001706088	0.778543443
(19)	0.541934	0.537165927	0.173955576	0.002047306	0.978439732
(20)	0.2264799	0.141497366	0.065233341	0.000511826	0.220938004
(21)	0.5823769	1.331123369	0.489250057	0.035998461	1.493961742
(22)	0.2264799	0.125775436	0.054361117	0.000511826	0.199896289
(23)	0.4286941	0.112673829	0.130466682	0.003582785	0.31562572
(24)	0.4448712	0.186042833	0.152211129	0.008871659	0.284063148
(25)	0.2345685	0.159839617	0.076105564	0.000511826	0.305104863
(26)	0.2264799	0.136256723	0.065233341	0.000853044	0.389271721
(27)	0.1941256	0.398288882	0.21744447	0.009383485	0.399792579
(28)	0.2183913	0.64197879	0.076105564	0.000682435	0.452396865
(29)	0.0808857	0.212246049	0.043488894	0.001023653	0.389271721
(30)	0.242657	0.078609648	0.076105564	0.000682435	0.252500576
(31)	0.1213285	0.597433323	0.065233341	0.001706088	0.683855727
(32)	0.242657	0.107433185	0.076105564	0.000853044	0.336667435
(33)	0.1536828	0.128395758	0.054361117	0.000682435	0.31562572
(34)	0.6632626	1.105775712	0.848033432	0.022349755	1.662295459
(35)	0.3963398	0.508342389	0.097850011	0.000682435	0.263021433
(36)	0.242657	0.358984058	0.097850011	1.639038936	0.662814012
(37)	0.2022142	0.262032159	0.086977788	0.001706088	0.641772297
(38)	0.1375057	0.621016218	0.054361117	0.000853044	0.378750864

Because of limited space, the column of Nominal capacity was ignored to appear in this table.

Table 4. *Calculation of Sj, R and Q [This study].*

Industry	Sj	Rj	Qi	Rank
(1)	13.06898077	4.520226244	0.135317326	17
(2)	13.12608095	4.205384616	0.179976047	21
(3)	6.601870944	2.13642534	0.783542365	36
(4)	9.528772578	4.430271493	0.307924557	25
(5)	14.07925886	4.790090497	0.049431821	5
(6)	10.96049717	3.474212033	0.386981214	31
(7)	12.74873326	4.27285068	0.186816245	22
(8)	12.78661451	4.497737557	0.151381473	19
(9)	11.53995646	3.598190046	0.342341222	28
(10)	3.453942064	1.636584756	1	38
(11)	10.66039624	3.710633484	0.365006878	30
(12)	14.57867153	4.97	0	1
(13)	14.11590182	4.587692307	0.078143889	9
(14)	11.48383085	3.778099547	0.31787802	27

Industry	Sj	Rj	Qi	Rank
(15)	10.731617	3.418280543	0.405657731	32
(16)	13.97397331	4.700135747	0.067656752	7
(17)	9.893054131	3.229627506	0.471644126	34
(18)	11.22820978	3.64316742	0.349606209	29
(19)	10.87407844	3.215882353	0.429613796	33
(20)	14.30071174	4.835067873	0.0327322	3
(21)	7.309930615	2.113936651	0.755091905	35
(22)	14.40140997	4.88004525	0.021459886	2
(23)	13.54598492	4.632669683	0.097012314	13
(24)	13.36968066	4.700135747	0.094816633	12
(25)	14.04047495	4.65515837	0.071414283	8
(26)	13.95166869	4.47524887	0.102391434	14
(27)	13.12780062	4.45276018	0.142793334	18
(28)	12.74074993	4.340316743	0.177055394	20
(29)	14.17788844	4.47524887	0.092224007	11
(30)	14.30602108	4.76760181	0.042613233	4
(31)	12.59041262	3.84556561	0.258023138	24
(32)	14.06479468	4.587692307	0.080440895	10
(33)	14.31973346	4.632669683	0.062236253	6
(34)	6.513190015	1.754117647	0.844872866	37
(35)	12.9652575	4.745113123	0.106246956	15
(36)	11.14961108	3.890542987	0.316033397	26
(37)	13.1566729	3.935520363	0.219079738	23
(38)	13.17768275	4.497737557	0.133804945	16

Because of limited space, the column of Nominal capacity was ignored to appear in this table.

According to Table 4, the industry which has held the highest Qi (1), the largest industry can be introduced in terms of existing criteria and vice versa. Therefore, it was found a hierarchical cluster classification for ITLI as 10 > 34 > 3 > 21> 17 > 19 > 15 > 6 > 11 > 18 > 9 > 14 > 36 > 4 > 31 > 37 > 7 > 2 > 28 > 8 > 27 > 1 > 38 > 35 > 26 > 23 > 24 > 29 > 32 > 13 > 25 > 16 > 33 > 5 > 30 > 20 > 22 > 12.

