A Fabrication Repertoire Replica Amidst Partisan Commerce Layaway Strategem And Infalllibity Cannibalizing Neutrosophic Fuzzy Number

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Abstract

Infallibility is an important factor both in fabrication repertoire replica and in the great demand of products. During a fabrication process, more exemplary products with high reliableness aim for increase in product demand although credit rating too is a prominent business strategy. Integrating the above duo concepts, we explain and explore mathematically a fabricating repertoire replica with partisan layaway stratagem and infallibility effect on the fabrication system wherein the demand of the customers is reliant on the product cost and rate of decay is regarded as constant. In this propounded model, commerce layaway stratagem on the fabricator and the customer is acquainted by considering all the achievable sitch due to permitted credit (layaway) duration. As a consequence, considering all the achievable instances for the fabricator and the customer's layaway duration, seven non-linear optimization issues for the proposed replica are required.

Keywords: Fabrication repertoire; Infallibility; Fragmentary commerce layaway; Trapezoidal Neutrosophic fuzzy number; Grading scale

1. Introduction:

In classical economic production inventory management, a replica is initiated considering the rate of fabrication and the demand of a product as constant. Nevertheless, as a matter of fact, demand is volatile and dependent on many factors like price, stock, time etc. On the contrary, in the existing combative business conditions, the fabricating enterprises should produce increased infallible products. To facilitate this, the fabricating enterprises are expected to ascertain novel and effective strategems so as to increase the quality of production to produce more infallible products with minimum cost and time and examine periodically whether the output product are perfect or not. This paper focusses on expounding the existing production problem and the outcome of the infallibility of the approach. The relative optimization issue is a non-linear constrained optimization issue with seven instances wherein each instance is solved mathematically. Ultimately, to authenticate the model proposed each instance is solved individually with an illustration

2. Literature Review:

A model for classical economic production inventory management is offered, presuming that the demand and production rate of any given commodity remain constant. In this domain, an integrated system comprising economic production quantity (EPQ) with deterioration and economic ordering quantity (EOQ) lot-size (EPLS) was addressed by Goyal and Gunasekaran [1]. Subsequently, Bhunia and Maiti [2] added demand and inventory level dependent production rate to the Goyal and Gunasekarans model. To get the retailers' attention and increase the number of products they sell, manufacturing companies and retailers give various offers to them in the current, fiercely competitive marketing environment. There are various different types of policies that have been documented by various scholars in the inventory research literature. An EOQ model that takes into account single-level payment delays was presented by Goyal [3]. Subsequently, Goyal, Aggarwal, and Jaggi [4] expanded on Goyal's model to examine how reterritorialization affects the best course of action. Subsequently, Jamal et al. [5] expanded this model by adding elements of shortage and further it was studied by Chu et.al [6], Chung [7], Sarkar et.al [8,9], Liao et.al [10], Teng.

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Manufacturers fix defective products under certain feasible conditions in order to profit more from the problematic products. An production inventory model with reliability-dependent market demand was further extended by Khan, M.A.A., Ahmed, S., Babu, M.S., Sultana, N.,[11], Shaikh, A.A., Khan, M.A.A., Panda, G.C., Konstantaras, I.,[12], Shaikh, A.A., Das, S.C., Bhunia, A.K., Panda, G.C., Khan, M.A.A.,[13] and further an extension to their work was provided by Khan, M.A.A., Shaikh, A.A., Panda, G.C., Konstantaras, I.,[14] and Khan, M.A.A., Shaikh, A.A., Panda, G.C., Bhunia, A.K., and Konstantaras, I [15].

3. Preliminaries:

3.1 Neutrosophic Set:

Let U be a universal set. A neutrosophic set on U is denoted by the relation as $N=\left[T_N(u), I_N(u), F_N(u): u\in U\right]$ where $T_N(u), I_N(u), F_N(u): U \to -]0,1[+$ portraits the level of enrollment, indeterministic and non-participation of the component $u\in U$ with the condition that $-0\le T_N(u)+I_N(u)+F_N(u)\le 3+\forall u\in U$.

3.2 Neutrosophic Fuzzy Number:

A neutrosophic set N defined by the complete ordering of real numbers R is considered a neutrosophic number if, in the remote possibility that it possesses the following characteristics:

(i) N is normal if $\exists u_0\in R$ such that $T_N(u_0)=I_N(u_0)=F_N(u_0)$.

