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A FRAMEWORK FOR EVALUATING AND COMPARING INVENTORY CONTROL POLICIES IN SUPPLY CHAINS

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Supply chains, always, face increased uncertainty in demand. For that reason, inventory control presents a critical issue of supply chain management. Controlling inventories with proper policies can enhance customer service levels, smooth production plans, and reduce operation costs. In this paper, a framework is suggested for evaluating and comparing different types of inventory control policies. Four distinct inventory control policies are discussed and modeled. Different types of measures are used to evaluate the performance of the supply chains which implement these inventory control policies; performance measures used are; fill rate, as an example of desired measures (to be increased), and inventory level, as an example of undesired measures (to be decreased). A framework for evaluating and comparing the overall performance of the inventory policy is developed and applied. A discrete event simulation with ARENA simulation package is used for developing a simplified supply chain model consists of two echelons, with one supplier that prepares and supplies raw materials to a production/inventory system, which has two different inventories, one for supplied raw materials, and the other for finished products. A numerical example is provided to illustrate the applicability of the developed framework. The applied numerical example clarified the ability of the evaluation framework to deal with different types of inventory control policies, and different practice scenarios.

KEYWORDS: *Supply chain management, Simulation, Inventory control; continuous review; periodic review*

1. INTRODUCTION

Today's uncertain business environments become a major source of competition that leads to improving decision-making practices in a supply chain. According to recent literatures **[3, 5, 10, 11, 15, and 19]**; this can be defined as a network of facilities and distribution entities (suppliers, manufacturers, distributors, retailers, etc.). These entities perform the functions of procurement of raw materials, transformation of raw materials into intermediate and finished products or services to be delivered to a customer. A schematic of traditional supply chain is shown in figure 1.

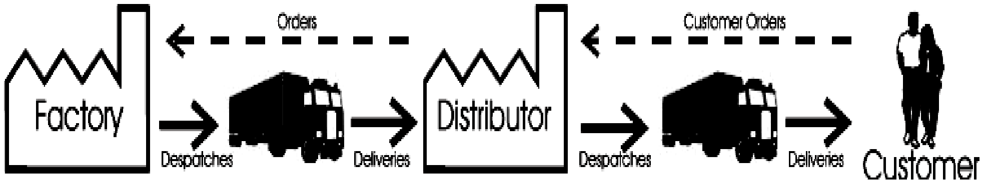

Figure 1 Schematic of a traditional supply chain

For years, different echelons in a supply chain have operated, almost, independently. High coordination among echelons improves supply chain performance. One of the challenges in supply chain management is to control the capital tied up in raw material, work in progress, and finished goods, i.e., the total investment in inventories. Efforts to link production management to various stock keeping processes result in better planning of the supply chain activities and better management of the materials. These improvements resulted in better customer service levels and lower inventories **[13]**.

The objective of inventory management is to balance conflicting goals. For example, keeping stock levels down to have cash available for other purposes conflicts with having high stock levels for the continuity of the production and for providing a high service level to customers. There are two important motives of a supply chain for holding inventories which are economies of scale and the uncertainties inherent in the system. Most researches in this area (inventory management) are concerning with inventory control in stochastic environments. Generally, an uncertain environment implies the existence of various external sources and types of uncertainty, which influence customer demand for product and a replenishment process. The common significant sources of uncertainty for most systems are: demand uncertainty, uncertainties related to supply, and uncertainty in the order delivery lead time **[4]**.

Recently, many supply chains inventory control policies were discussed **[e.g. 2, 8, 9, 14, 16, 18, 20, and 26]**. These policies regulate issuing of orders to replenish stocks. Usually, the structural characteristics of replenishment policy are taken as: (1) fixed or variable reorder cycle, and (2) fixed or variable lot sizes order. Depending on the type of replenishment policy, the most often used control variables are; the length of the review period, safety or reorder level, and order quantity.

This paper presents simulation models of different supply chains inventory control policies; i.e. continuously or periodically reviewed policies. The aim of this work is to develop a new framework to evaluate the performance of different inventory control policies. The performance of the supply chain is evaluated using different types of measures. These measures may be desired (to be increased), such as fill rate, or undesired (to be decreased), such as inventory level. Also these measures may be applied at one or multiple locations of supply chain. Abd El-Aal, et al. **[1]** distinguished four supply chain management simulation types and recommended the use of discrete event simulation type. Discrete event simulation type deals with individual events that incorporate uncertainty to the simulated model. Simulation models are developed using discrete event simulation with ARENA simulation package to illustrate different scenarios.

2. LITERATURE REVIEW

2.1. Inventory Definition and Reasons

Inventory is defined as a stock of items kept on hand by an organization to use to meet customer demand **[22]**. Inventory management and stock management are terms that can be used interchangeably. It is an essential part of managing the supply chain activities. The management challenge is to minimize the stock-holding costs while satisfying customer demand. In other words there is a trade-off between customer service levels achieved and inventories held. Waters **[24]** identifies that the main purpose of inventory stocks is to act as a buffer between supply and demand.

2.2. Inventory Control

Inventory control is the organization methodology to answer the following three basic questions: 1) What items should be stocked? 2) How much to order? 3) When to order? The first of these questions is a matter of good housekeeping, simply avoiding stock that is not needed. The answer of the second question is expressed in terms of what is called 'order quantity'. While the answer of the third question depends on the type of replenishment policy; if it is continuously reviewed, a 'reorder point' is usually specified by the inventory system at which a new order must be placed. If replenishment policy is periodically reviewed, the time for reviewing the inventory position is usually specified to decide if order is placed or not **[21, and 24]**.

