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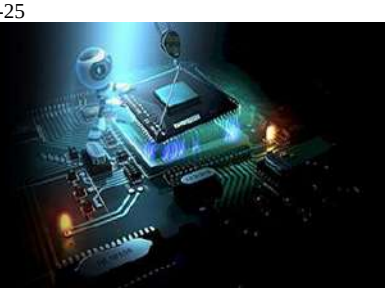

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Reliability checking and performance analysis of stake holder of E-SCM using machine learning and petrinets

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Abstract
Electronic commerce or E-commerce (sometimes written as E-commerce) is a business model that lets firms and individuals buy and sell things over the internet.
E-commerce provides the sellers with a global reach. They remove the barrier of place. Now sellers and buyers can meet in the virtual world, without the hindrance of location.
Supply chain management is coordination of all supply activities of an organization from its suppliers and partners to its customers efficiently and effectively. Electronic supply chain management (E-SCM) is collaborative use of technology to improve the operations of supply chain activities as well as the management of supply chains. The advantages of E-SCM are many, and include timely order-processing, improved inventory tracking and management, improved accuracy in order fulfillment. But which E-SCM is a reliable one is a bothering question of a customer. The customer is the most important and integral part of the supply chain. Neglecting the customer in this chain can cause breakdown of the entire process.
The electronic supply chain provides retailers and their suppliers a medium for instant communication. But can a customer rely on a paticular retailer and can the customer expect his product on time. This reliability can be checked by using Bayesian appoach. Then petrinet is used to check the performance of retailers, manufacturers and suppliers and find out when the product will reach the customer through this E-SCM. Using web design tools a webpage is created to give information about supplier. The given information is checked in the background for its authenticity. Later the delivery details will be sent to customer only if information is authentic. This will benefit the customers from fraud sites and help them find a reliable retailer and improves reliability of customer on retailer. Also helps customers in taking decision to place the orders. If order is placed then predicts the number of days taken to deliver that product to customer. Therefore helping the customer to keep track of the order. Hence overall satisfaction of the customer is improved.

Keywords: E-SCM, companies, machine learning and petrinets, Electronic commerce

Introduction
Nowadays people prefer online shopping than going to the markets. Well, as the development of E-commerce is increasing all over the country day by day more people are getting attracted towards online shopping. Be it clothes, books, groceries or any other essential items people prefer to shop online.
Some of the factors why people prefer online shopping are:

1. Variety
2. Convenience
3. Reasonable price
4. Easy return and exchange policies
5. Additional discounts

Online shopping websites operating in a large number in the country to provide variety of dresses, shoes and other accessories to the citizens without any hassle have made their life quite easier but reliability of many of these websites is still a question.
E-commerce and online shopping is growing exponentially every day. Trust is a critical factor in the online purchasing decision of the consumer. The lack of trust is a fundamental reason why many users won't purchase goods or services from E- commerce Web sites. Much research ahs been done on the area of trust and E-commerce. However, no single, comprehensive definition exist do to the complex notion of trust and the factors that go into a

the development of trust in an e-vendor. Many consumers are sceptical or suspicious about the functional mechanisms of electronic commerce, its intransparent processes and effects, and the quality of many products that are offered online.

E-Supply chain management is practiced in manufacturing industries. E-SCM involves using internet to carry out value added activities so that the products produced by the manufacturer meets customers' and result in good return on investment. E- SCM is the effective utilization of internet and business processes that help in delivering goods, services and information from the supplier to the consumer in an organized and efficient way.

E-SCM chain consists of the following players — manufacturer, logistics companies, distributors, suppliers, retailers and customers. E-Supply Chain Management concentrates on the coordination between the various players in the chain. Coordination is very essential for the success of the organization. E-SCM focuses on reducing the inventory cost.SCM involves counter checks of materials, information and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. It involves coordinating and integrating these flows both within and among companies.

Extranet, intranet, Internet are used in E-supply chain. Extranet helps to connect the participating companies. It may be the supplier or the customer. A customer can check the order status. Likewise, a supplier can collect data about inventory to know about the replenishment of the inventory.

With the help of internet, a company can advertise about the product and accept online orders. With the help of intranet, an organization can maintain communication within the boundaries of the company. It is said that the ultimate goal of any effective SCM is to reduce inventory.

E-supply chain enables to link the supplier with the customer by exchanging information instantaneously. The organization has sufficient inventory when required. There will not be any shortage or surplus of inventory. Shortage of inventory brings down the reputation of the firm. Likewise, excess inventory blocks the funds of the firm unnecessarily.

Machine learning is a subfield of artificial intelligence (AI). The goal of machine learning generally is to understand the structure of data and fit that data into models that can be understood and utilized by people.

A Petri net is essentially like a finite state machine. There are states (although in Petri nets, they're called places), and there are transitions between them. Places are depicted as circles and transitions are depicted as rectangles.

Problem description

As E-commerce is recent trends in online shopping where stakeholder is not physically available. All transaction is to be done by mutual trust, the backbone of E-commerce is E-SCM. E-SCM may not have reliable stakeholders for doing online business because of which the entire online business may fall and customer will not be able to known when their product will reach them, to avoid this reliable checking model is required. This is the thing done in "Reliability checking and Performance Analysis of Stake holder of E-SCM using Machine Learning and Petrinets".

