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The using of logistic integrated total expected costs models in supply chain management (Case Study: Sanaye Felezi Iran CO)

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ABSTRACT: This research about the use of integration and minimization of supply chain and logistic total expected cost model in Sanaye Feleziye Iran Co. In previous research that be done in this company, focus only on supply, production and distribution models or the combination of two models from these models, but there is no review the relationship between these three models. This issue is very importance because integration of total expected costs in terms of supply, production and distribution is the main reason for reduce of total expected costs. This research includes of the use of supply, production and distribution models and an integration model that is integrated supply, production and distribution systems.

***Keywords*:** supply, production, distribution, total expected cost, integration, logistic, supply chain.

INTRODUCTION

These days, daily increasing of competitive conditions in markets, customer services and essential progress in information technology and communication industries caused to satisfying the customers in appropriate quality of product or service, low price in comparison to other competitive and on time delivery of product or service, has the essential role in remaining of organizations at markets and getting the market's proportion. For this reason the concept of supplying chain management is posed during these two decades.

Integration of supply chain and logistic total expected costs issue is an assurance for being equal of loading operation times and transferring a loading or unloading considering to production rate which is result of ideal transferring rate. Ideal transferring rate is converted to the transferring time of each part which is named such as balance index or balance time or cycle time.

Integration of supply chain and logistic total expected costs is caused to reduce of supply, production and distribution total expected costs, and decreasing the total expected cost of transferring operation of materials and other stuff during the building stream. Finally, this is caused to increasing the velocity of supplying parts according to the production plan and non-stopping in the production process and rapid respond to the receiving requests. In this research we are looking for considering that weather integration of supply, production and distribution models, could be useful in improving the costs of transferring or not? And if this claim will be true, in which different parts of logistic, exclusive of supply chain, with the use of integration of supply, production and distribution models, could be used.

Much research has been done in this issue, some of which that: with the aim of developing a phase multi-purposed model for equalizing the use of transportation machines in logistic system, have considered this issue (Ghazanfari and khalili-dizaj, 2004). Was choosing as case study with the purpose of decreasing the transportation

costs in iran khodro Company (Asghari and Aghdasi, 2004). Have presented a model for determining the order point and optimizing the size of order considering the transportation costs (Teimouri and Ghiyami, 2004). Have presented some models for integrating the total logistic cost in supplying chain management (Ghazanfari and Seyed Hosseini, 2004). Have practiced to the development of a model for optimizing the total cost of logistic distribution in conditions of a producer and some distributed warehouses in supplying chain management (Ghazanfari and Seyed Hosseini, 2004). by presenting a mathematical Mosel, have practiced to lowering the transportation costs and existence in a production company which the production have been done in some stages and considering the limitation of time for producing a part till requested time to transportation (Watanabe et al., 1994).
The main reasons for doing this research are:
1) Reduce the total expected costs of supply.
2) Reduce the total expected costs of production.
2) Reduce the total expected costs of distribution.
3) Reduce the total expected costs of integration model.

LITERATURE REVIEW

Supply Chain

Supplying chain consists of material stream, money and information between supplier's network, transportation, producer, distribution network and final customer (Javid, 2004).

supply chain management

Supply chain management (SCM) is the management of a network of interconnected businesses involved in the provision of product and service packages required by the end customers in a supply chain. Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption (Javid, 2004).

Logistics

The keyword "logistic" has been used in the U.S.A military forces for more than one century and gradually has been accepted by the other military forces of English language countries. In the recent decades this is also developed in trade market and civil industrial. Logistic has originally come from a Greek work "logistics" and it means science of computation and skill in computerizing. Antoine Henry Jomini had the first systematic try to definition this word with low accordance and connected to the other war elements. He was a French commentator and war writer. He defined the logistic in his book 'the brief art of war" in 1838 like this: logistic is the scientism art of militaries movement. Based on his definition, the logistic apparently consists of all supporting and moving activities of militaries such as, planning (Henry Jomini, 1838).