4.2 Results of Friedman Test and SAW Method

In this step, the SAW method was employed to classify ITLI based on data of employees, power, water, fuel, and the land area used. Table 5 presents a ranking style developed in the SAW system.

Table 5. *The ranking style developed in the SAW system.*

Industry	Employees	Power	Water	Fuel	Land	Weights	Rank
(1)	0.082536151	0.069180128	0.024817518	0.001385915	0.075729212	0.253648924	22
(2)	0.057619577	0.064449863	0.022335766	0.001077934	0.106020897	0.251504037	23
(3)	0.119911012	0.426906431	0.052116788	0.016784977	0.30508054	0.920799748	4
(4)	0.244493882	0.187436757	0.064525547	0.001077934	0.084383979	0.581918099	6
(5)	0.060734149	0.026016458	0.017372263	0.000615962	0.049764911	0.154503743	32
(6)	0.146384872	0.057354465	0.047153285	0.001847887	0.194732259	0.447472768	11
(7)	0.112124583	0.028972874	0.034744526	0.000923944	0.099529822	0.276295749	18
(8)	0.035817575	0.091057604	0.094306569	0.000769953	0.077892904	0.299844605	16
(9)	0.054505006	0.093422737	0.104233577	0.006929577	0.164440575	0.423531472	13
(10)	0.186874305	0.422767449	0.079416058	0.003541784	0.510631258	1.203230854	2
(11)	0.068520578	0.089875038	0.198540146	0.010471362	0.153622116	0.52102924	8
(12)	0.043604004	0.014190795	0.017372263	0.001693897	0.032455377	0.109316336	38
(13)	0.031145717	0.03192929	0.024817518	0.000769953	0.069238137	0.157900615	31
(14)	0.087208009	0.112343798	0.067007299	0.001231925	0.14713104	0.414922071	14

Industry	Employees	Power	Water	Fuel	Land	Weights	Rank
(15)	0.096551724	0.141907955	0.064525547	0.021558685	0.181750109	0.50629402	9
(16)	0.04516129	0.045528802	0.019854015	0.000615962	0.058419678	0.169579747	28
(17)	0.110567297	0.083370923	0.049635036	0.003387793	0.313735307	0.560696356	7
(18)	0.09810901	0.144273087	0.032262774	0.001539906	0.160113191	0.436297968	12
(19)	0.104338154	0.121213045	0.039708029	0.001847887	0.201223335	0.46833045	10
(20)	0.043604004	0.03192929	0.014890511	0.000461972	0.045437527	0.136323304	35
(21)	0.112124583	0.300371838	0.111678832	0.032492019	0.307244232	0.863911504	5
(22)	0.043604004	0.028381591	0.012408759	0.000461972	0.041110144	0.12596647	37
(23)	0.082536151	0.025425175	0.029781022	0.003233803	0.064910753	0.205886904	26
(24)	0.085650723	0.041981103	0.034744526	0.008007512	0.058419678	0.228803542	25
(25)	0.04516129	0.036068272	0.017372263	0.000461972	0.062747061	0.161810858	29
(26)	0.043604004	0.030746724	0.014890511	0.000769953	0.080056596	0.170067788	27
(27)	0.037374861	0.089875038	0.049635036	0.008469484	0.082220287	0.267574706	20
(28)	0.042046719	0.144864371	0.017372263	0.000615962	0.093038746	0.297938061	17
(29)	0.015572859	0.047893935	0.009927007	0.000923944	0.080056596	0.154374341	33
(30)	0.046718576	0.017738494	0.017372263	0.000615962	0.051928603	0.134373898	36
(31)	0.023359288	0.134812557	0.014890511	0.001539906	0.140639965	0.315242227	15
(32)	0.046718576	0.024242609	0.017372263	0.000769953	0.069238137	0.158341538	30
(33)	0.029588432	0.028972874	0.012408759	0.000615962	0.064910753	0.13649678	34
(34)	0.127697442	0.249521487	0.193576642	0.02017277	0.3418633	0.932831641	3
(35)	0.076307008	0.11470893	0.022335766	0.000615962	0.054092294	0.26805996	19
(36)	0.046718576	0.081005791	0.022335766	1.479387793	0.136312582	1.765760508	1
(37)	0.038932147	0.059128315	0.019854015	0.001539906	0.131985198	0.251439581	24
(38)	0.02647386	0.140134105	0.012408759	0.000769953	0.077892904	0.257679581	21

Because of limited space, the column of Nominal capacity was ignored to appear in this table.