Objectives

- To carryout literature survey on traditional Supply Chain Management(SCM) and E-SCM.
- To study different methods of Bayesian approach and PetriNet.
- To design and implement the reliable model of E-SCM.
- To implement the E-SCM using Matlab software tools.
- To design a dashboard for reliable model of E-SCM.

Literature survey

Online retail experience and customer satisfaction: the mediating role of last mile delivery Description:

In order to successfully address the growing and rapidly changing expectations of online shoppers, recent e-commerce and retail research have developed a strong customer experience agenda. In pursuit of a deeper understanding of customer experience, the topic has become complex and multifaceted endeavor. Recent studies suggest adopting a multistage view for understanding customer decision-making and retail experience.

The multistage perspective shows a good fit for e-retail customer experience once the core activities and touchpoints are identified.

The expanding market continuously generates revenue records in the setting where the joint market value of e-retail giants such as Amazon and Alibaba is comparable to the gross domestic product of Mexico or Spain. The front runners reach beyond the scope of retail by developing e-services, digital media, and hardware, and reorient towards long-term relationships with their customers. In this market race, e-retailers invest in the exploration of new sources and tools of customer satisfaction as part of their market strategy in order to leverage customers experience and gain a competitive edge.

Advantages

1. Delivery experience has a significant effect on the relationship between the online shopping experience and total customer satisfaction.

Disadvantages

1. The access dimension had a significant effect on overall service quality, but not on satisfaction.
2. Customer trust and customer loyalty, and other potentially relevant components of the e-retail experience that are still to be identified.
3. Despite a flawless online shopping experience, the delivery experience leaves the customer dissatisfied (for example, the parcel contains the wrong item or the parcel is taken to a very inconvenient pickup location). As a result, customers may switch to alternative e-retailers in an attempt to avoid future service failures.

Examining the impact of electronic supply chain management processes between stakeholder and customer

Description

The explosion of the Internet and portable electronic gadgets has culminated in the growing prevalence of e-businesses by availing the means through which real-time communication can be achieved at all levels of the supply chain. This has led to the establishment of what has come to be known as E-SCM.

E-SCM plays a significant role in the optimization of business operations by introducing a dramatic reduction in costs through the prompt involvement of players in the supply chain.

This is because the Internet and electronic gadgets facilitate the acquisition and interpretation of real-time market information to relevant stakeholders and players in the supply chain. The Internet allows the players in the supply chain to participate, anticipate and adjust to the dynamism of market trends. In this way, the company frees up resources by reducing the expenditure on stockpiling against demand spikes. The reduced costs result in an increase in the speed and accuracy of the data- sharing processes in the company, thus ensuring the delivery of the highest possible customer value.

Advantages

1. Internet plays a significant role in the reduction of operational costs by availing multiple, concurrent and complementary channels, along with a more elaborate mix of customer service capacities.
2. The Internet has made it very easy to search and locate products, place orders, and have them shipped from different parts of the world in a manner that was not possible before the inception and popularization of e-commerce platforms.

Disadvantages

2. Website costs - planning, designing, creating, hosting, securing and maintaining a professional e-commerce website isn't cheap, especially if you expect large and growing sales volumes.

Petri Nets for Dynamic Event-Driven System Modeling. Description

A Petri net is a particular kind of bipartite directed graphs populated by three types of objects. These objects are places, transitions, and directed arcs. Directed arcs connect places to transitions or transitions to places. In its simplest form, a Petri net can be represented by a transition together with an input place and an output place. This elementary net may be used to represent various aspects of the modeled systems. For example, a transition and its input place and output place can be used to represent a data processing event, its input data and output data, respectively, in a data processing system. In order to study the dynamic behavior of a Petri net modeled system in terms of its states and state changes, each place may potentially hold either none or a positive number of tokens. Tokens are a primitive concept for Petri nets in addition to places and transitions. The presence or absence of a token in a place can indicate whether a condition associated with this place is true or false, for instance. A Petri net is formally defined as a 5-tuple N = (P, T, I, O, M0), where (1) P = {p1, p2, …, pm} is a finite set of places; (2) T = {t1, t2, …, tn} is a finite set of transitions, $P \cup T \neq \emptyset$, and $P \cap T = \emptyset$; (3) I: $P \times T \rightarrow N$ is an input function that defines directed arcs from places to transitions,

where N is a set of nonnegative integers; (4) O: $T \times P \rightarrow N$ is an output function that defines directed arcs from transitions to places; and (5) M0: $P \rightarrow N$ is the initial marking. A marking in a Petri net is an assignment of tokens to the places of a Petri net. Tokens reside in the places of a Petri net. The number and position of tokens may change during the execution of a Petri net. The tokens are used to define the execution of a Petrinet.