MATERIALS AND METHODS

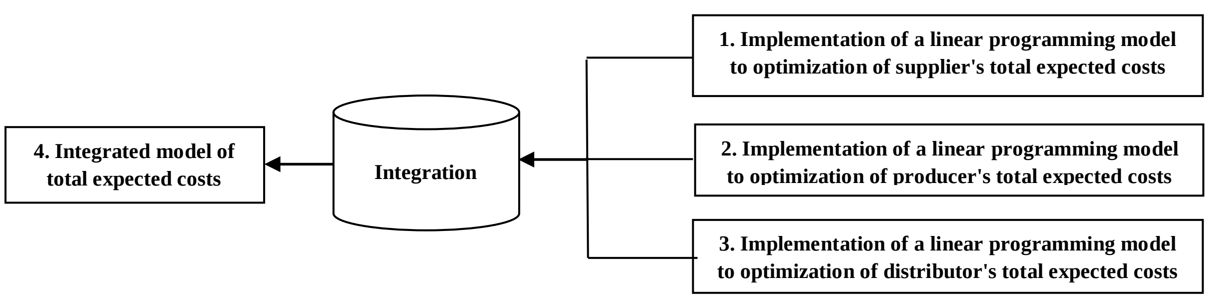

Figure 1: Research Practical Model

Define of parameters in these models:

In this model, the variables are defined as:
ZD (t), ZQ (t), ZP (t): decision making parameters in raw materials supply, production and distribution of products in period (t).

XD (t), XQ (t), XP (t): the amount of supply, production and distribution in period (t).
SD (t), SQ (t), SP (t): fixed cost of supply, production and distribution in period (t).
CD (t), CQ (t), CP (t): variable cost of supply, production and distribution in period (t).
hD (t), hQ (t), hP(t): maintenance cost of supply, production and distribution in period (t).
ID (t), IQ (t), IP (t): the amount of inventory of raw materials for supply, production and distribution of product in period (t).
AD (t), AQ (t), AP (t): capacity of supply, production and distribution in period (t).
M: is a large number

Modeling of a linear programming to optimization of supplier's total expected costs

The main aim in this step of this research is optimization of supplier's total expected costs (TCQ). This cost is summation of inventory maintenance cost, supply variable cost and supply fixed cost:
Z = TCQ = inventory maintenance cost + supply variable cost + supply fixed cost

$$Min \sum_{t=1}^{T} SQ(t)\ ZQ(t) + CQ(t)\ XQ(t) + hQ(t)\ IQ(t)$$

S.T

$$1)\ XQ(t) \le AQ(t)$$

$$2)\ \sum_{t=1}^{J} XQ(t) \ge \sum_{t=1}^{J} (t) \quad J = 1,2,\ldots, T$$

$$3)\ IQ(t) = XQ(t) - dQ(t) + IQ(t-1) \quad t = 1,2,\ldots, T$$

$$4)\ XQ(t) \le MZ(t)$$

$$5)\ XQ(t) \ge \ , ZQ(t) = 0$$

$XQ(t) \ge 0\ \ , ZQ(t) = 0$ Or 1

This model shows that:
1. The objective function in this model is minimization of supplier's total expected costs (TCQ)
2. The first constraint shows that considering the supply capacity
3. The second constraint shows that amount of demands for supply in each period (t)
4. The third constraint shows that amount of inventory for supply in each period (t)
5. The fourth constraint shows the relationship between XQ (t) and ZQ (t). Because it is possible in each period, supply activity to do or not to do, their relationship has been established with a large number (M).