According to Table 5, it was found a hierarchical cluster classification for ITLI in SAW system as 36 > 10 > 34 > 3 > 21 > 4 > 17 > 11 > 15 > 19 > 6 > 18 > 9 > 14 > 31 > 8 > 28 > 7 > 35 > 27 > 38 > 1 > 2 > 37 > 24 > 23 > 26 > 16 > 25 > 32 > 13 > 5 > 29 > 33 > 20 > 30 > 22 > 12.

Industry 4 or the fourth industrial revolution was introduced in 2011 at the Hanover industrial exhibition in Germany. This concept will also alter production as it affects communications and the consumer market. The main idea of Industry 4 comprises industrial production should expand in line and parallel with advanced information and communication technologies. Industry 4 is not a standard approach or technology, so the methods and steps used and required to implement in companies are not the same. Industry 4 is a concept that can be applied in different ways in various industries. These great developments can lead to inequality (especially in the labor force market). Replacing the workforce with automation, robots, and machines will worsen the gap between capital and work. But replacing employees with emerging technologies can also create security and jobs. As a result, the main components of the implementation of the industry 4 are cyber-physical systems of running processes with internet connectivity. Physical cyber-security systems are part of the machinery, transportation systems, production equipment, logistics, coordination, and process management in factories. Therefore, the future of industries production will be on the way that human resources, machinery, production units, logistics, and products will communicate directly with each other. Industry 4 will also gain more benefits through of the wide industries networks and artificial intelligence systems. Its implementation will not only optimize the production stream at the assembly line, but also the entire value chain will be affected. In addition, this network includes all phases of the product's lifecycle, from initial steps of generation to their development, use, maintenance and recycling. On the other hand, industrial ecology posed to be a new topic of research for monitoring relation between pollutants dissipated from input material injected to industries cycle and ambient. However, in many societies, there is still insufficient scientific information on the technologies used, facilities and materials and energy streams applied in industrial ambient. Hence, according to Tables 6 and 7, present study examines the flow of input materials into ITLI and their facilities, respectively.