2.3. Inventory Replenishment Policies

Traditional concepts in formulating inventory policies have held to the idea that production and sales must be balanced to minimize inventory. Increasing production over sales results in overstocking and increase expenses. Increasing sales over production result in stock-out and loss of business. Whatever the case, a tangible cost value can be applied to each to develop an optimal inventory control policy. There are four basic replenishment policies in use in supply chain inventory management **[6, 7, 12, 17, and 23]**:

(s, Q), (s, S), (T, S), and (T, s, S) policies

Where:

s = reorder point, Q = order quantity,

S = order-up-to level, T = review period (time interval between reviews)

2.3.1. Continuous Review Policies

Under continuous review, the economic order quantity (EOQ) is ordered when the inventory position drops to or below the reorder point s upon the implementation of one of the two continuously inventory control policies (s, Q) or (s, S) Policy.

2.3.1.1. (s, Q) Policy

Replenishment policy: whenever the inventory position (items on hand plus items on order) drops to the reorder point s or below, an order is placed for a fixed quantity Q.

2.3.1.2. (s, S) Policy

Replenishment policy: whenever the inventory position drops to the reorder point s or below, an order is placed for a sufficient quantity to raise the inventory position to the order-up-to level S.

2.3.2. Periodic Review Policies

Inventory position is reviewed at regular instants, spaced at time intervals of length *T*. An order is placed for a sufficient quantity to bring the inventory position up to a given level S upon the implementation of one of the two periodically inventory control policies (*T, S*) or (*T, s, S*) Policy.

2.3.2.1. (T, S) Policy

Replenishment policy: inventory position is reviewed at regular instants, spaced at time intervals of length *T*. At each review, an order is placed for a sufficient quantity to raise the inventory position to the order-up-to level *S*.

2.3.2.2. (T, s, S) Policy

Replenishment policy: inventory position is reviewed at regular instants, spaced at time intervals of length *T*. At each review, if the inventory position is at the reorder point *s* or below, an order is placed for a sufficient quantity to raise the inventory position to the order-up-to level *S*; if inventory position is above the reorder point s, no order is placed.

2. 4. Related Researches

Table 1 represents a sample of recent researches that related to one or more of the inventory control policies that discussed before.

3. PROPOSED PERFORMANCE EVALUATION FRAMEWORK

This section presents the suggested framework for evaluating the performance of any inventory control policy. The proposed framework is so simple to be understood as well as to be implemented. The framework is based on the manager perspective or view-point of dividing the performance measures to desired (to be increased) and/or undesired (to be decreased) measures. This division step facilitates the evaluation process, and provides the bases of the evaluation framework.

The performance evaluation framework for each inventory policy consists of the following steps:

1) Divide the performance measures into two categories:
   a) Desired (to be increased),
   b) Undesired (to be decreased).
2) Evaluate the overall policy performance (ϕ):

$$\phi = \frac{\begin{array}{c}\textit{Coplementary of undesired performance measures} + \\ \textit{Percent of the desired performance measures}\end{array}}{\textit{Total no. of performance measures}}$$

$$\textit{Coplementaryof undesired performance measures} = \textit{1-Percent of undesired performance measures}$$

3) For desired (to be increased) performance measures (fill rate, production flexibility, etc):
   a) Fill rate (as an example of the desired performance measures):
      i) Fill rate calculation:

$$Fill\ rate = 100 \times \frac{no.\ of\ fully\ satisfied\ customers}{no.\ of\ total\ customers}$$

ii) The relative average fill rate is calculated:

$$Relative\ average\ fill\ rate = 100 \times \frac{current\ policy\ fill\ \ rate\text{-}min.\ fill\ rate}{max.\ fill\ \ rate}$$

Table 1 Recent researches related to inventory control policies

Author	Inventory Control Policy					Type of System
	Continuous Review		*Periodic Review*		*Other policies*	
	(s, Q)	*(s, S)*	*(T, S)*	*(T, s, S)*		
Ahire and Schmidt (1996), [2]	●				●	Two-echelon
Kelle and Milne (1999), [14]		●				Multi-echelon
Çakanyildirim et al. (2000), [8]	●					Single-item
Ng et al. (2001), [16]	●					Tow-echelon
Petrovic and Petrovic (2001), [17]	●	●	●	●		Single-item
Chen et al. (2002), [10]	●					Two-echelon
Seo et al. (2002), [20]	●				●	Two-echelon
Saad and Kadirkamanathan (2006), [18]		●			●	Multi-echelon
Zhou et al. (2007), [26]				●	●	Single-item
Karaman and Altiok (2009), [13]	●					Multi-echelon
Tiacci and Saetta (2009), [23]		●			●	Multi-items
Yan et al. (2009), [25]			●			Two-echelon
Zied Babai et al. (2010), [27]		●		●		Multi-items

4) For undesired (to be decreased) performance measures (on-hand inventory level, total cost, lead time, etc):
   a) On-hand inventory level (as an example of the undesired performance measures):
      i) Calculate complementary of relative average inventory level (CRAIL):

$$CRAIL = 1\text{-}\frac{current\ policy\ inventory\ level\text{-}min.\ inventory\ level}{max.\ inventory\ level}$$

      ii) Calculate the overall complementary of average inventory level (OCRAIL):

$$OCRAIL = \frac{Complementary\ of\ relative\ average\ inventory\ level\ of\ raw\ materials\ + \ Complementary\ of\ relative\ average\ inventory\ level\ of\ finished\ products}{2}$$

5) Evaluate the overall policy performance (ϕ):

$$\phi = \frac{Relative\ average\ fill\ rate\ +\ OCRAIL}{2}$$

The calculation of the relative complementary rate of both inventory level and amount lost to is for getting the direct product of them with the fill rate to direct evaluate the performance of each inventory policy. The inventory policy which posses the highest overall evaluation value is the one which gives best practice.