A Petri net graph is a Petri net structure as a bipartite directed multigraph. Corresponding to the definition of Petri nets, a Petri net graph has two types of nodes. A circle represents a place; a bar or a box represents a transition. Directed arcs (arrows) connect places and transitions, with some arcs directed from places to transitions and other arcs directed from transitions to places. An arc directed from a place pj to a transition ti defines pj to be an input place of ti, denoted by I(ti, pj) = 1. An arc directed from a transition ti to a place pj defines pj to be an output place of ti, denoted by O(ti, pj) = 1. If I(ti, pj) = k (or O(ti, pj) = k), then there exist k directed (parallel) arcs connecting place pj to transition ti (or connecting transition ti to place pj). Usually, in the graphical representation, parallel arcs connecting a place (transition) to a transition (place) are represented by a single directed arc labeled with its multiplicity, or weight k. A circle contains a dot represents a place contains a token

Advantages

1. Petri nets have been proven to be a powerful modeling tool for various types of dynamic event-driven systems.

Disadvantages

1. When Petri nets are used in the process of system design then there is no way of using them totally separated from other methods. So integration concepts, as well as respective tools, are necessary.

Online Shopper Behavior: Influences of Online Shopping Decision Description

The process of making decision are very similar whether the consumer is offline or online. But one some major differences are shopping environment and marketing communication. According to traditional consumer decision model, Consumer purchase decision typically starts with need awareness, then information search, alternative evaluations, deciding to purchase and finally, post-purchasing behavior. In terms of online communication, when customers see banner ads or online promotion, these advertisements may attract customers' attention and stimulate their interesting particular products. Before they decide to purchase, they will need additional information to help them out. If they do not have enough information, they will search through online channels, e.g., online catalogs, websites, or search engines. When customers have enough information, they will need to compare those choices of products or services. In the search stage, they might look for the product reviews or customer comments. They will find out which brand or company offers them the best fit to their expectation. During this stage, well-organized web site structure and the attractive design are important things to persuade consumers to be interested in buying product and service.

Advantages

1. Motivations that lead consumer to buy online: Convenience, Available products and services, Cost and time efficiency.

Disadvantages

1. Factors that Impede Consumers from online Shopping: Security, Intangibility of online product, Social contact, Dissatisfaction with online shopping.

Petri Net Based Resource Modeling and Analysis of Workflows with Task Failures Description:
Petri nets are a powerful formalism in modeling Inidentified and widely used as workflows. A workflow determines the flow of work according to pre-defined business process definitions.many situations, business processes are constrained by scarce resources. The lack of resources can cause contention, the need for some tasks to wait for others to complete, and the slowing down of the accomplishment of larger goals. In our previous work, a resource-oriented workflow nets (ROWN) based on two-transition task model was introduced for resource-constrained workflow modeling and analysis. Considering the possibility of task failure in the middle of execution, we propose a three-transition task model to specify a task's start, end and failure in this paper. Resource requirements for general workflow can be done through reachability analysis. For a class of well- structured workflows, an efficient resource analysis algorithm is developed.

Advantages
1. It is simple to use this approach. One can easily modify an existing Petri net functionality.
2. It allows multi-case resources requirements analysis. The number of cases are specified by the number of tokens in the source place i at the initial state.
3. It virtually works for all workflows, regardless of whether they are complex or simple in terms of control flow.
4. It can be identified and widely used as a solid model of business processes.

Disadvantages
1. The concurrency of operations has become more and more common. This has generally improved utilization and throughput, but consequently increases the complexity.
2. Subclasses of Petri nets increase the decision power, but at a cost of being unable to model a large number of systems. Extended Petri net models increase the modeling power, but in all known cases at the expense of decision power, since most analysis questions become undecidable.
3. Petri net models have limitations in their inability to test for exactly a specific marking in an unbounded place and to take action on the outcome of the test.

Synchronization among Activities in a Workflow using Extended Workflow Petri Nets Description:
To maximize throughput in workflow systems concurrency is required. On the other hand concurrency must be controlled especially in systems in which a set of tasks cannot serve more than one activity at a time constituting a critical section. Workflow space is

1. System design
3.1 Proposed System Design
In this chapter designing of the reliability checking of stakeholders and prediction of the product reaching the customer is done.