Table 6. *Input materials flow towards ITLI [This study].*

Industry	Initial materials
(1)	AL sheets containg 5 cm width and 2 cm thickness (58.5t); Iron strap, st-37 in sizes of 0.1*0.3*0.0015 m^3 (15t); ABS plastic 1*1.5*0.0015 m^3 (53t); Artificial leather (13000 m^2); Textile 36*0.9 m^2 (18000 m^2); Cardboard with thickness of 2 mm (5.5 m^2); Gum (3790 kg); Oily dye (3300 kg); Oily thinner (1200 kg); Nylon bags (120000 No); Carton (24000 No); Metal hinges (240000 No); Plastic base (48000 No); Bolt and rivet (120000 No); Metal bottons (240000 No); Handle and its base (metallic and plastic 120000 No); Lock and code (120000 No).
(2)	Wool (642t); Vegetable lubricant (12t); Packaging thread with grade 10 (3t); Sack for baling (3t).
(3)	Cotton (1556t); PVC duke (875 No); PP sacks (52000 No); Duke thread (1230 kg).
(4)	Textile with width of 1.20 and 1.5 m^2 (81000 m); Sewing thread (1200 kg).
(5)	Calf leather (126400 m^2); Liners (31020 m^2); Textile with various thicknesses (600 m^2); Cardboard (2900 m^2); Wrappers (867 m^2): Pads with thickness of 4 mm (2940 m^2); Zippers grade 3 and 5 in L of 20 and 30 centimeters. (21740 and 32610 threads); Ring (10000 pairs); PS (380 duke); Glue (1230 L); Plastic bags (429 kg); Carton (1715 No); Punch (1670 No).
(6)	Light cow leather in thickness of 1.4-1.6 mm (330000 ft^2); Heavy cow leather in thickness of 2-3 and 5-6 mm (78.2t); 3rd grade goat leather (75000 ft^2); Raw cotton (284 m^2); Three layers nylon with grade of 20 (86 kg); Catton thread (255 kg); Chloropen (1420 kg); Light PE as shoe molds (6750 pairs); PVC shoe heels (270000 No); Light PE bags (275000 No); Cardboard boxes 20*12*30 cm^3 (135000 No).
(7)	Textile (425000 m^2): PS layer with thicknesses of 2 and 3 cm^2 and weight of 300 and 200 g/m^2 (35000 and 36500 kg); Wad with dimensions of 1*2 and 2*2 cm^2 (30000 and 40000 m^2); Textile (15910 m^2); Plastic sacks having sizes of 60*20*50 and 70*30*50 cm^3 (25000 No); Ordinary sewing thread for sewing 20.2 (10000 No); Plastic buttons (155000 No); Plastics with length of 20 cm (70000 No); Carton with dimensions of 80*60*100 and 100*220*120 cm^3 (5350 No); Plastic bags of 220*80*60 and 220*220*120 cm^3 (2000 kg).
(8)	Animal leather (271350 No); Tanning materials of vegetable type (1530.9 kg); Tanning materials of artificial type (29484 kg); Pigment (5897 kg); Oil (29484 kg); H_2SO_4 (2948.4 kg); Packaging bags (2813 No).
(9)	Various raw yarn (158t); Textile reactive dye (5925 kg); Textile disperss dye (1975 kg); Pyramid duke (1000 No); Caustic soda (1500 kg); Hydrogen Peroxide 35% (2000 L); Spray for disperss dye (500 kg); Cellophane (400 kg); Cardboard boxes having sizes of 35*15*12 cm^3 (167000 No); Cardboard carton with size of 60*36*36 cm^3 (14000 No).
(10)	Acrylic tops (1070t); Polyester (1605t); Polyethylene glycol base oils (54t); Duke thread (23t); Label (23t); Plastic bags (23t); Carton in sizes of 0.75*0.75*0.75 m^3 (105t).
(11)	Animal skin after slaughtering (477750 kg); $NaCO_3$ (30637 kg); Salt (459550 kg); Sodium sulfide (45955 kg); Detergent (30637 kg); Disinfectant (18382 kg); Sodium bisulfite (30637 kg); Lime (459550 kg); $H_2 SO_4$ (9191 kg); Enzyme (30637 kg); Ammonium sulfate (9191 kg); Fat removal (42042 kg); Chromium materials (36787 kg); Packaging materials (7659 kg).
(12)	Jersey (32550 kg); Flexible rope of waist (1580 kg); Polyester thread (355 kg); Label (35000 No); Cardboard boxes (85000 No); Cellophane (2270 kg).
(13)	Cotton cords (11000 kg); Glue (88 kg); Starch (88 kg); Dye (4.4 kg); Brass buttoms (220000 kg); Gum (880 kg); Linen paper (440 kg); Boxes having sizes of 8*8*1.5 cm^3 (204000 No); Carton in sizes of 40*40*22 cm^3 (40000 No); Plastic bags (100 kg).
(14)	Acrylic fiber and wool (238t); Waste fibers (68t); Spinning oil RLU 120 (23t); Acidic dye (6t).