(ii) N is an convex set for the truth function with the condition that the set, $T_N(\mu u_1+(1-\mu)u_2)\ge \min\left(T_N(u_1), T_N(u_2)\right)\forall u_1,u_2\in R, \mu\in\left[0,1\right]$.

(iii) N is an convex set for the indeterministic and falsity function with the condition such that the set has $I_N(\mu u_1+(1-\mu)u_2)\ge \max\left(I_N(u_1), I_N(u_2)\right)\forall u_1,u_2\in R, \mu\in\left[0,1\right]$ and $F_N(\mu u_1+(1-\mu)u_2)\ge \max\left(F_N(u_1), F_N(u_2)\right)\forall u_1,u_2\in R, \mu\in\left[0,1\right]$.

3.3 Trapezoidal Neutrosophic Fuzzy Number:

A trapezoidal neutrosophic fuzzy number $N=\left(n_1,n_2,n_3,n_4,u_B,v_B,w_B\right)$ in R with the following truth, indeterminacy, and falsity function as,

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$$T_{\tilde{N}}(u)=\begin{cases}0; & u\prec n_1\, or\, u\succ n_1\\ \dfrac{u-n_1}{n_2-n_1}u_N; & n_1\le u\le n_2\\ u_N; & n_2\le x\le n_3\\ \dfrac{n_4-u}{n_4-n_3}u_B; & n_3\le u\le n_4\\ 1; & otherwise\end{cases}$$

$$I_{\tilde{N}}(u)=\begin{cases}0; & u\prec n_1\, or\, u\succ n_1\\ \dfrac{n_2-u}{n_2-n_1}v_B; & n_1\le u\le n_2\\ v_N; & n_2\le x\le n_3\\ \dfrac{n_4-u}{n_4-n_3}v_B; & n_3\le u\le n_4\\ 1; & otherwise\end{cases}$$

$$F_{\tilde{N}}(u)=\begin{cases}0; & u\prec n_1\, or\, u\succ n_1\\ \dfrac{n_2-u}{n_2-n_1}w_N; & n_1\le u\le n_2\\ w_N; & n_2\le x\le n_3\\ \dfrac{n_4-u}{n_4-n_3}u_N; & n_3\le u\le n_4\\ 1; & otherwise\end{cases}$$

3.4 Grading Scale Of Trapezoidal Neutrosophic Fuzzy Number:

Let $\tilde{N}=\left(n^l,n^{m_1},n^{m_2},n^u,T_{\tilde{N}},I_{\tilde{N}},F_{\tilde{N}}\right)$ be a trapezoidal neutrosophic fuzzy number where n^l,n^{m_1},n^{m_2},n^u denote the lower bound, values of the first and second median, upper bound $T_{\tilde{N}},I_{\tilde{N}},F_{\tilde{N}}$ represent the degrees of truth, indeterminacy and falsity functions respectively, then its corresponding ranking function is given by,

$$R\left(\tilde{N}\right)=\frac{n^l+n^u+2\left(m_1+m_2\right)}{2}+\left(T_{\tilde{N}}+I_{\tilde{N}}+F_{\tilde{N}}\right)$$

4. Assumptions:

The model proposed is advanced based on the given below assumptions:

1. The fabricator fabricates the articles with infallibility.
2. Interim is inconsequential and retrieval is expeditious.
3. Demand of consumer of any product and its cost are inversely correlated with almost all articles i.e., the cost of products may increase/decrease of the demand of that product respectively. Hence, the demand curve is constructed as a decreasing function of market price $s_p{}'$. In this model, we consider the rate of demand as an exponent function of market price i.e., at all times t_1^*, $D'=\upsilon S_p{}'^{-\chi},\chi\succ 0$. If $\chi=0$, the demand function is transformed into sustained demand.
4. The scheduling horizon of the repertoire approach is boundless.
5. Rate of downturn λ' is constant and ranges between $0\,\&\,1$.

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6. Scarcities are prohibited.
7. The fabricator permits partisan commerce layaway strategem to the customers.