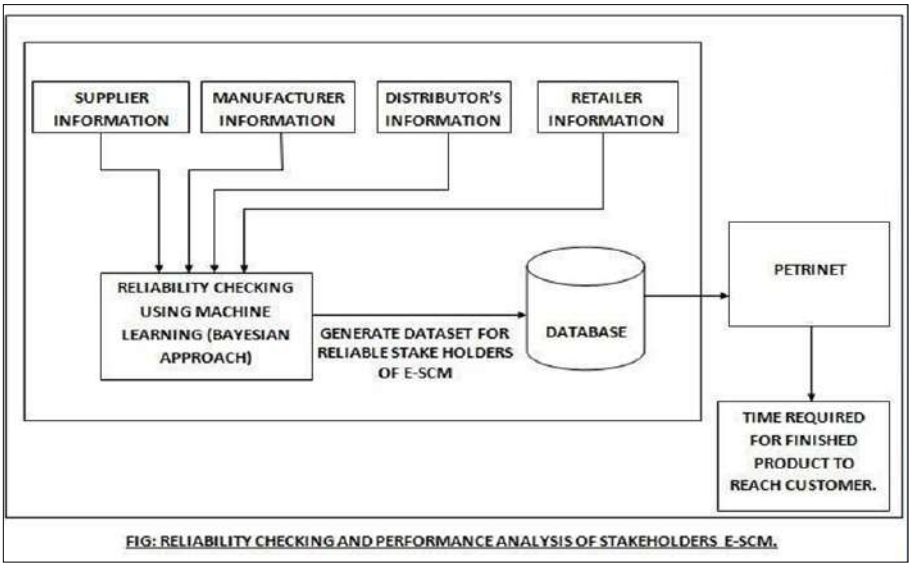


Fig 3.1.1: Reliability checking and performance analysis of stakeholders E-SCM

Input: Information about Manufacturer, Supplier, Distributor, Wholesaler, Retailer. PROCESS: Using bayes rule for checking whether E-SCM is reliable or not. Using petrinet mathematical tool checking the performance of the Manufacturer, Supplier,Distributor, Wholesaler and Retailer in the background. To predict when the product will reach the customer using workflow petrinets. Using web design tool creating webpage and giving information about the supplier and checking the information given by the supplier is authentic or not in the background. If authentic it is passed on to the customer.
Output: Prediction of number of days required for finished product to reach the market using workflow petrinets and reliability check of stakeholders.