Industry	Initial materials
(15)	Cotton yarn, 100% and grade of 20, 10 and 49 (55.5, 74 and 49t); PVC (3.5t); NaOH (3.3t); Softener (1200 L).
(16)	Cotton thread with grade of 20 (41.4t); Vaseline oil (22t); NaOH, 50% (10t); Sodium silicate (10t); H_2O_2, 30% (5400 l); Nylon for packaging (240 kg); Marked paper (1000 sheets); Waxy paper (4800 sheets); Gum (300 kg); Three layers cartons (3000 No).
(17)	Polyester cords grade 55 and 150 Den (68 and 45t); Lubricant (565 kg); PP sacks, w= 1.2 m (5500 m); Compressed cardboard, L= 1.6 m (2400 No).
(18)	Acrylic yarn, grade 3 nm (363t); Cotton yarn, grade 20.2 Ne (40t); Sewing yarn (200 kg); Polyester Filament (9.9t); PE bags (122000 No); Cardboard carton in dimensions of 1*0.8*0.5 m^3 (12200 No); Texture labels (121500 No).
(19)	Weft yarn (347t); Cotton yarn, grade 20.2 (61.2t); Nylon yarn, grade 60.2 metric (215 kg); Plastic bags (131500 No); Cardboard carton, 0.5*0.8*1 m^3 (13200 No); Nylone or polyester texture (11t)
(20)	Longer fibers and low fineness wools containing, 11.5% permissible moisture of wool weight percentage.
(21)	Acrylic yarn, 32.2 metric (1080t); Polyester yarn (223t); Polyester yarn, 24-48 filament (178t); Fiber (45t); Yarn sewing, 61 metric (0.9t); Equiliberants materials (10t); Packaging materials (580000 No).
(22)	Sewing yarn (500 kg); Cellophone (2000 kg); Label (137500 No); Cartons (2000 No); Needle (5000 No); Acrylite yarn (56500 kg).
(23)	Shirt fabric (202500 m); Sewing yarn (20250 yards); Sealing Adhesives (13500 m); Buttons (945000 No); Cellophone (1350 kg); Cardboard (2700 kg).
(24)	Acrylic yarn (1430000 kg); Polyester yarn (2378 kg); Fiber label (2917 No); Buttons (712220 No); Cellophone (3260 kg); Packaging cartons, sizes of 70*50*50 cm^3 (5193 No).
(25)	Poly amid or polyester cords containing weight of 500-4000 g/10000 m (280t); Packaging nylon (18000 No); Antistatic (1000 kg); Oil of grease (100 kg).
(26)	Iron wires, d=0.25 mm (87.6t); Al wire, d= 0.25 mm (30t).
(27)	Nylon threads (36339 kg); Acrylic, cotton, polyester threads (1260, 1260, 974 kg); Boxes of about 10*8*30 cm^3 (388 No); Three layers carton (2000 No); Gum (50 kg); Cellophone sacks (1200 kg); Dye (413 kg); H_2SO_4 (206 kg); $AlSO_4$ (103 kg); Softener (5 kg); Flexible ropes made from natural rubber (3645 kg).
(28)	Calf crust (1020000 ft^2); Sheep crust (810000 ft^2); Goat crust (700000 ft^2); Resin (5900 kg); Pigment (6200 kg); Various waxes (2350 kg); Polyurethane dispersion (3500 kg); Filler (1950 kg); Lacquer (7850 kg); Various pigments (450 kg); Casein (1350 kg); Oil (2200 kg).
(29)	Double layers cotton yarn, grade 30 and 10 (1400 and 50 kg); Packaging equipment (1200 No).
(30)	Leather (182600 ft^2); Cotton or polyester gum, grade 60.4 (350 kg); Shoe bags (300 kg); PE plastic (1050 No); Cardboard carton of about 80*50*40 cm^3 (612 No).
(31)	Raw cotton, nylon or polyester fibers (1600 kg); Resin (400 kg).
(32)	Nylon yarn or threads (8800 kg); Cardbord spools (126000 No); Cardboard boxes, capacity of 12 spools per box (10500 No); Three layers cartons in dimensions of 30*50*70 cm^3 (875 No).
(33)	Cotton thread grade of 20.2 (42120 kg); Acrylic thread grade of 6 (72252 kg); Packaging nylon (55000 No).
(34)	Silk cotton containing moisture of maximum 11% (131.4t); Sacks of 1.5 m^2 (4500 No).
(35)	Cords, 7-11 g/m (5000 m); Filament polyester (26000 kg); Dye and chemical materials (1420 kg); Packaging materials (3000000 No); Drawers with grade of 3 and 5 (7500000 No).
(36)	Light leather (210000 t); Sodium sulfur (21t); Cao (210t); NaCl (210t); Sodium bisulfide (14t); H_2SO_4, 98% (4.2t); Uropon enzyme (14t); Disinfectant, like formalin 38% (8.4t).
(37)	Silk fibers, grade 30, having 25% allowable gum (23.7t); PP sacks, w=4 m (2000t).
(38)	Viscose fibers (350t); Latex glue (131t); Packaging nylon (875 kg); Packaging carton (7433000 No).

PE= polyethylene, d= diameter, St= Steel, PVC= Polyvinylchloride, ABS=Acrylonitrile butadiene Styrene, PS= Polystyrene, PP= Polypropylene, W= width, L= Length.