Modeling of a linear programming to optimization of producer's total expected costs

The main aim in this step of this research is optimization of producer's total expected costs (TCP). This cost is summation of inventory maintenance cost, produce variable cost and produce fixed cost:
Z = TCP = inventory maintenance cost + produce variable cost + produce fixed cost

$$\text{Min} \sum Sp(t)\ Zp(t) + Cp(t)\ Xp(t) + hp(t)\ Ip(t)$$

S.T

$$1)\ XP(t) \le AP(t)$$

$$2)\ \sum_{t=1}^{J} XP(t) \ge \sum_{t=1}^{J} d(t) \quad J = 1,2,\ldots, T$$

$$3)\ IP(t) = XP(t) - d(t) + IP(t-1) \quad t = 1,2,\ldots, T$$

$$4)\ XP(t) \le MZP(t)$$

$XP(t) \ge 0\ \ , ZP(t) = 0$ Or 1

This model shows that:
1. The objective function in this model is minimization of producer's total expected costs (TCP)
2. The first constraint shows that considering the production capacity
3. The second constraint shows that amount of demands for production in each period (t)
4. The third constraint shows that amount of inventory for production in each period (t)
5. The fourth constraint shows the relationship between XP (t) and ZP (t). Because it is possible in each period, production activity to do or not to do, their relationship has been established with a large number (M).

Modeling of a linear programming to optimization of distributor's total expected costs

The main aim in this step of this research is optimization of distribution total expected costs (TCD). This cost is summation of inventory maintenance cost, distribution variable cost and distribution fixed cost:

Z = TCD = inventory maintenance cost + distribution variable cost + distribution fixed cost

$$\text{Min} \sum_{t=1}^{T} SD(t)\ ZD(t) + CD(t)\ D(t) + hD(t)\ ID(t)$$

S.T

1) $XD(t) \leq AD(t)$

2) $XD(t) \rangle d(t)$

3) $ID(t) = XD(t) - d(t) + ID(t-1)$

4) $XD(t) \leq MZD(t)$

5) $XD(t) \geq 0, ZD(t) = 0$ Or 1

This model shows that:

1. The objective function in this model is minimization of distribution total expected costs (TCD)
2. The first constraint shows that considering the distribution capacity
3. The second constraint shows that amount of demands for distribution in each period (t)
4. The third constraint shows that amount of inventory for distribution in each period (t)
5. The fourth constraint shows the relationship between XD (t) and ZD (t). Because it is possible in each period, distribution activity to do or not to do, their relationship has been established with a large number (M).

Modeling integrated of total expected costs

The main aim in this step of this research is optimization of integrated total expected costs (TCI). This cost is summation of supplier's total expected costs, producer's total expected costs and distribution total expected costs:

Z = TCI : Integration of TCQ, TCP and TCD

$$\text{Min} \sum_{t=1}^{T} SQ(t)\ ZQ(t) + SP(t)\ ZP(t) + SP(t)\ ZD(t) + CQ(t)\ XQ(t) + CP(t)\ XP(t) + CD(t)\ XD(t)$$

$$hQ(t)\ IQ(t) + hp(t)\ Ip(t) + hD(t)\ ID(t)$$

S.T

1) $XQ(t) \leq AQ(t)$

2) $XP(t) \leq AP(t)$

3) $XD(t) \leq AD(t)$

4) $\sum_{t=1}^{J} XQ(t) + IQ(t-1) \geq \sum_{t=1}^{J} XP(t) \quad J = 1,2,\ldots\ldots, T$

$t = 1,2,\ldots\ldots, T$

5) $\sum XP(t) + XP(t-1) \geq \sum XD(t)$

6) $XD(t) + ID(t-1) \geq d(t)$

7) $IQ(t) = XQ(t) - XP(t) + IQ(t-1)$

8) $IP(t) = XP(t) - XP(t) - XD(t) + IP(t-1)$

9) $ID(t) = XP(t) - d(t) + IP(t-1)$

10) $XQ(t) - MZQ(t) \leq 0$

11) $XP(t) - ZP(t) \leq 0$

12) $XD(t) - MZD(t) \leq 0$

13) $XQ(t),\ XP(t),\ XD(t) \geq 0$

14) $ZQ(t),\ ZP(t),\ ZD(t) = 0$ Or 1

1. The objective function in this model is minimization of integrated total expected costs (TCI).
2. The first constraint guarantees that raw materials purchased, is less than capacity of supplies.