4. PROPOSED SIMULATION MODEL

4.1. Model description

A generic model of a single-product-two-echelon supply chain system is considered. This system contains a raw materials supplier, which supplies the production/inventory facility with raw materials. This production/inventory facility is assumed to produce one product type. The production facility implements an inventory control policy for; replenishing its raw material inventory, and triggering the production process. The sequence of management for the proposed production/inventory system is composed of two segments: inventory and demand management segments. These two segments are conceptually described in figures 2 and 3.

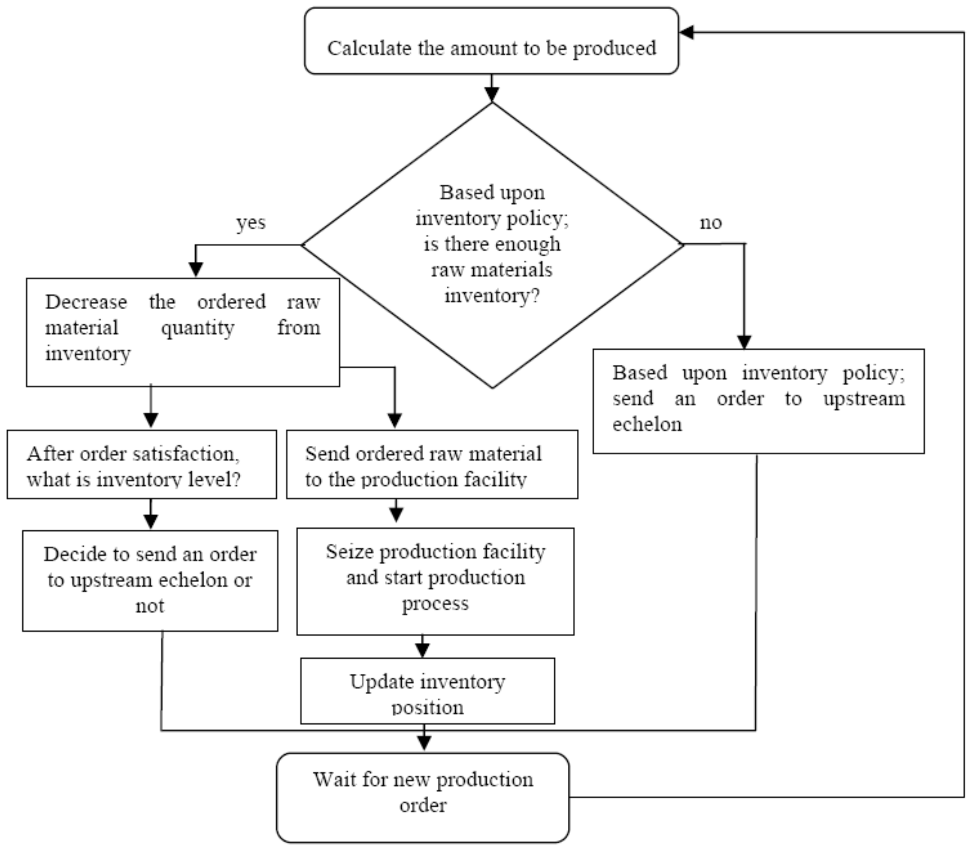

Figure 2 Inventory management conceptual model

4.1.1. Inventory management segment of production/inventory system

This segment deals with items producing and inventory updating. The raw materials are held at their inventory waiting for signal to initiate production process. As soon as production signal is occurred a specified number of raw materials is pulled from raw materials inventory, which is decreased with that raw materials number. After raw materials inventory position is changed, it is checked for replenishment from its supplier. Upon the completion of one product, the finished products inventory is updated.

4.1.2. Demand management segment of production/inventory system

In this segment the customer orders are received, and then the finished product inventory is checked. Enough inventories represent that the order is fully satisfied otherwise the demand is not fully satisfied by on-hand finished products inventory. This unsatisfied portion represents lost sale. In both cases the finished product inventory is decreased by the satisfied items, and then it is checked for production initiating.