Table 7. *All available facilities of ITLI [This study].*

Industry	Facilities
(1)	Air compressors, 350 L/min (1 No); Frame and fixer (1 series); Plastic vacuum forming machines (2 No); Guillotine, 2 m, thickness of 3 mm (1 No); Saw (1 No); Press machine, 10 tons (2 No); Industrial sewing wheel (14 No); Blowy press (2 No); Dye baking kiln (1 No); Plastic cutting machine (1 No); Blowy devices (1 series).
(2)	Batting machine, 120 kg/h, 20 kw (1 No); Carding machine, 70 kg/h, 20 kw (2 No); Weaving machine, 8 dukes, 65 and 100 kg/h, and 15 kw (2 and 1 No); Screwdriving machine, 2 kw, 125 kg (1 No); Cube press, 1 kw, 115 kg/h (1 No); Buffing machine (1 No); Balance, 300 kg (2 No); Lab (1 unit).
(3)	Batting machine, 2 kw (1 No); Carding machine, 16 kw, 350 m/min (2 No); Twisting machine, 14 kw (2 No); Spinning machine, 75 kw, 55-100 rpm (6 No); Steam producer machine for threads (1 No); Air compressor, 1.2 m^3/min, 5 atm (1 No); Weighbridge, 100 kg (2 No); Lab and repairing workshop (1 and 1 No).
(4)	Cutting table, 2*6 m^2 (2 No); Cutting machine, 60 cm (4 No); Leather label machine, 8000 m/d (2 No); Cutting blade, L= 40 cm (2 No); Various sewing machine (80 No); Button press machine (2 No); Industrial washing machine (8 No); Jean press machines (10 No); Boiler, 1 ton (1 No); Pocket Trouser Sewing Machine (6 No); Vacuum pumps of moisture absorption (1 No); Air compressor, 283 L/min (1 No); Water softener machine (1 No).
(5)	Hydraulic cutting machine, 25 ton, 0.75 kw (1 No); Cutting machine as string, w=3-500 mm (1 No); Printing machine on leather, 50*60 mm^2 (1 No); Leather cutting machine with thicknesses of 0-10 mm (1 No); Levis machine, 0.75 kw (3 No); Gum machine, 4 kw (3 No); Sewing machine, 0.6 kw (8 No); Punching machine (1 No); Blade tabs (2 No).
(6)	Hydraulic press, 2.2 kw (7 No); Bobbin machine, 7 kw (2 No); Levis machine, 4 kw (3 No); Sewing machine, 0.6 Kw (18 No); Sewing machine (for up and down layers of texture), 4 tons (1 No); Buffing machine, 0.5 kw (1 No); Groove machine, 2000 rpm, (2 No); Air compressors, 400 L/min, 3 kw (1 No); Worktables (12 No); Pushcart (4 No); Chariot (8 No); Lab (1 unit).
(7)	Sewing machine, 3.7 kw (7 No); Orlog sewing machine, 25.5 m/min, 5 kw (6 No); Scissor, 1 kw (2 No); Batting machine, 5 kw (1 No); Rolling machine and holder base, 1.5 kw (1 No); Cutting table of about 300*300 cm^2 (2 No).
(8)	Balaban machine, 7.5 kw (2 No); Samming machine, 10 kw (1 No); Setting out machine, 10 kw (1 No); Cutting machine, 15 kw (1 No); Wet blow machine, 2 kw (1 No); Tunnel dryer, in size of 16000*300*400 cm^3 (1 No); Softener (1 No); Clamping machine (1 No); Buffing machine, 1 kw (2 No); Measuring machine, 2 kw (1 No).
(9)	Multi-layer producer machine, containing around 192 holes, 18 kw (1 No); Baking machine (1 No); Screwdriving machine, 2 kw (1 No); Dyeing machine, 70 kg (3 No); Dryer machine with hot air (1 No); Duke maker machine, with 4 sources of head, 1 kw (14 No); Industrial derrick, 2 tons (1 No); Air compressor, 500 L/min (1 No); Fitted lab (I unit); Twisting machine, 12 sources of head, in size of 2.5*6*1.5 m^3 (3 No).
(10)	Gearbox, 11 kw, 250 kg (4 No); Horizontal finisher machine, 16 sources of head, 1200 kg/h, 25 kw (1 No); Ring machine, 288 sources of head, 15 kw (10 No); Bobbin twisting machine, 18 kw (7 No); Bending machine, 1200 m/min and 400 m/min, 10 kw (4 and 6 No); Air compressor, 30 kw, 7 bar (1 No); Balance, 500 kg (1 No); Fitted lab and repair workshop (1 and 1 No).
(11)	Drum machine, 7.5 kw, 15 rpm (3 No); Paddle machine, 750 skins (3 No); Shaving machine 150 skin/h (1 No); Desensitization machine, 150 No/h (1 No); Wool washing and baling machine (1 No).
(12)	Scissors with 5 cutting directions (2 No); Sewing and similar machines (8 No); Overlog machine with thread of model 372 (6 No); Iran steam ironing machine (1 No); Cutting and designing table (1 No).
(13)	Twisting machine containing 24 dukes, 7 kw (1 No); Duke machine, containing 24 dukes, 2 kw (1 No); Weaving machine (1 No); Knitting machines, 100 No/h, 3 kw (3 No); Cutting machine,