3. The second constraint guarantees that the value of production in each period is less or equal of factory capacity in the same period.
4. The third constraint guarantees that the value of distribution in each period is less or equal of warehouse capacity in the same period.
5. The fourth - sixth constraints guarantee that the value of distribution in each period is enough to supplying the demands received.
6. The seventh – ninth constraints shows that the value of inventory, supply, production and distribution.
7. The tenth – twelfth constraints are described in previous steps.

Data Analyzing
Case Study

In this step of research, to implementation of these models in assembly shop in Sanaye Felazi Iran Co. in this regard, received demand to supply 65 shelters in four month (four periods) is considered.

Implementation of a linear programming model to optimization of supplier's total expected costs in Sanaye Felezi Iran Co:

To make this model, should be considered the table1 (costs based on million Taman and the supply decision making parameters are equal of maximum assembly shop capacity = 40 shelters in each period).

Table 1. Information about the values of costs, decision making parameters and received demands (for supply)

Period Parameter	1	2	3	4
SQ(t)	15	15	15	15
hQ(t)	10	10	10	10
CQ(t)	25	22	26	26
d(t)	15	15	20	15
ZQ(t)	40	40	40	40
IQ(t)	25	10	0	0

The supplier's linear programming model is:

$$Min z = 15x_1 + 15x_2 + 15x_3 + 15x_4 + 25x_5 + 22x_6 + 26x_7 + 26x_8 + 10x_9 + 10x_{10} + 10x_{11} + 10x_{12}$$

S.t:

$$(1)\begin{cases} x_5 \le 40 \\ x_6 \le 40 \\ x_7 \le 40 \\ x_8 \le 40 \end{cases}$$

$$(2)\{x_5 + x_6 + x_7 + x_8 \ge 65$$

$$(3)\begin{cases} x_9 = x_5 - 15 + 0 \\ x_{10} = x_6 - 15 + 25 \\ x_{11} = x_7 - 20 + 0 \\ x_{12} = x_8 - 15 + 0 \end{cases}$$

$$(4)\begin{cases} x_5 \le Mx_1 \\ x_6 \le Mx_2 \\ x_7 \le Mx_3 \\ x_8 \le Mx_4 \end{cases}$$

Implementation of a linear programming model to optimization of producer's total expected costs in Sanaye Felezi Iran Co:

To make this model, should be considered the table2 (costs based on million Taman and the production decision making parameters are equal of maximum assembly shop capacity = 40 shelters in each period).

Table 2. Information about the values of costs, decision making parameters and received demands (for production)

Period / Parameter	1	2	3	4
SP(t)	30	30	30	30
hP(t)	8	8	8	8
CP(t)	60	64	58	63
d(t)	15	15	20	15
ZP(t)	40	40	40	40
IP(t)	0	20	0	0

The producer's linear programming model is:

$$Min z = 30x_1 + 30x_2 + 30x_3 + 30x_4 + 60x_5 + 64x_6 + 58x_7 + 63x_8 + 8x_9 + 8x_{10} + 8x_{11} + 8x_{12}$$

S.t:

$$(1)\begin{cases} x_5 \le 40 \\ x_6 \le 40 \\ x_7 \le 40 \\ x_8 \le 40 \end{cases}$$

$$(2)\{x_5 + x_6 + x_7 + x_8 \ge 65$$

$$(3)\begin{cases} x_9 = x_5 - 15 + 0 \\ x_{10} = x_6 - 15 + 0 \\ x_{11} = x_7 - 20 + 20 \\ x_{12} = x_8 - 15 + 0 \end{cases}$$

$$(4)\begin{cases} x_5 \le Mx_1 \\ x_6 \le Mx_2 \\ x_7 \le Mx_3 \\ x_8 \le Mx_4 \end{cases}$$

Implementation of a linear programming model to optimization of distributor's total expected costs in Sanaye Felezi Iran Co:

To make this model, should be considered the table3 (costs based on million Taman and the distribution decision making parameters are equal of maximum assembly shop capacity = 40 shelters in each period).