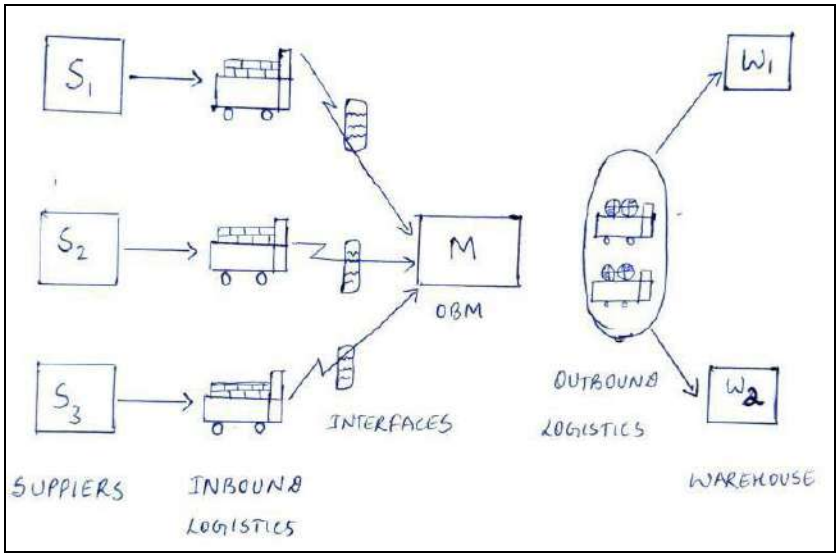


Fig 3.1.2: The supply chain considered for petrinet modelling

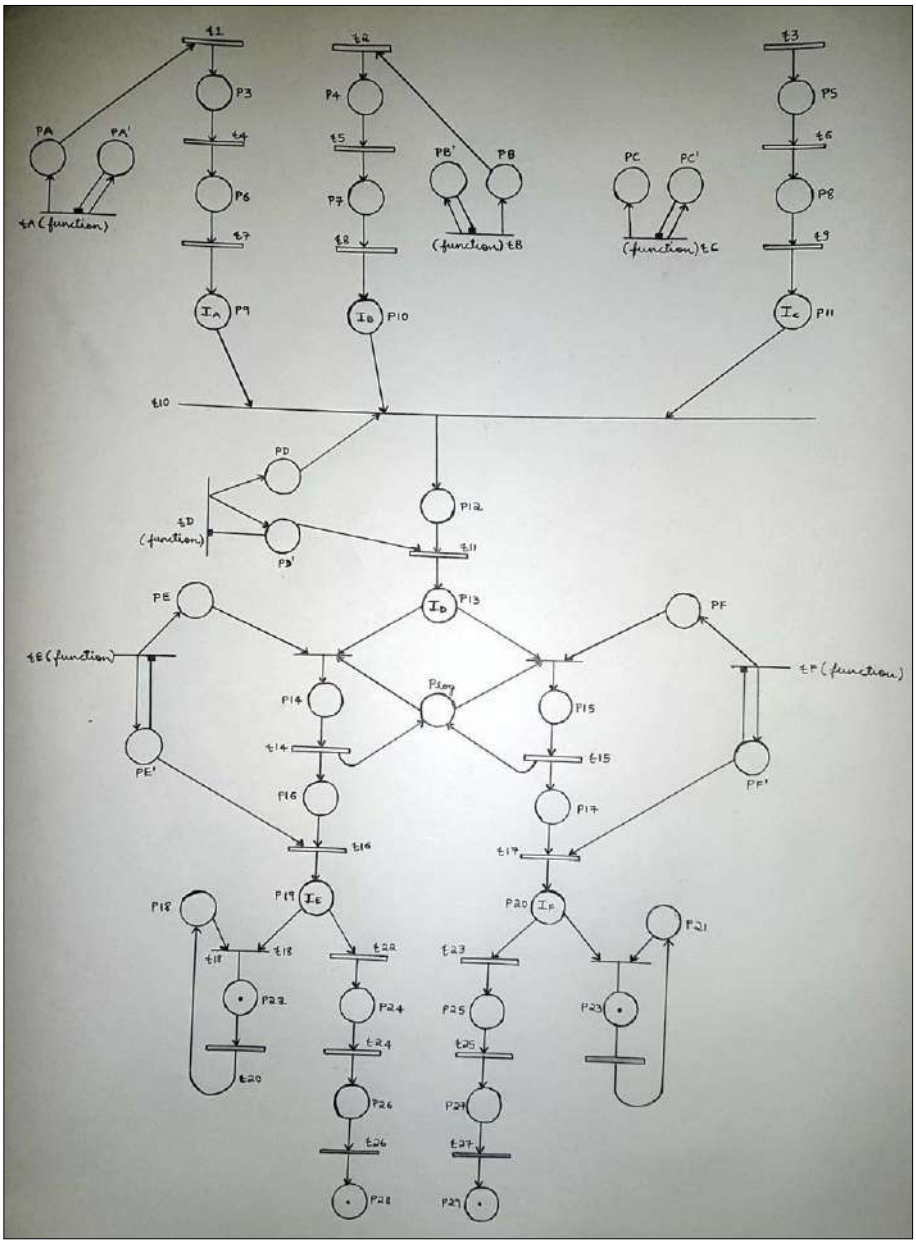


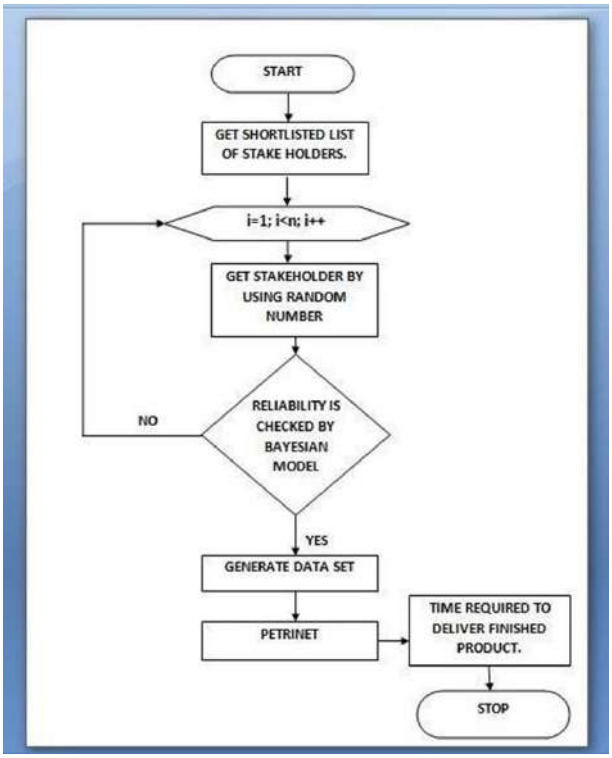
Fig 3.1.3: Petri net model for the reorder point inventory control based supply chain.

Table 1: Description of the Petri net for reorder point based ased supply chain

Place Name	Description
PA’	Material on order to supplier of A
PB’ PC’ PA PB PC P3 P4 P5 P6 P7 P8 P9 P10 P11 PD PD’ P12 P13 PE PE’ PF PF’ P14 P15 Plog P16 P17 P19 P20 P18 P21 P22 P23 P24 P25 P26 P27 P28 P29	Material on order to supplier of B Material on order to supplier of C Manufacturing at supplier of A Manufacturing at supplier of B Manufacturing at supplier of C Logistics from supplier of A Logistics from supplier of B Logistics from supplier of C Interface between logistics from supplier of A and factory Interface between logistics from supplier of B and factory Interface between logistics from supplier of C and factory Inventory of A available Inventory of B available Inventory of C available Order receipt for production of D Material on order for production of D Production of D Inventory of D available Order receipt for production of E Material on order for production of E Order receipt for production of F Material on order for production of F Outbound logistics of E from plant to warehouse Outbound logistics of F from plant to warehouse Logistics carriers available Assembling of E from inventory of D Assembling of F from inventory of D Finished goods inventory of E at warehouse Finished goods inventory of F at warehouse Back order for E ready Back order for F ready Customer order of E ready Customer order of F ready Ready product at E to be sent for distributor inventory Ready product at F to be sent for distributor inventory Product E reaches wholesaler inventory Product F reaches wholesaler inventory Product E reached to retailer Product F reached to retailer

Table 2: Description of the Petri net for reorder point based supply chain, contd.

Transition Name	Description
tA tB tC t1 t2 t3 t4 t5 t6 t7 t8 t9 tD t10 t11 tE tF t12 t13 t14 t15 t16 t17 t18 t19 t20 t21 t22 t23 t24 t25 t26 t27	Start of manufacturing of A Start of manufacturing of B Start of manufacturing of C Processing by supplier of A Processing by supplier of B Processing by supplier of C Transportation from supplier of A Transportation from supplier of B Transportation from supplier of C Paperwork or interfaces with supplier of A Paperwork or interfaces with supplier of B Paperwork or interfaces with supplier of C Trigger for production of D Manufacturer of D starts production Processing of D Trigger for assembling of E Trigger for assembling of F End of assembling of E from D End of assembling of F from D Outbound logistics of E Assembling of E Outbound logistics of F Assembling of F Customer order for E served Customer order for F served Arrival of order for E Arrival of order for F Shipping of product E Shipping of product F Product E is sent to wholesaler Product F is sent to wholesaler Product E sent to retailer Product F sent to retailer



Implementation

Fig 4.1: Flowchart for the reliability checking process.