5. Notations:

r_c' – Cost for repossessing the items

h_c' – Possession cost of an item

λ' – Mounting dilapidation rate

s_p' – Market price

p_c' – Unvarying devising cost

p_r' – Devising rate

υ – Parameter for demand function

χ – Parameter for controlling the demand of the function

r_r' – Aplomb value for manufactured goods

$I'(t^*)$ – Stock level at time t where $0 \le t^* \le T^*$

M_t^p – Trade credit period provided by the supplier to the manufacturer

N_t^p – Trade credit period provided by the customer to the manufacturer

ς – Amount to be paid by the customer to the manufacturer at the time of placing an order to purchase the item

I_{m_e}' – Interest gained by the manufacturer

I_{p_m}' – Interest amount paid by the manufacturer

t_1^* – Time of production cessation

6. Mathematical Formulation:

6.1 Crisp Paradigm:

The manufacturing company attempts to manufacture non-defective things during the production period in this challenge. The inventory level is initially thought to be zero. The manufacturing company begins production at time $t=0$ at a pace of p_r' units per unit of time. The surplus amounts are kept once the customer's need has been satisfied. The manufacturing company decides to halt production at time $t=t_1^*$, meeting customer demands for produced items until time $t=T^*$.

Consequently, the following are the equations that govern the above scenario:

$$I'(t)+\lambda' I'(t) = -D' + r_r' p_r', \quad 0 \prec t \le t_1^*$$

$$I'(t)+\lambda' I'(t) = -D', \quad 0 \prec t \le T^*$$

Solving the above equations with the help of the continuity function at $t=t_1^*$ we derive at,

$$I'(t) = \frac{r_r' p_r' - D'}{\lambda'}\left(e^{-\lambda' t}-1\right), \quad 0 \le t \le t_1^*$$

$$I'(t) = \frac{D'}{\lambda'}\left(e^{\lambda'(-t+T^*)}-1\right), \quad t_1^* \le t \le T^*$$

In the above derivation, applying the continuity function $t=t_1^*$ we get the value of t_1^* to be,

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$$t_1^* = \frac{1}{\lambda'}\log\left(1+\frac{D'\left(e^{\lambda' T^*}-1\right)}{r_r' p_r'}\right)$$

Expanding the expression, we obtain t_1^* as, $t_1^* = \left[\frac{D'T^*}{r_r' p_r'} + \frac{1}{2}\left(\frac{D'\lambda'}{r_r' p_r'} - \frac{D'^2\lambda'}{r_r'^2 p_r'^2}\right)T^{*^2}\right]$

Cost of procuring annually per cycle is $PC_A = {r_c'}/{T^*}$

Yearly carrying cost per cycle is $CC_A = \frac{h_c'}{\lambda' T^*}\left(r_r' p_r' t_1^* - D'T^*\right)$

Dilapidation rate for once in twelve months is given by, $DR_A = \frac{p_c'\left(r_r' p_r' t_1^* - D'T^*\right)}{T^*}$

Two distinct situations might arise driven by the credit period durations that have been examined.

Situation 1: $N_t^p \prec M_t^p$

When this occurs, the manufacturer's credit period N_t^p for consumers is shorter than the manufacturer's credit period M_t^p for suppliers. Based on this scenario, four possible outcomes could happen.

Case 1: $M_t^p \le t_1^*$

The sum of the amount that was paid as interest is, $I_{P_1} = \frac{p_c' I_c'}{\lambda' T^*}\left[\int_{t_1^*}^{T^*} I'(t)dt + \int_{M_t^p}^{t_1^*} I'(t)dt\right]$

$$I_{P_1} = \frac{p_c' I_c'}{\lambda'^2 T^*}\left[\lambda'\left(r_r' t_1^* p_r' - T^* D'\right) + \left(p_r' r_r' - D'\right)\left(1 - e^{-\lambda' M_p^t} - \lambda' M_p^t\right)\right]$$

Interest garnered is given by, $I_{E_1} = \frac{\left[s_p' I_{m_e}' D'\varsigma\int_0^{N_t^p} tdt + s_p' I_{m_e}' D'\int_{N_t^p}^{M_t^p} tdt\right]}{T^*}$

$$I_{E_1} = \frac{s_p' I_{m_e}' D'\left[M_t^{p2} - (1-\varsigma)N_t^{p2}\right]}{2T^*}$$