Industry	Facilities
	0.5 kw (2 No); Roller machine, 0.5 kw (1 No); Dyeing machine, 0.5 kw (1 No); Button machine, 0.5 kw (1 No); Sewing machine, 0.5 kw (1 No).
(14)	Recycling machine, 24 kw (2 No); Yarn flattening machine, 24 kw (1 No); Dust machine (1 No); Weaving machine, 20 kw (1 No); Ring machine for producing coper, 162 kw (1 No); Martin Boiling Point Machine of 16 and 4 w (1 and 1 No); Twisting machine, 16 kw (1 No); Press machine, 4 kw (1 No); Dyeing machine, 10 kw (1 No); Centrifuge machine, 3 kw (1 No); Mechanical equipment, 300 kw (1 series).
(15)	Twisting machine, containing 600 cabinets, 12 kw (1 No); Stitching machine containing 7 cylinders, 45 kw (1 No); Automatic knot, 600 knots/min (1 No); Weaving machine, w= 150 cm (12 No); Jack (2 No); Electrical and physical yarn measurement machine (1 No); Air compressor, 2.6 m^3/min, 25 kw (1 No); Balance, 100 g (1 No); Quality control equipment (1 No).
(16)	Weaving machine, 150 knots/min (10 No); Bobbin machine (1 No); Twisting machine (1 No); Washing machine (1 No); Drying cylinder (1 No); Small cutting machine (1 No); Package measurement device (1 No); Packaging and labelling machine (1 No); Circular scissor (1 No); Worktable, 2*1.5 m^2 (1 No).
(17)	Weaving machine, 4 kw (5 No); Twisting machine, 450 m/min, 2 kw (1 No); Measurement and roll machine, 2 kw, 0-40 m/min (1 No); Lab and repair workshop (1 and 1 unit); Air compressor, 150 L/min, 10 atm (1 No).
(18)	Twisting machine, 200 bobbins, 12 kw (1 No); Knitting machine, 600 knots/min (1 No); Weaving machine, 4 kw (8 No); Jacquard machine, needles No= 2*1344 cm^2 (8 No); Carving machine, w= 3 m, 24 rollers, 25 kw, in size of 4.7* 3.4*5.7 m^3 (2 No); Useful width of about 260 cm, magnetic suction system and holding capacitor and bushing, 27 kW (1 No); Scissors with rotary cutting, blade d= 50 mm, cutting thickness, 8 mm, 56 w (1 No); Zig Zag sewing machine 0.55 kw (1 No); Blanket sewing machine, 0.55 kw (3 No); Compressor, 5 m^3/min; Lab (1 unit).
(19)	Twisting machine, 22.9 m/min (1 No); Knitting machine XL, grading of cord, 5-925 m (1 No); Weaving machines mdel of 93 SM, w=3.2 m (2 No); Jacquard machine Kromas model (8 No); Carving machine CUCN-X (2 NO); Finishing machine 005/SLC (1 No); Scissor, 8 mm, diameter of blade= 50 mm (1 No); Blanket sewing machine 748156-17198 (3 No); Air compressor, 8 atm, 2.3 m ^{3}/min (1 No).
(20)	Batting machine, 10 hp, 120 kg/h (1 No); Carding, 15 hp, 40 kg/h (1 No); Ring, 8.5 hp, 148 duckes (2 No); Screw bobbin, 2.6 hp (1 No); Air compressor, 200 L/min, 7 atm (1 No).
(21)	Twisting machine, 12 kw, 600 rpm (1 No); Weaving machine, 4 kw (4 No); Polishing machine, 1.5 kw, 0.5-12 m/min (1 No); Control and check device, 0.75 kw (1 No); Print machine, 36 kw, 8-10 m/min (1 No); Steam machine, 3.6 kw (1 No); Thorn machine, 16.5 kw (2 No); Pallet opener machine, 40 kw, 2 m/min (1 No); Winnow machine and scraping machine, 64 and 50 kw (1 and 1 No); Rollers, 10 kw (1 No); Scissor 56 kw (1 No); Various sewing machines of 0.55 kw (2 No); Fitted lab (1 unit).
(22)	Various weaving machine (6 No); Duke machine (1 No); Sewing machine (3 No); Scissor (2 No); Base and table (5 No); Press and ironing machine (2 No).
(23)	Saw cutter machine, 16 m/s (1 No); Design table in size of 9*1.6 m^2 (1 No); Various sewing machines and their equipment (27 No); Ironing machine (4 No).
(24)	Various weaving machines with model of 234 (10 No); Scissor (3 No); Design table (6 No); Various sewing machines and their devices (8 No); Ironing machine (2 No).
(25)	Twisting machine (1 No); Cupboard 608 (1 No); Lifter (1 No); Rachel machine with a width of 130 inches and can install 50 net pillars (1 No); Balance (1 No); Humidification machine (1 No); Compressor (1 No).
(26)	Twisting machine equipped to 160 spools (1 No); Net weaving machine (1 No); Roll machine (1 No); Jach (1 No).
(27)	Various textile and sewing machines of socks, 3.5, 2.5, 1, 1.25, 3, 4.5, 5, 4.5 and 40 dozens/h (22 No); Pigment machine, dozen/h (3 No); Dyeing machine, 80 dozens/h (1 No); Washing machine, 80 dozens/h (1 No); Ironing machine, 80 dozen/h (24 No).