As shown in the figure4.1 first, the no of stakeholders is taken to check whether they are reliable or not. Then the for loop is created depending on the no of stakeholders that is entered. The stakeholders ID is then obtained using random numbers and reliability is checked by Bayesian model. If the stakeholder is not reliable then the i in the for loop is incremented and the reliability is checked for the next stakeholder, if the reliability of the stakeholder is yes that means the stakeholder is reliable then the values are entered into the dataset. After this by using the petrinet concept the time required to deliver the finished product to the customer is calculated.

Algorithm : Reliability checking of stakeholder

Step 1: Take integer input as number of stakeholder to check reliability.

Step 2: Random number between 1-10 is assigned as ID for stakeholder.

Step 3: Random number is assigned between 0.0 to 0.99 as the probability of stakeholder being reliable.

Probability of stakeholder not being reliable =1-supplier being reliable.

Step 4: By using Bayes Rule:

P(+|reliable)=random number between 0.00 to 0.99 P(-|reliable)=1-P(+|reliable)

P(+|not reliable)=random number between 0.00 to 0.99 P(-|not reliable)=1-P(+|not reliable)

Step 5: Calculating Maximum Posterior Hypothesis (MAP). Stakeholder being reliable=P(+|reliable)*probability of stakeholder being reliable

Step 6: Normalising the above quantities so that they sum 1 Smap=MAP1+MAP

Step 7: Calcute probability of being reliable or not of stakeholder to 1 pr1=MAP1/Smap, pr=MAP/Smap

Step 8: if pr>pr1 Stakeholder is reliable and print his ID Else Stakeholder is not reliable and print his ID

Step 9: END

Algorithm: Performance analysis of the stakeholders inorder to calculate the deliver time using pertinet

Step 1: START

Step 2: Generation of reliable stakeholders ID

Step 3: Calculate the waiting time

=k/n where k=total no of subproducts ordered by manufacturer to the supplier. n=no of subproducts that the supplier has.

Calculate

And find maximum among those for summation Therefore Waiting time=$\sum_{i=0}^{n}$

Step 4: After the products are manufactured, it is required to test the quantity of the product, so we calculate the time required to inspect the product $t$actual=tsum/αqualified tsum=The cost time of the product inspection which is good (sum of direct cost and indirect cost) αqualified=Probability of the product is qualified αqualified can either be 0 or 1 If the probability of the product being qualified is 1 then move for the next step else display the message that the product is not of good quality

Step 5: Calculation of process time

Here available time will be the number of days in which the customer needs the product and the customer demand will be the max pieces that the customer needs.

Process time=Available time/Customer demand

Step 6: Next step is to calculate the moving time,where distance will be the customers location and speed will be the value with which the delivery boy can drive the vehicle to reach the products to customer.

Moving time =d =distance, s =speed

Step 7: Calculation of queuing time

Moving time=distance/speed

Q=W +q

1

Wq = mean waiting time in queue, μ=mean service rate=0.2 μ

Step 8: Calculation of throughput time Throughput time=process time+quality inspection time+queue time+moving time

Step 9: Calculation of delivery cycle time

Wait time+throughput time

If the product can be delivered within the expected time then it will print that the product can be delivered else print that the product cannot be delivered within expected time that the customer needs.

Step 10: STOP.