Consequently, the manufacturer's typical expense is disclosed by the following representation,

$$TC_1(T^*) = PC_A + CC_A + DR_A + I_{P_1} - I_{E_1}$$

Case 2: $t_1^* \le M_t^p \le T^*$

Here, the sum of the amount that was paid as interest is, $I_{P_2} = \frac{p_c' I_c'}{T^*}\left[\int_{M_t^p}^{T^*} I'(t)dt\right]$

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$$I_{P_2}=\frac{p_c{}'I_c{}'}{\lambda'^2T^*}\left[e^{\lambda'(T^*-M_t^p)}-\lambda'(T^*-M_t^p)-1\right]$$

Interest garnered is given by, $I_{E_2}=s_p{}'I_{m_e}{}'D'\varsigma\int_0^{N_t^p}tdt+s_p{}'I_{m_e}{}'D'\int_{N_t^p}^{M_t^p}tdt$

$$I_{E_2}=\frac{s_p{}'I_{m_e}{}'D'\left[M_t^{p2}-(1-\varsigma)N_t^{p2}\right]}{2T^*}$$

The manufacturer's typical expense is disclosed by, $TC_2(T^*)=PC_A+CC_A+DR_A+I_{P_2}-I_{E_2}$

Case 3: $N_t^p\le T^*\le M_t^p$

The cycle duration T^* in this instance is greater than the manufacturer's permitted delay time M_t^p. ie., $I_{P_3}=0$

Furthermore, under a partial trade credit policy, the manufacturer may receive interest from client revenue, which is computed as $I_{E_3}=\dfrac{s_p{}'I_{m_e}{}'D'\left[2M_t^pT^*-(1-\varsigma)N_t^{p2}-T^{*^2}\right]}{T^{*^2}}$

Therefore, typical expense is laid out as, $TC_3(T^*)=PC_A+CC_A+DR_A+I_{P_3}-I_{E_3}$

Case 4: $T^*\le N_t^p\le M_t^p$

In this case, the length of the cycle T^* is smaller than both the manufacturer's permitted payment delay period M_t^p and the customers' credit period N_t^p. ie., $I_{P_4}=0$

The manufacturer may be entitled to interest from client income under a partial trade credit policy which may be computed as, $I_{E_4}=s_p{}'I_{m_e}{}'D'\left[M_t^p-(1-\varsigma)N_t^{p2}-\dfrac{\varsigma T^*}{2}\right]$

Hence the typical expense is, $TC_4(T^*)=PC_A+CC_A+DR_A+I_{P_4}-I_{E_4}$

Situation 2: $M_t^p\prec N_t^p$

When the manufacturer's credit period M_t^p from his supplier is less than the manufacturer's credit period N_t^p from customer's three scenarios could occur namely,

Case 5: $M_t^p\prec N_t^p\le t_1^*$

The following determines the amount of interest owed and the interest earned by the manufacturer.

Interest owed is, $I_{P_5}=\dfrac{p_c{}'I_c{}'}{\lambda'^2T^*}\left[\lambda'\left(r_r{}'p_r{}'t_1^*-D'T^*\right)+\left(r_r{}'p_r{}'-D'\right)\left(1-e^{-\lambda'M_t^p}-\lambda'M_t^p\right)\right]$

Interest earned by the manufacturer is, $I_{E_5}=\dfrac{s_p{}'I_{m_e}{}'D'\varsigma M_t^{p2}}{2T^*}$

Typical expense is given by, $TC_5(T^*)=PC_A+CC_A+DR_A+I_{P_5}-I_{E_5}$

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Case 6: $t_1^* \prec M_t^p \prec N_t^p \leq T^*$

Amount of interest owed and the interest earned by the manufacturer is brought out as, $I_{P_6} = \frac{p_c' I_c'}{\lambda'^2 T^*}\left[-\lambda'\left(T^* - M_t^p\right) - 1 + e^{\lambda'\left(T^* - M_t^p\right)}\right]$ and $I_{E_6} = \frac{s_p' I_{m_e}' D' \varsigma M_t^{p2}}{2T^*}$

Manufacturer's typical expense is disclosed by, $TC_6(T^*) = PC_A + CC_A + DR_A + I_{P_6} - I_{E_6}$