Industry	Facilities
(28)	Buffing machine, 200 No/h (2 No); Dust precipitation machine (1 No); Coating machine with heater, 9000 m/h (1 No); Press machine of 500 tons (1 No); Ironing machine, introducing leather to machine with speed of 180-1440 m/h (1 No); Automatic spray machine equipped to heater (1 No); Glazing machine equipped with glass roller, 60-70 leather/h (1 No); Flex mahine (1 No).
(29)	Automatic weaving machine (3 No).
(30)	Hydraulic press, 20 tons, 2.2 kw (1 No); Pallet machine, GL50 E, 3 kw (1 No); Levis machine, 0.4 kw, CL2BC (3 No); Sewing machine, 0.4 kw, model of GL1ER (4 No); Various sewing machines of 0.5 kw, 2300 suture/min (7 No); Punch machine, 0.5 kw (1 No); Blade tabs (1 No); Fitted lab (1 No).
(31)	Fiber flatterner, d= 800 cm (1 No); Storage and preservation machine, 2 tons (1 No); Carding machine, 5 m/min (1 No); Forming and shaping machine, 40 m/min (1 No); Needle machine (1 No); Three layers dryers, 5 m/min (1 No).
(32)	Twisting maching containing 540 bobbins (1 No); Tape machine, 1 kw (12 No); Ribbon machine, 10 m/min, containing 4 sources of head (2 No); Fitted lab and repair workshop (1 No).
(33)	Weaving machine Sumat model of SM39, 5.4 power consumption, Kw and speed, 11000 m / min (m) Working, W= 3200 mm (4 No); Jacquard, chroma model holding 1344 hooks (8 No); Screw Bobbin Machine, 1.5 kw (1 No); Twisting machine, 200 dukes, 5.4 kw (1 No); Sewing machine, Mo-453, 4 kw, 500 suture/min (1 No).
(34)	Cocoon machine, 7 and 25 kw (1 and 1 No); Cocoon distributer, 5 kw with water consumption 1 m^3/h (2 No); Silk machine of 12 kw (2 No); Hank machine, 18 kw (2 No); Silk sucking machine, 100 kg of silk/shift (1 No); Centrifuge, 500 rpm (1 No); Impact machine, 5 impact/min (1 No); Hank dryer, 2*3 m^2 (1 No); Twisting machine, 12 and 10 kw (6 No); Twist fixation chamber, 2*2 m^2 (1 No); Spinning machine, centrifuge with pepper cutter roller, pepper press, silage for pewter, etc (1 No).
(35)	Coil machine and its joiner (12 and 12 No); Fastener and connectors (6 No); Dyeing pot (1 No); Dye dryer (1 No); Cutting machine (1 No); Martin Boiling Point Machine (1 No).
(36)	Balaban machines, 4 kw, 74 volumes (4 No); Hopcel machine, 2.3 kw, 50 volumes (8 No); Splinting machine, 100 volumes/h, 3 kw (1 No); Sheaving machine, 6 volumes/h, 4 kw (1 No); De-watering machine, 6 volumes/h, 4 kw (1 No); Wool washing machine and baling, 5 kw (1 No).
(37)	Twisting machine, capacity of 600 bobbins, 800 rpm (1 No); Weaving machine, 470 wefts/min (6 No); Area and fabric cloth, 50 m/min, 2 kw (1 No); Jack (1 No); Air compressor, 250 L/min, 3 kw (1 No); Lab and repair workshop (1 and 1 unit).
(38)	Batting machine CH-1600, 25 kw (1 No); Carding machine, 70 m/min, 7 kw (1 No); Conveyor machine equipped to cutter, 112 kw, with thermal element of 69 kw (1 No); Spray machine (2 No); Compressor, 1500 L, 10 atm (1 No).

W= Width

5. Conclusions

The main achievements and applications of presented study encompassed a collection or inventory of ITLI availability, expansion capacity depend on materials and energy networks, sustainability plans and developments, green product maturation and evolution, growth rates, facilities and technology developments towards industry 4 purposes, move towards global industrial indicators, establish national database, in situ management and optimal utilization, conduct training programmers as related to evaluation, characterization and utilization of existing resources, identification the type of pollutants dissipated into the environment, and environmental conservation purposes considering the input materials nature. Paving the way towards studies associated with efficiency of industries (based on data of nominal capacity, input and output quantities, number of staff, power, water, fuel, and the land area used values) technical and economic estimations. Also, based on the decision-making techniques, two types of classification were developed for the ITLI.

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7. Conflict of Interest

There is no conflict of interest.

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