Snapshots

Experimental results

Fig 5.1: Homepage

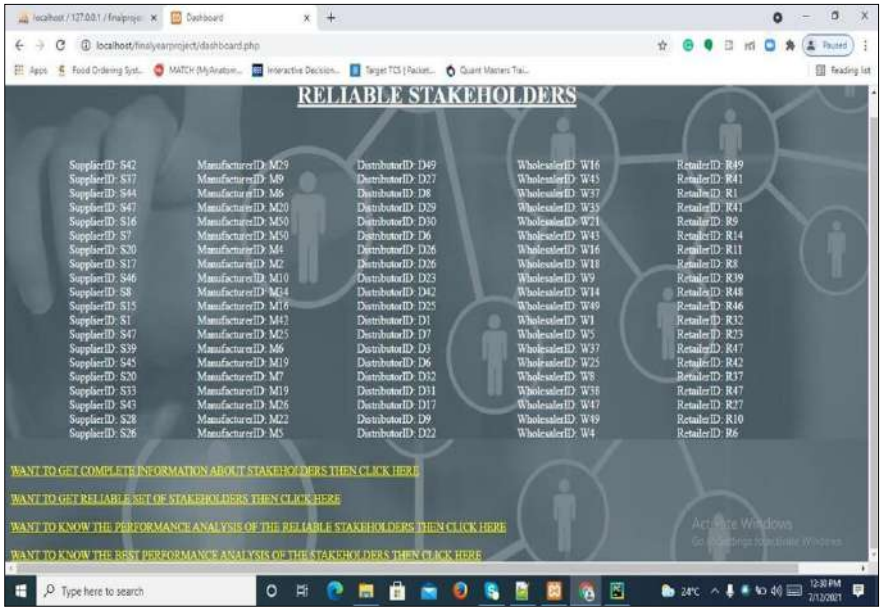
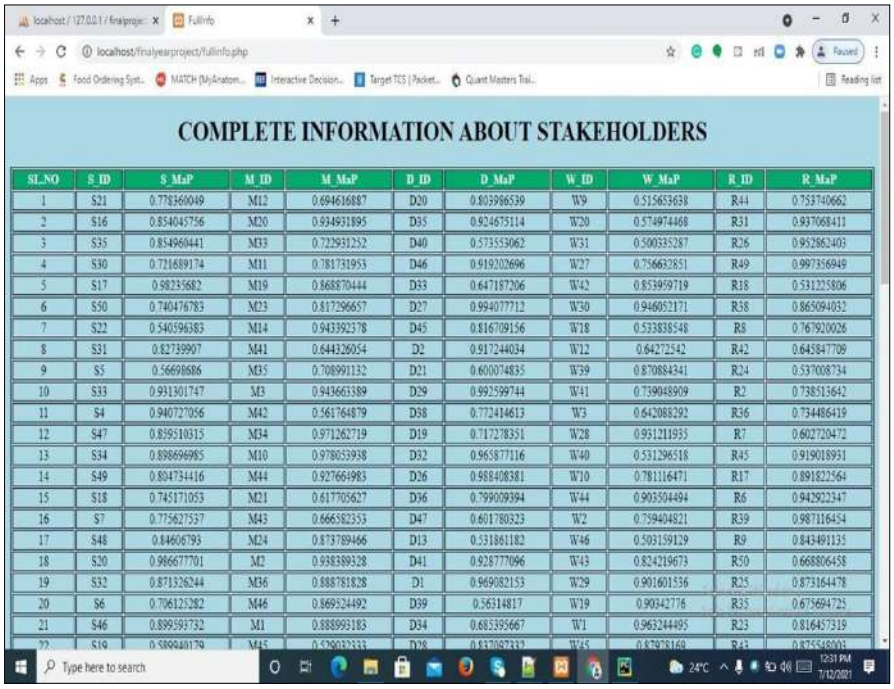


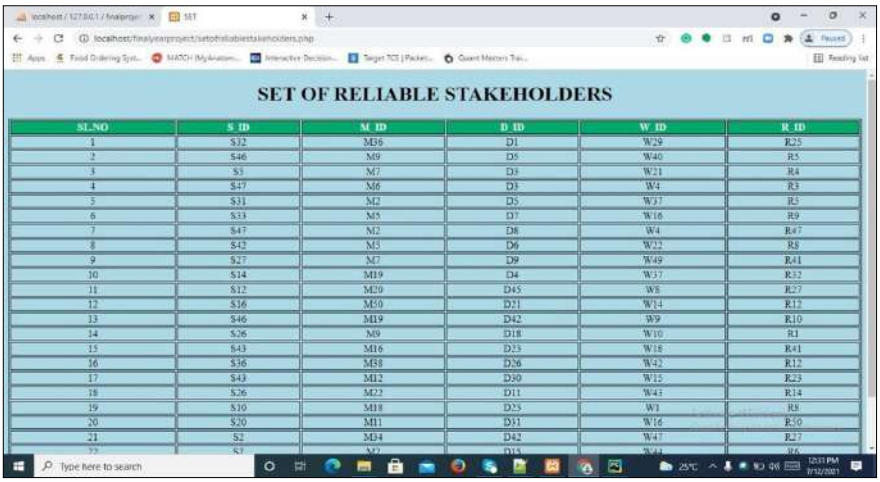
Fig 5.2: Page consisting of top 20 reliable stakeholder id's who have high map values