Case 7: $T^* \leq M_t^p \prec N_t^p$

The manufacturer's credit period M_t^p in this instance is shorter than the cycle duration T^*. As a result, the maker is exempt from paying interest. ie., $I_{P_7} = 0$

Interest earned by the manufacturer is brought out as, $I_{E_7} = s_p' I_{m_e}' D' \varsigma \left[M_t^p - \frac{T^*}{2}\right]$

Typical expense of the manufacturer is revealed by, $TC_7(T^*) = PC_A + CC_A + DR_A - I_{E_7}$

6.2 Fuzzy Paradigm:

Case 1:

$$TC_1(T^*) = {r_c'}\big/{T^*} + \frac{h_c'}{\lambda' T^*}\left(r_r' p_r' t_1^* - D'T^*\right) + \frac{p_c'\left(r_r' p_r' t_1^* - D'T^*\right)}{T^*} + \frac{p_c' I_c'}{\lambda'^2 T^*}\begin{bmatrix}\lambda'\left(r_r' t_1^* p_r' - T^* D'\right) + \\ \left(p_r' r_r' - D'\right)\left(1 - e^{-\lambda' M_p^t} - \lambda' M_p^t\right)\end{bmatrix} + \frac{s_p' I_{m_e}' D'\left[M_t^{p2} - (1-\varsigma) N_t^{p2}\right]}{2T^*}$$

Here, the variables $r_c', h_c', s_p', p_c', p_r'$ are considered as trapezoidal neutrosophic fuzzy number and on pertaining the ranking function of trapezoidal neutrosophic fuzzy number we forfeit the total cost in fuzzy paradigm to be,

$$TC_1(T^*) = {N(r_c')}\big/{T^*} + \frac{N(h_c')}{\lambda' T^*}\left(r_r' N(p_r') t_1^* - D'T^*\right) + \frac{N(p_c')\left(r_r' N(p_r') t_1^* - D'T^*\right)}{T^*} + \left(\frac{N(p_c') I_c'}{\lambda'^2 T^*}\right)\begin{bmatrix}\lambda'\left(r_r' t_1^* N(p_r') - T^* D'\right) + \\ \left(N(p_r') r_r' - D'\right)\left(1 - e^{-\lambda' M_p^t} - \lambda' M_p^t\right)\end{bmatrix} + \frac{N(s_p') I_{m_e}' D'\left[M_t^{p2} - (1-\varsigma) N_t^{p2}\right]}{2T^*}$$

Case 2:

$$TC_2(T^*) = {r_c'}\big/{T^*} + \frac{h_c'}{\lambda' T^*}\left(r_r' p_r' t_1^* - D'T^*\right) + \frac{p_c'\left(r_r' p_r' t_1^* - D'T^*\right)}{T^*} + \frac{p_c' I_c'}{\lambda'^2 T^*}\left[e^{\lambda'(T^* - M_t^p)} - \lambda'(T^* - M_t^p) - 1\right] + \frac{s_p' I_{m_e}' D'\left[M_t^{p2} - (1-\varsigma) N_t^{p2}\right]}{2T^*}$$

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Here, the variables $r_c', h_c', s_p', p_c', p_r'$ are considered as trapezoidal neutrosophic fuzzy number and on pertaining the ranking function of trapezoidal neutrosophic fuzzy number we forfeit the total cost in fuzzy paradigm to be,

$$TC_2(T^*) = \frac{N(r_c')}{T^*} + \frac{N(h_c')}{\lambda' T^*}\left(r_r' N(p_r') t_1^* - D'T^*\right) + \frac{N(p_c')\left(r_r' N(p_r') t_1^* - D'T^*\right)}{T^*} + \frac{N(p_c') I_c'}{\lambda'^2 T^*}\left[e^{\lambda'(T^* - M_t^p)} - \lambda'(T^* - M_t^p) - 1\right] + \frac{N(s_p') I_{m_e}' D'\left[M_t^{p2} - (1-\varsigma) N_t^{p2}\right]}{2T^*}$$

Case 3:

$$TC_3(T^*) = \frac{r_c'}{T^*} + \frac{h_c'}{\lambda' T^*}\left(r_r' p_r' t_1^* - D'T^*\right) + \frac{p_c'\left(r_r' p_r t_1^* - D'T^*\right)}{T^*} + \frac{s_p' I_{m_e}' D'\left[2M_t^p T^* - (1-\varsigma) N_t^{p2} - T^{*^2}\right]}{T^{*^2}}$$