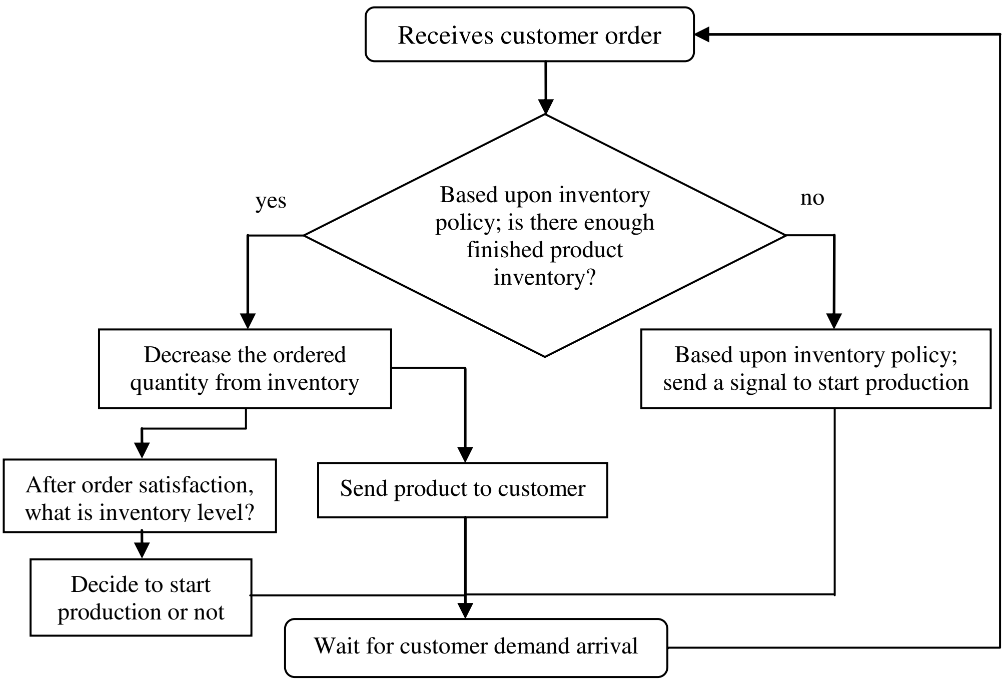

Figure 3 Demand management conceptual model

4.2. Model Assumptions

Model assumptions, concerning inventory processes, considered in this paper are as follows:

a. Customer demand is confined to a single product.
b. The inventory faces customer demand according to Poisson.
c. When demand exceeds the stock, a sales lost is recorded.
d. The raw materials inventory is replenished from an external source (supplier) and replenishment quantities are received with a lead time (transportation delay) follows Erlang distribution.

e. The supplier of raw materials has unlimited inventory.
f. Each model applies the same inventory policy at raw materials and finished products inventory.
g. The two inventories have the same inventory holding costs.
h. Both; fill rate and inventory level have the same weight (in cost terms) of influence on the overall performance of the supply chain.

3.3 Arena Simulation Models

Figures 4 through 8 show details of *(s, Q)* inventory control policy as an example of the developed arena models.

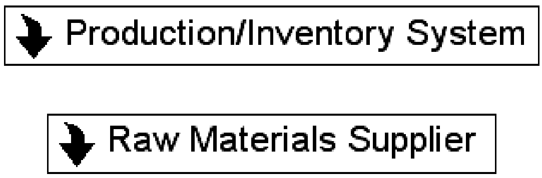

Figure 4 Arena model for the two-echelon proposed supply chain

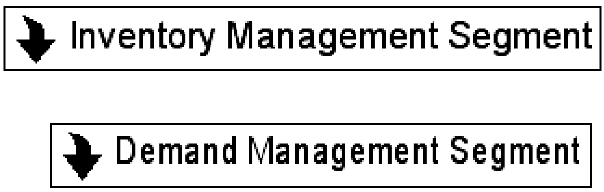

Figure 5 Arena model for the two management segment of the inventory

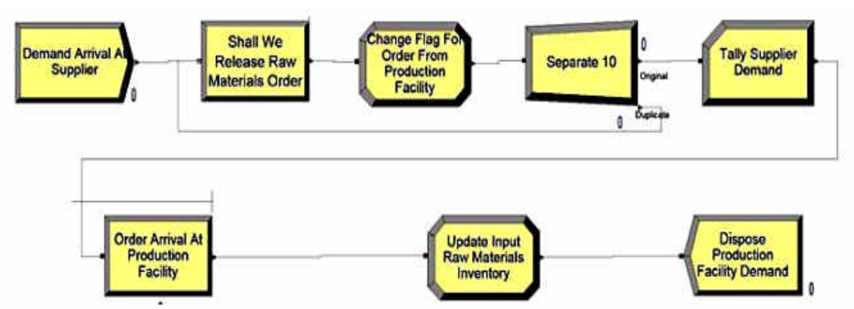

Figure 6 Arena model for the raw materials supplier

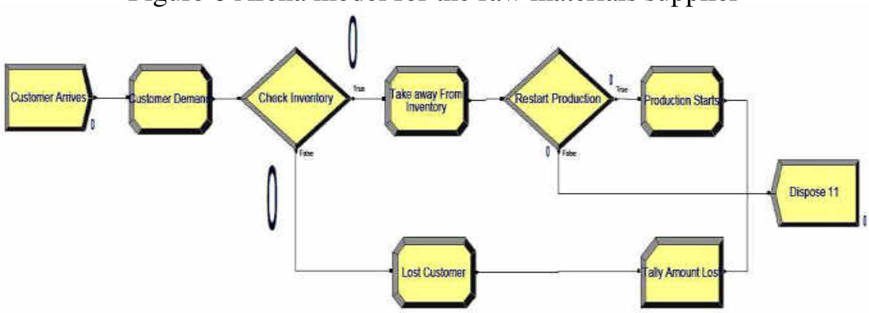

Figure 7 Arena model for the demand management segment of (s, Q) inventory control policy