Table 3. Information about the values of costs, decision making parameters and received demands (for distribution)

Period / Parameter	1	2	3	4
SD(t)	6	6	6	6
hD(t)	4	4	4	4
CD(t)	16	17	18	16
d(t)	15	15	20	15
ZD(t)	40	40	40	40
ID(t)	6	6	6	6

The distributor's linear programming model is:

$$Min z = 6x_1 + 6x_2 + 6x_3 + 6x_4 + 16x_5 + 17x_6 + 18x_7 + 16x_8 + 4x_9 + 4x_{10} + 4x_{11} + 4x_{12}$$

S.t:

$$(1)\begin{cases} x_5 \le 40 \\ x_6 \le 40 \\ x_7 \le 40 \\ x_8 \le 40 \end{cases} \quad (2)\{x_5 + x_6 + x_7 + x_8 \ge 65$$

$$(3)\begin{cases} x_9 = x_5 - 15 + 0 \\ x_{10} = x_6 - 15 + 0 \\ x_{11} = x_7 - 20 + 0 \\ x_{12} = x_8 - 15 + 0 \end{cases}$$

$$(4)\begin{cases} x_5 \le Mx_1 \\ x_6 \le Mx_2 \\ x_7 \le Mx_3 \\ x_8 \le Mx_4 \end{cases}$$

Implementation of a linear programming model to optimization of integrated total expected costs in Sanaye Felezi Iran Co:

To make this model, should be considered the tables: 4, 5 and 6 (costs based on million Taman and the integrated decision making parameters are equal of maximum assembly shop capacity = 40 shelters in each period).

Table 4. Information about the values of costs, decision making parameters and received demands (for supply)

Period / Parameter	1	2	3	4
SQ(t)	15	15	15	15
hQ(t)	10	10	10	10
CQ(t)	25	22	26	26
d(t)	15	15	20	15
ZQ(t)	40	40	40	40
IQ(t)	25	10	0	0

Table 5. Information about the values of costs, decision making parameters and received demands (for production)

Period / Parameter	1	2	3	4
SP(t)	30	30	30	30
hP(t)	8	8	8	8
CP(t)	60	64	58	63
d(t)	15	15	20	15
ZP(t)	40	40	40	40
IP(t)	0	20	0	0

Table 6. Information about the values of costs, decision making parameters and received demands (for distribution)

Period / Parameter	1	2	3	4
SD(t)	6	6	6	6
hD(t)	4	4	4	4
CD(t)	16	17	18	16
d(t)	15	15	20	15
ZD(t)	40	40	40	40
ID(t)	6	6	6	6

The integrated linear programming model is:

$$Min z = 15x_1 + 15x_2 + 15x_3 + 15x_4 + 30x_5 + 30x_6 + 30x_7 + 30x_8 + 6x_9 + 6x_{10} + 6x_{11} + 6x_{12} + 25x_{13} +$$
$$22x_{14} + 26x_{15} 26x_{16} + 60x_{17} + 64x_{18} + 58x_{19} + 63x_{20} + 16x_{21} + 17x_{22} + 18x_{23} + 16x_{24} + 10x_{25} + 10x_{26}$$
$$10x_{27} + 10x_{28} + 8x_{29} + 8x_{30} + 8x_{31} + 8x_{32} + 4x_{33} + 4x_{34} + 4x_{35} + 4x_{36}$$