The variables $r_c', h_c', s_p', p_c', p_r'$ are considered as trapezoidal neutrosophic fuzzy number and on pertaining the ranking function of trapezoidal neutrosophic fuzzy number we forfeit the total cost in fuzzy paradigm to be,

$$TC_3(T^*) = \frac{N(r_c')}{T^*} + \frac{N(h_c')}{\lambda' T^*}\left(r_r' N(p_r') t_1^* - D'T^*\right) + \frac{N(p_c')\left(r_r' N(p_r') t_1^* - D'T^*\right)}{T^*} + \frac{N(s_p') I_{m_e}' D'\left[2M_t^p T^* - (1-\varsigma) N_t^{p2} - T^{*^2}\right]}{T^{*^2}}$$

Similarly, the aforementioned procedure is applied for the remaining cases.

7. Numerical Paragon:

Seven scenarios for each of the aforementioned inventory models have been taken to illustrate each of the inventory models along with all of the solutions.

7.1 Crisp Epitome:

Case 1:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 500/order, s_p' = 80/unit, N_t^p = 0.1/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 1500 units/year, h_c' = 10/unit/year, M_t^p = 0.15 year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.92, \chi = 0.05$$

Case 2:

$$I_c' = 0.12/year, \lambda' = 0.04, r_c' = 400/order, s_p' = 70/unit, N_t^p = 0.164384/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 2000 units/year, h_c' = 5/unit/year, M_t^p = 0.328767 year, \varsigma = 0.07, \upsilon = 1200,$$
$$r_r' = 0.92, \chi = 0.05$$

Case 3:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 500/order, s_p' = 75/unit, N_t^p = 0.164384/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 1600 units/year, h_c' = 7/unit/year, M_t^p = 0.5 year, \varsigma = 0.07, \upsilon = 1100,$$
$$r_r' = 0.95, \chi = 0.06$$

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Case 4:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 450/order, s_p' = 80/unit, N_t^p = 0.8/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 1500units/year, h_c' = 4/unit/year, M_t^p = 0.9year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.94, \chi = 0.06$$

Case 5:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 500/order, s_p' = 50/unit, N_t^p = 0.15/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 2500units/year, h_c' = 5/unit/year, M_t^p = 0.1year, \varsigma = 0.07, \upsilon = 1500,$$
$$r_r' = 0.94, \chi = 0.05$$

Case 6:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 400/order, s_p' = 80/unit, N_t^p = 0.3/year, I_{m_e}' = 0.08/year,$$
$$p_c' = 50/unit, p_r' = 1500units/year, h_c' = 10/unit/year, M_t^p = 0.2year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.95, \chi = 0.05$$

Case 7:

$$I_c' = 0.12/year, \lambda' = 0.05, r_c' = 500/order, s_p' = 75/unit, N_t^p = 0.9/year, I_{m_e}' = 0.07/year,$$
$$p_c' = 50/unit, p_r' = 1600units/year, h_c' = 5/unit/year, M_t^p = 0.7year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.92, \chi = 0.06$$

The ideal solution in crisp paradigms is displayed in the table below for each scenario.

Epitome	Cases	t_1^*	T^*	$TC(T^*)$
1	1	0.2180	0.3731	2313.86
2	2	0.1790	0.3385	1143.23
3	3	0.2089	0.3725	756.73
4	4	0.3249	0.5918	849.75
5	5	0.2030	0.3849	2468.87
6	6	0.1844	0.3260	2036.10
7	7	0.3031	0.5741	1543.79

Table 1: Solution obtained in crisp paradigm

7.2 Fuzzy Epitome:

The fuzzy parameters are considered in this model includes the values of the variables,