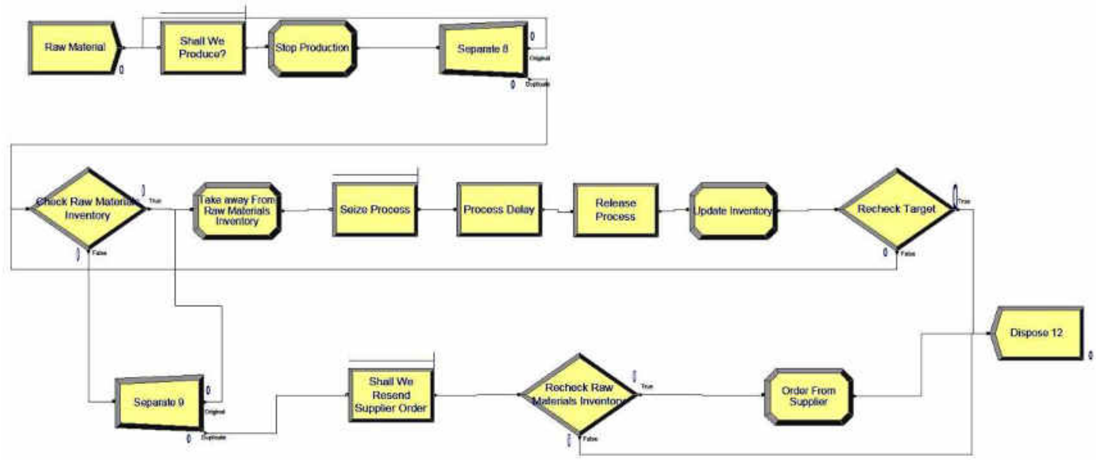

Figure 8 Arena model for inventory management segment of (*s*, *Q*) inventory control policy

4.4. Model Parameters

The following tables (2, and 3) summarize the different parameters and variables of the simulated model. Initial inventory for each, raw materials and finished products, is 150 units. The model is simulated for one complete year or 365 days (8760 hours), for steady state, a warm-up period of 100 days (2400 hours) is applied. For more output confidence, the model has 100 replications.

Table 2 System parameters

Customer order arrival	Demand quantity	Production time	Transportation delay
Poisson (12) hours	Uniform (50, 100) units	Uniform (20, 30) minutes	ERLA(1,2) hours

Table 3 Inventory control variables of the numerical example

Policy	Reorder point	Order quantity	Order-up-to-level	Review period
(s, Q)	80	125	———	———
(s, S)	80	———	175	———
(T, S)	———	———	200	1.5-days
(T, s, S)	80	———	175	1-day

5. RESULTS AND DISCUSION

The results of seven simulation scenarios or experiments are discussed in this section. Each scenario corresponding to different values of customer arrival rate *(λ),* demand amount rate *(β),* and production time rate *(θ),* as a percent of the original customer arrival, demand amount, and production time, respectively, which presented in Table 2.

For each one of these scenarios the performance measures outputs lead to the overall performance of the inventory policy.

The following figures (9, 10, and 11) show the output results of the performance measures of the first simulation scenario ($\lambda = 1, \beta = 1, \theta = 1$).

Figures 9 and 10 illustrate the inventory level of raw materials and finished products, respectively, as documented in the forth and sixth columns in table 4. These two figures also provide a comparison of the undesired performance measure (inventory level) between the four inventory control policies. This comparison indicates that the *(T, s, S)* policy has the lowest inventory level for raw materials and finished products inventories. This good behavior of policy is due to its periodically (each *T* period of time) replenishment to a specified level *(S)*, this replenishment do not occurs until the level of the inventory reaches to the reorder point *(s)*. This means that for some revision periods no replenishment will occurs. On the contrast of the *(T, s, S)* policy is the *(T, S)* policy which has the largest inventory level for raw materials and finished products inventories. This bad behavior of policy is due to its periodically (each *T* period of time) replenishment to a specified level *(S)*, this replenishment is done regardless the level of the inventory. This means that each revision period replenishment is made to bring the inventory level to the point of *S*. The remaining policies; *(s, Q)*, and *(s, S)*, have intermediate level of inventories due to its continuously reviewing and replenishing when the inventory level reaches to the reorder point *(s)*. This means that for some revisions no replenishment will occurs, and as well as the reorder point is reached replenishment will occurs.