S.t:

$$(1)-(3)\begin{cases} x_{13} < 40 \\ x_{14} \le 40 \\ x_{15} \le 40 \\ x_{16} \le 40 \\ x_{17} \le 40 \\ x_{18} \le 40 \\ x_{19} \le 40 \\ x_{20} \le 40 \\ x_{21} \le 40 \\ x_{22} \le 40 \\ x_{23} \le 40 \\ x_{24} \le 40 \end{cases}$$

$$(4)\{x_{13}+x_{14}+x_{15}+x_{16}+(25+10) \ge x_{17}+x_{18}+x_{19}+x_{20}$$

$$(5)\{x_{17}+x_{18}+x_{19}+x_{20}+(20) \ge x_{21}+x_{22}+x_{23}+x_{24}$$

$$(6)\begin{cases} x_{21}+0 \ge 15 \\ x_{22}+0 \ge 15 \\ x_{23}+0 \ge 20 \\ x_{24}+0 \ge 15 \end{cases}$$

$$(7)\begin{cases} 25 = x_{13}-x_{17}+0 \\ 10 = x_{14}-x_{18}+25 \\ 0 = x_{15}-x_{19}+0 \\ 0 = x_{16}-x_{20}+0 \end{cases}$$

$$(8)\begin{cases} 0 = x_{17}-x_{21}+0 \\ 20 = x_{18}-x_{22}+0 \\ 0 = x_{19}-x_{23}+20 \\ 0 = x_{20}-x_{24}+0 \end{cases}$$

$$(9)\begin{cases} 0 = x_{17}-80+0 \\ 0 = x_{18}-80+0 \\ 0 = x_{19}-70+20 \\ 0 = x_{20}-60+0 \end{cases}$$

$$(10)\begin{cases} x_{13} \le Mx_1 \\ x_{14} \le Mx_2 \\ x_{15} \le Mx_3 \\ x_{16} \le Mx_4 \end{cases}$$

$$(11)\begin{cases} x_{17} \le Mx_5 \\ x_{18} \le Mx_6 \\ x_{19} \le Mx_7 \\ x_{20} \le Mx_8 \end{cases}$$

$$(12)\begin{cases} x_{21} \le Mx_9 \\ x_{22} \le Mx_{10} \\ x_{23} \le Mx_{11} \\ x_{24} \le Mx_{12} \end{cases}$$

RESULTS AND DISCUSSION

Results of Implementation of a linear programming model to optimization of supplier's total expected costs in Sanaye Felezi Iran Co:

The results of implementation of this step, by using of Win Qsb software are:

Table 7. The optimum amounts of supply

Period / Parameter	1	2	3	4
XQ(t)	40	0	10	15

Table7 shows that:

1. The optimum amount of supply in first period is: 40 units
2. The optimum amount of supply in second period is: 0 units
3. The optimum amount of supply in third period is: 10 units
4. The optimum amount of supply in fourth period is: 15 units
5. The supplier's total expected costs is: 4400 (million Taman)

Results of Implementation of a linear programming model to optimization of producer's total expected costs in Sanaye Felezi Iran Co:

The results of implementation of this step, by using of Win Qsb software are:

Table 8. The optimum amounts of production

Period / Parameter	1	2	3	4
XP(t)	15	35	0	15

Table8 shows that:

1. The optimum amount of production in first period is: 40 units
2. The optimum amount of production in second period is: 0 units
3. The optimum amount of production in third period is: 10 units
4. The optimum amount of production in fourth period is: 15 units
5. The producer's total expected costs is: 9045 (million Taman)

Results of Implementation of a linear programming model to optimization of distributor's total expected costs in Sanaye Felezi Iran Co:

The results of implementation of this step, by using of Win Qsb software are:

Table 9. The optimum amounts of distribution

Period / Parameter	1	2	3	4
XD(t)	15	15	20	*15*

Table9 shows that:

1. The optimum amount of distribution in first period is: 40 units
2. The optimum amount of distribution in second period is: 0 units
3. The optimum amount of distribution in third period is: 10 units
4. The optimum amount of distribution in fourth period is: 15 units
5. The distributor's total expected costs is: 2535 (million Taman)

Results of Implementation of a linear programming model to optimization of integrated total expected costs in Sanaye Felezi Iran Co:
The results of implementation of this step, by using of Win Qsb software are:

Table 10. The optimum amounts of supply, production and distribution

Period / Parameter	1	2	3	4
XQ(t)	40	10	0	15
XP(t)	15	*35*	0	15
XD(t)	15	15	20	15

Table10 shows that:
1. The optimum amount of supply in first period is: 40 units
2. The optimum amount of supply in second period is: 10 units
3. The optimum amount of supply in third period is: 0 units
4. The optimum amount of supply in fourth period is: 15 units
5. The optimum amount of production in first period is: 15 units
6. The optimum amount of production in second period is: 35 units
7. The optimum amount of production in third period is: 0 units
8. The optimum amount of production in fourth period is: 15 units
9. The optimum amount of distribution in first period is: 15 units
10. The optimum amount of distribution in second period is: 15 units
11. The optimum amount of distribution in third period is: 20 units
12. The optimum amount of distribution in fourth period is: 15 units
13. The integrated total expected costs is: 15430 (million Taman)

Comparison between summation of TCQ, TCP and TCD with TCI
1. TC = TCQ +TCP+ TCD = 4400+9045+2535 = 15980
2. TCI = 15430
Comparison between amounts of TC and TCI shows that 550 million Taman reduced cost.

CONCULSION

According to the results of doing this research, the role of creating the integrated system with optimum supply, production and distribution plans is a vital affair for every production or service organization. In fact the determining an accurate program for implementation of supply, production and distribution processes and feeding of assembly departments according to the changing in production plan and as for bill of materials in each workstations, is an important competitive advantage for every organization.

According to the obtained results from optimum supply, production and distribution plans of shelter assembly shop, the decreasing of supplier's total expected costs, producer's total expected costs and distributor's total expected costs.

Because of variety of variations, it is not possible to control the total variations that mean that some impressive variations on the result of research are out of control. So, it is suggested that the related researches in this filed should be done by all impressive variations.

As for the supply, production and distribution total expected cost and its relating to the costs is a new issue in Iranian organizations, so in considering of its indexes and in organizations and filed study, this research has been faced with the previous researches limitations. Also it is suggested that research in this field should be done by impressive various indexes in logistic and different organizations.

REFERENCES

Asgari N, Aghdasi M. 2004. was choosing as case study with the purpose of decreasing the transportation costs in Iran Khodro Company12: 28-36.

Bamol W. 1993. The first prompts for determining the transportation vehicle in an alone product more which could be a model of decreasing the existence and transportation cost 7: 14-30.
Constable R. 1975. A theoretical model for developing the costs of transportation and return of order. These models determine the reclaim of existence point, amount of order and choose a transportation vehicle which lowers the existence and transportation cost, continuously 11(3):27-41.
Dasci C. 2001. Have presented a model for supplying-distribution system based on application of continuous function in order to presenting the distribution cost and customer request9 (3): 118-133.
Ghazanfari H, Hosseini M. 2004. have practiced to the development of a model for optimizing the total cost of logistic distribution in conditions of a producer and some distributed warehouses in supplying chain management 11:62-75.
Ghazanfari H, Seyed Hosseini M. 2004. Have presented some models for integrating the total logistic cost in supplying chain management 154: 91-114.
Ghazanfari M, Khalili Dizaj M. 2004. with the aim of developing a phase multi-purposed model for equalizing the use of transportation machines in logistic system, have considered this issue 325:154-170.
Nishazaki. 2001. Modeled this matter as a phase modeling. In this study the purpose function is for decreasing the cost of transportation, travel time and the number of vehicle16 (7): 51-66.
Nozick T. 2000. as for theory of integrating process, transportation cost and facilities cost and existence, have presented a mathematical model and for considering the performance of the presented model, they have opted a car making factory as a case study 5(3): 48-62.
Teimouri E, Ghiyami Y. 2004. Have presented a model for determining the order point and optimizing the size of order considering the transportation costs 281:29-41.
Watanabe. 1994. by presenting a mathematical Mosel, have practiced to lowering the transportation costs and existence in a production company which the production have been done in some stages and considering the limitation of time for producing a part till requested time to transportation 5:19-35.