Doi: https://doi.org/10.54216/IJNS.240118
Received: August 24, 2023 Revised: December 27, 2023 Accepted: April 07, 2024

$$r_c' = (350,450,550,650);\left(r_c'^L, r_c'^U\right) = (400,600);\left(T_{r_c'}, I_{r_c'}, F_{r_c'}\right) = (500,490,500)\,\&\, RN\left(r_c'\right) = 510$$

$$p_r' = (750,1250,1750,2250);\left(p_r'^L, p_r'^U\right) = (1000,2000);\left(T_{p_r'}, I_{p_r'}, F_{p_r'}\right) = (1500,1495.5,1500)$$

$$h_c' = (7,9,11,13);\left(h_c'^L, h_c'^U\right) = (8,12);\left(T_{h_c'}, I_{h_c'}, F_{h_c'}\right) = (10,8,10)\,\&\, RN\left(h_c'\right) = 10, RN\left(p_r'\right) = 1500$$

$$s_p' = (50,70,90,110);\left(s_p'^L, s_p'^U\right) = (60,100);\left(T_{s_p'}, I_{s_p'}, F_{s_p'}\right) = (80,75,80)\,\&\, RN\left(s_p'\right) = 82$$

$$p_c' = (20,40,60,80);\left(p_c'^L, p_c'^U\right) = (30,70);\left(T_{p_c'}, I_{p_c'}, F_{p_c'}\right) = (50,40,50)\,\&\, RN\left(r_c'\right) = 54$$

Case 1:

$$I_c' = 0.12/year, \lambda' = 0.05, N_t^p = 0.1/year, I_{m_e}' = 0.07/year, M_t^p = 0.15 year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.92, \chi = 0.05$$

Case 2:

$$I_c' = 0.12/year, \lambda' = 0.04,\ N_t^p = 0.164384/year, I_{m_e}' = 0.07/year, M_t^p = 0.328767 year, \varsigma = 0.07,$$
$$\upsilon = 1200, r_r' = 0.92, \chi = 0.05$$

Case 3:

$$I_c' = 0.12/year, \lambda' = 0.05, N_t^p = 0.164384/year, I_{m_e}' = 0.07/year, M_t^p = 0.5 year, \varsigma = 0.07, \upsilon = 1100,$$
$$r_r' = 0.95, \chi = 0.06$$

Case 4:

$$I_c' = 0.12/year, \lambda' = 0.05, N_t^p = 0.8/year, I_{m_e}' = 0.07/year, M_t^p = 0.9 year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.94, \chi = 0.06$$

Case 5:

$$I_c' = 0.12/year, \lambda' = 0.05, N_t^p = 0.15/year, I_{m_e}' = 0.07/year, M_t^p = 0.1 year, \varsigma = 0.07, \upsilon = 1500,$$
$$r_r' = 0.94, \chi = 0.05$$

Case 6:

$$I_c' = 0.12/year, \lambda' = 0.05,\ N_t^p = 0.3/year, I_{m_e}' = 0.08/year, M_t^p = 0.2 year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.95, \chi = 0.05$$

Case 7:

$$I_c' = 0.12/year, \lambda' = 0.05, N_t^p = 0.9/year, I_{m_e}' = 0.07/year, M_t^p = 0.7 year, \varsigma = 0.07, \upsilon = 1000,$$
$$r_r' = 0.92, \chi = 0.06$$

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The ideal solution in fuzzy paradigms is displayed in the table below for each scenario.

Table 2: Solutions obtained in fuzzy paradigm

Fuzzy Paradigm				
Epitome	Cases	t_1^*	T^*	$TC(T^*)$
1	1	0.2177	0.3123	1726.13
2	2	0.1453	0.2558	1069.95
3	3	0.1334	0.2950	703.33
4	4	0.2499	0.4255	793.32
5	5	0.1686	0.3167	1985.49
6	6	0.1107	0.2877	1873.74
7	7	0.1931	0.4183	1488.37

8. Conclusion:

This paper aims on a fabrication repertoire replica for perishable articles accounting cost associated demand and infallibility related rate of fabrication amidst partisan layaway strategem. Probing into the correlation between the infallibility and the cost of fabrication of the approach graphically, the infallibility of the product is the principal factor pertained to the entire cost of fabrication of the system. The more infallible the product is, lower will be the cost of the system and if the fabrication system fabricates lea infallible articles, higher will be the cost of system. From the numerical analysis, it is found that the overall price of the system is least when the customer's payment period is greater than the extent of the recession cycle and less than the fabricator's layaway period. Hence, it may be inferred that this instance of the system is more frugal for the fabricator than all the distinct instances.

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