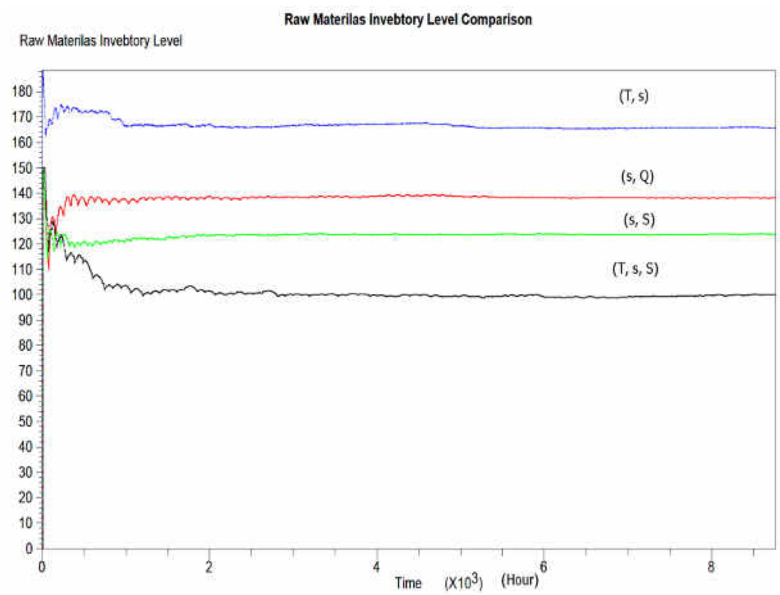

Figure 9 Output results of raw materials inventory level

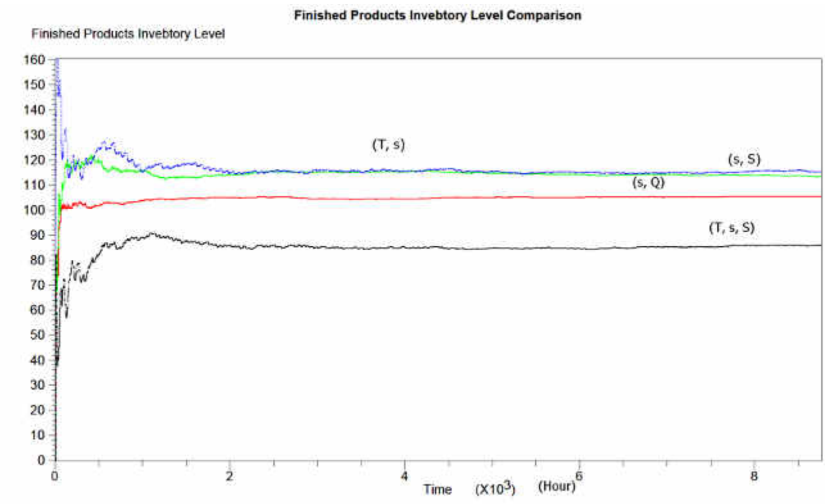

Figure 10 Output results of finished products inventory level

Figure 11 illustrates a comparison of the fill rate between the four control policies, as documented in the second column in table 4. This comparison shows that *(s, Q)* policy has the highest fill rate due to its relatively higher inventory levels than the other policies allover the time periods. This high level of inventory enables the potentiality of satisfying higher numbers of customers, and then increases the fill rate. The *(T, s, S)* policy has the lowest fill rate due to its relatively low inventory levels. Although the *(T, S)* policy has a higher inventory levels than *(s, Q)*, and *(s, S)* policies, it has a lower fill rate. This is due to its reviewing period *(T)* for the replenishing process, while *(s, Q),* and *(s, S)* policies have continuous review and hence continuous replenish process.

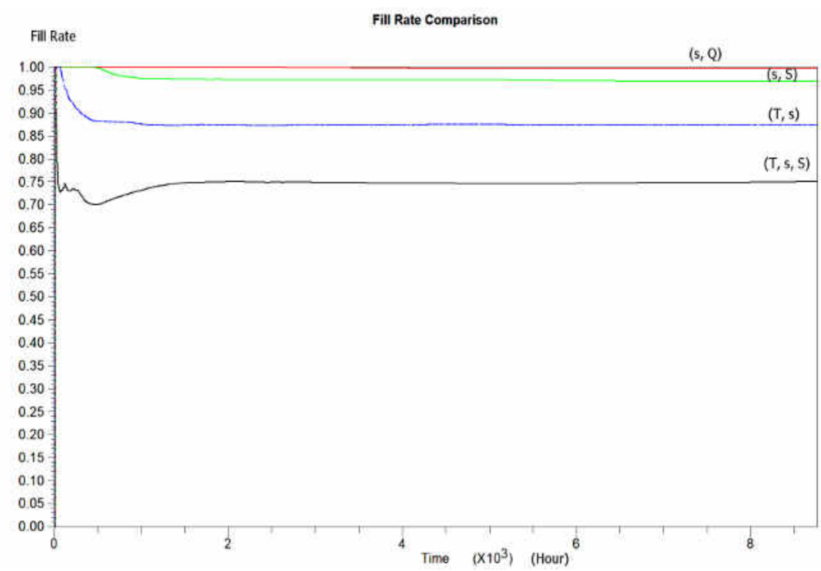

Figure 11 Output results of fill rate

With this output results, the decision maker may not get the right decision, as the results may be shown to be conflicting among the different policies. You can imagine the status when many performance measures are used to evaluate the different policies.

The important role of the suggested evaluation framework is now clarified. It enables the decision maker to give the right decision with simple comparison of the output results of the simulation models. The evaluation framework potential lays in the relative comparison of different policies.

Table 4 Simulation results of the given example with different scenarios

Policy	Fill rate (%)	Relative average fill rate %	Finished products		Raw materials		OCRAIL %	Overall relative policy performance Φ %
			Units	CRAIL %	Units	CRAIL %		
λ = 1, β = 1, θ = 1								
(s, Q)	99.38	23.1435	105.52	81.2267	138.51	75.7787	78.5027	50.8231
(s, S)	96.95	20.6983	113.17	74.5722	124.03	84.5232	79.5477	50.1230
(T, S)	87.97	11.6623	114.96	73.0151	165.59	59.4250	66.2201	38.9412
(T, s, S)	76.38	0	83.94	100	98.40	100	100	50
λ = 0.9, β = 1, θ = 1								
(s, Q)	99.38	26.1521	102.78	80.2427	138.03	74.7144	77.4786	51.8153
(s, S)	96.51	23.2642	111.47	72.4468	124.32	83.1250	77.7859	50.5251
(T, S)	84.57	11.2497	108.13	75.4432	163.01	59.3902	67.4167	39.3332
(T, s, S)	73.39	0	80.76	100	96.81	100	100	50
λ = 0.7, β = 1, θ = 1								
(s, Q)	96.29	26.8771	93.09	83.0949	136.77	73.1335	78.1142	52.4957
(s, S)	95.52	26.0775	107.43	69.7490	123.30	81.4586	75.6038	50.8406
(T, S)	79.16	9.0871	96.27	80.1345	161.80	57.6638	68.8991	38.9931
(T, s, S)	70.41	0	74.93	100	93.30	100	100	50
λ = 1, β = 1.1, θ = 1								
(s, Q)	98.69	28.0170	101.14	81.6874	138.10	75.3383	78.5128	53.2649
(s, S)	92.98	22.2312	110.86	72.9195	123.93	83.9638	78.4417	50.3365
(T, S)	82.86	11.9769	108.06	75.4452	164.28	59.4021	67.4237	39.7003
(T, s, S)	71.04	0	80.84	100	97.59	100	100	50
λ = 1, β = 1.3, θ = 1								
(s, Q)	90.14	30.0865	90.90	88.0098	137.58	75.4638	81.7368	55.9117
(s, S)	85.24	24.6505	108.21	72.0174	123.49	84.1250	78.0712	51.3609
(T, S)	73.50	11.6264	96.83	82.5326	162.68	60.0347	71.2837	41.4550
(T, s, S)	63.02	0	77.93	100	97.66	100	100	50
λ = 1, β = 1, θ = 1.5								
(s, Q)	95.11	18.3892	90.91	91.4767	138.62	76.6390	84.0578	51.2235
(s, S)	95.68	18.9885	106.93	76.7695	124.25	84.9708	80.8702	49.9294
(T, S)	88.21	11.1345	108.96	74.9065	172.47	57.0124	65.9594	38.5469
(T, s, S)	77.62	0	81.62	100	98.33	100	100	50
λ = 1, β = 1, θ = 1.75								
(s, Q)	88.10	12.2361	79.05	98.9577	138.77	79.1638	89.0607	50.6484
(s, S)	91.31	15.8797	99.68	78.8810	125.05	87.0434	82.9622	49.4209
(T, S)	87.81	11.9069	102.76	75.8837	174.12	58.8617	67.3727	39.6398
(T, s, S)	77.32	0	77.98	100	102.49	100	100	50

Table 4 shows the numerical results of applying the suggested method for inventory policies evaluation. This table presents seven simulation scenarios, each scenario corresponding to different values of customer arrival rate *(λ)*, demand amount rate *(β),* and production time rate *(θ)*, as a percent of the original customer arrival, demand amount, and production time, respectively, which presented in table 2.

Column 3 in table 4 is calculated based on step 3 (ii) in the proposed framework. While columns 5 and 7 are calculated based on step 4 (i). Column 8 is the result of applying step 4 (ii) of the proposed framework. The final output of the framework is presented in column 9 as a result of applying step 5 of the proposed framework. This column illustrates the overall performance *(ф)* of the control policies relative to one of them (the reference in this case is the *(T, s, S)* policy), as the average of the measured performance indicators.

The numerical example reflects the influence of changing system's variables, parameters, or scenarios on the performance of the applied inventory control policy. Figures 12, 13 and 14 for the given example show the influence of varying, the demand arrival time rate *(λ)*, the demand amount rate *(β)*, and the production time rate *(θ)*, respectively, on the overall relative performance *(ф)* of the applied inventory policies. As shown in Figure 12 with the decrease of customer arrival rate *(λ)*: policy (*T, S*) has low relative performance *ф* and remains relatively constant. Policy (*s, S*) has high relative performance, which faces relatively low increase with the decrease of *λ*. While policy (*s, Q*) shows the highest relative performance, which increases significantly with the decrease of *λ*.

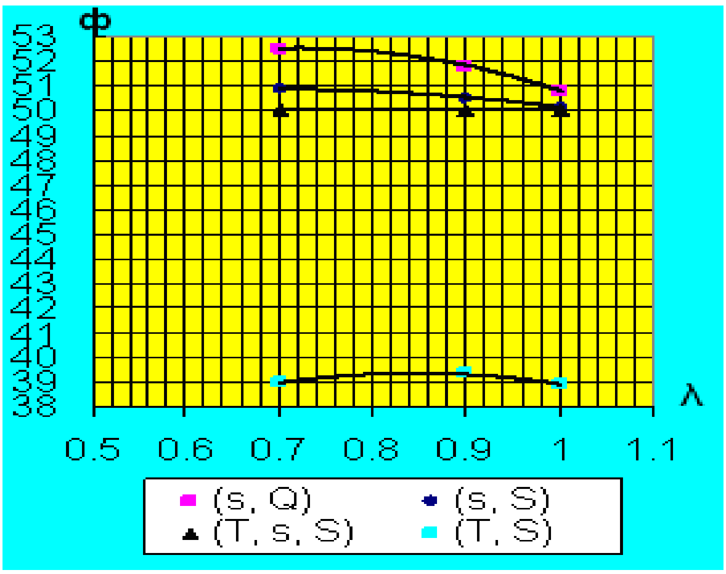

Figure 12 Influence of *λ* variation on the overall relative policy performance.

Figure 13 illustrates the influence of increase in the demand amount rate *(β)* on the relative performance *(ф)* of the control policies. Policy (*T, S*) has the lowest *ф*, which increases with the increase of the *β* rate. This is due to the decrease in the inventory level, and hence the increase in the value of *ф*. Each of (*s, Q*), and (*s, S*) policies have high ϕ value, this value is also increases with the increase in β rate. (*s, Q*) policy has the highest increase rate of ϕ due to its relatively higher fill rate.

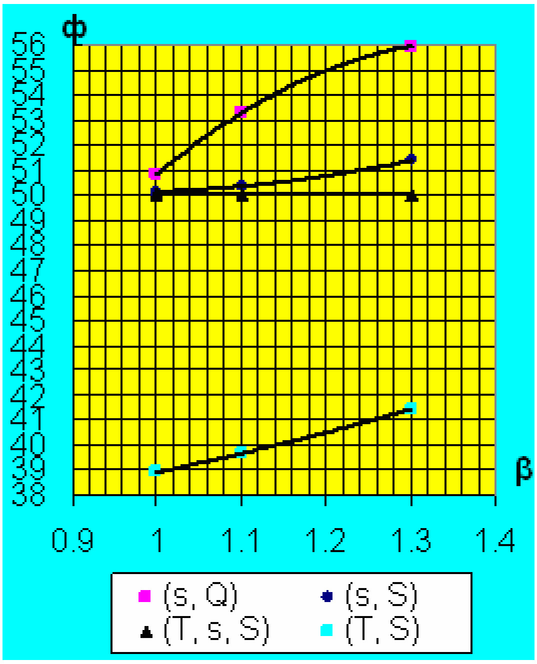

Figure 13 Influence of β variation on the overall relative policy performance.

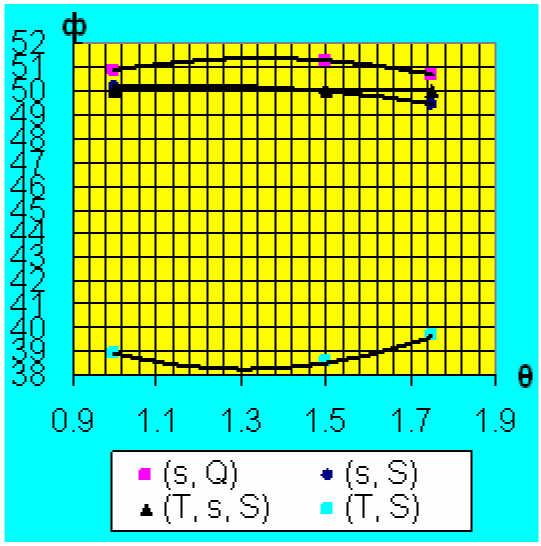

Figure 14 Influence of θ variation on the overall relative policy performance.

Figure 14 presents the effect of increase of the production time rate *(θ)* on the relative policy performance *(ϕ)*. This figure shows very small effect (may be neglected) of θ on the value of ϕ in all policies. This neglected effect is because ϕ value is directly independent of the θ rate.

6. CONCLUSION

This paper presents a framework for evaluating and comparing the performance of different types of inventory control policies. This framework is based upon different types of supply chain performance measures, i.e. desired (to be increased), and undesired (to be decreased). The framework studies the influence of changing supply chain's variables, parameters, and/or scenarios on the performance of the applied inventory control policy. The applied numerical example clarified the ability of the suggested framework to deal with different types of inventory control policies, and different practice scenarios. The framework develops and improves inventory systems maintaining its inventory control policies and recognizing the proper control policy. The relative comparison of the control policies; which is the bases of the proposed framework, (as illustrated in figures 12, 13, and 14) enables the managers or decision makers to get the right decision for applying the appropriate inventory control policy.

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أسلوب لتقييم ومقارنة سياسات مراقبة المخازن في سلاسل الإمداد

تواجه سلاسل الإمداد تقلباً دائماً في كميات الطلب ويحدث هذا الأمر بشكل متزايد. ولهذا السبب فإن مراقبة المخازن تمثل أحد الموضوعات الحيوية لإدارة سلاسل الإمداد.

نتيجةً لتطبيق استراتيجيات مناسبة لمراقبة المخازن يحدث تحسناً ملموساً لمستوى خدمة العملاء وسلاسةً لخطط الإنتاج وتقليلاً في تكاليف العمليات. هذا البحث يقدم مقترحاً لأسلوب يستخدم في تقييم السياسات المختلفة لمراقبة المخازن. يتم في هذا البحث مناقشة و نمذجة أربع سياسات لمراقبة المخازن. يتم استخدام مقاييس مختلفة لتقييم أداء سلاسل الإمداد التي تطبق تلك السياسات لمراقبة المخازن، مقاييس الأداء المختارة هي: معدل انجاز الطلبيات (كمثال للمقاييس التي يرجى زيادة قيمها)، ومستوى المخازن (كمثال للمقاييس التي يرجى نقصان قيمها).

يتم في هذا البحث تقديم وتطبيق أسلوباً لتقييم ومقارنة الأداء الإجمالي لسياسات المخازن. يتم عمل محاكاة لسلسلة إمداد مبسطة باستخدام برنامج المحاكاة (أرينا)، سلسلة الإمداد التي يتم عمل المحاكاة لها تتكون من عنصرين: المصدر الذي يجهز المواد الخام ومنظومة التصنيع والتخزين والتي تشتمل على نوعين من المخازن، احدهما لتخزين المواد الخام، والآخر لتخزين المنتجات. يتم إعطاء مثال بالأرقام لتوضيح قابلية الأسلوب المقترح للتطبيق. هذا المثال يوضح قدرة الأسلوب المقترح للتقييم على التعامل مع السياسات المختلفة لمراقبة المخازن تحت الظروف والخطط المختلفة.