COMPLETE INFORMATION ABOUT STAKEHOLDERS

SL_NO	S_ID	S_MaP	M_ID	M_MaP	D_ID	D_MaP	W_ID	W_MaP	R_ID	R_MaP
1	S21	0.778360049	M12	0.694616887	D20	0.803986539	W9	0.515653638	R44	0.753740662
2	S16	0.854045756	M20	0.934931895	D35	0.924675114	W20	0.574974468	R31	0.937068411
3	S35	0.854960441	M33	0.722931252	D40	0.573553062	W31	0.500335287	R26	0.952862403
4	S30	0.721689174	M11	0.781731953	D46	0.919202696	W27	0.756632851	R49	0.997356949
5	S17	0.98235682	M19	0.868870444	D33	0.647187206	W42	0.853959719	R18	0.531225806
6	S50	0.740476783	M23	0.817296657	D27	0.994077712	W30	0.946052171	R38	0.865094032
7	S22	0.540596383	M14	0.943392378	D45	0.816709156	W18	0.533838548	R8	0.767920026
8	S31	0.82739907	M41	0.644326054	D2	0.917244034	W12	0.64272542	R42	0.645847709
9	S5	0.56698686	M35	0.708991132	D21	0.600074835	W39	0.870884341	R24	0.537008734
10	S33	0.931301747	M3	0.943663389	D29	0.992599744	W41	0.739048909	R2	0.738513642
11	S4	0.940727056	M42	0.561764879	D38	0.772414613	W3	0.642088292	R36	0.734486419
12	S47	0.839510315	M34	0.971262719	D19	0.717278351	W28	0.931211935	R7	0.602720472
13	S34	0.898696985	M10	0.978053938	D32	0.965877116	W40	0.531296518	R45	0.919018931
14	S49	0.804734416	M44	0.927661983	D26	0.988408381	W10	0.781116471	R17	0.891822564
15	S18	0.745171053	M21	0.617705627	D36	0.799009394	W44	0.903504494	R6	0.942922347
16	S7	0.775627557	M43	0.666582353	D47	0.601780323	W2	0.759404821	R39	0.987116454
17	S48	0.84606793	M24	0.873789466	D13	0.531861182	W46	0.503159129	R9	0.843491135
18	S20	0.966677701	M2	0.938389328	D41	0.928777096	W43	0.824219673	R50	0.668806458
19	S32	0.871326244	M36	0.888781828	D1	0.969082153	W29	0.901601536	R25	0.873164478
20	S6	0.706125282	M46	0.869324492	D39	0.56314817	W19	0.90342776	R35	0.675694725
21	S46	0.899593732	M1	0.888993183	D34	0.685395667	W1	0.963244495	R23	0.816457319

Fig 5.3: Complete information about all stakeholders



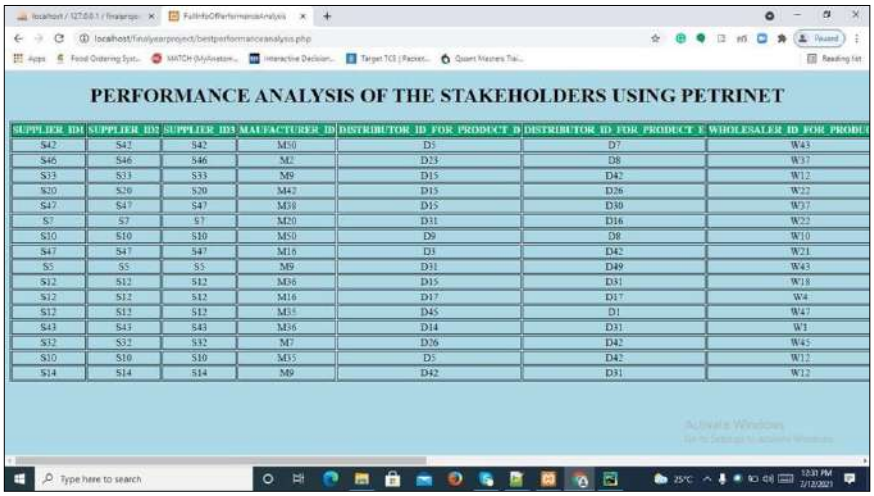
SET OF RELIABLE STAKEHOLDERS

SL_NO	S_ID	M_ID	D_ID	W_ID	R_ID
1	S32	M36	D1	W29	R25
2	S46	M9	D5	W40	R5
3	S3	M7	D3	W21	R4
4	S47	M6	D3	W4	R3
5	S31	M2	D5	W37	R5
6	S33	M5	D7	W16	R9
7	S47	M2	D8	W4	R47
8	S42	M3	D6	W22	R8
9	S27	M7	D9	W49	R41
10	S14	M19	D4	W37	R32
11	S12	M20	D45	W8	R27
12	S16	M50	D21	W14	R12
13	S46	M19	D42	W9	R10
14	S26	M9	D18	W10	R1
15	S43	M16	D23	W18	R41
16	S36	M38	D26	W42	R12
17	S43	M12	D30	W15	R23
18	S26	M22	D11	W43	R14
19	S10	M18	D25	W1	R8
20	S20	M11	D31	W16	R50
21	S2	M34	D42	W47	R27

Fig 5.4: Set of reliable stakeholders

ESALER_ID_FOR_PRODUCT_E	RETAILER_ID_FOR_PRODUCT_D	RETAILER_ID_FOR_PRODUCT_E	DELIVERY_TIME_FOR_PRODUCT_D	DELIVERY_TIME_FOR_PRODUCT_E
W47	R3	R1	4	4
W4	R47	R12	BAD QUALITY	BAD QUALITY
W18	R41	R3	BAD QUALITY	3
W12	R23	R14	CANNOT BE DELIVERED	BAD QUALITY
W38	R23	R14	4	4
W42	R50	R41	4	3
W47	R9	R14	3	3
W14	R41	R41	5	3
W16	R47	R9	CANNOT BE DELIVERED	CANNOT BE DELIVERED
W4	R1	R1	5	4
W12	R9	R5	5	5
W1	R8	R36	3	3
W4	R25	R8	4	3
W12	R8	R3	3	3
W4	R41	R27	4	4
W22	R41	R1	4	3
W9	R3	R8	CANNOT BE DELIVERED	CANNOT BE DELIVERED
W9	R50	R36	5	4
W22	R23	R8	4	4
W49	R25	R8	4	4
W47	R32	R27	3	4

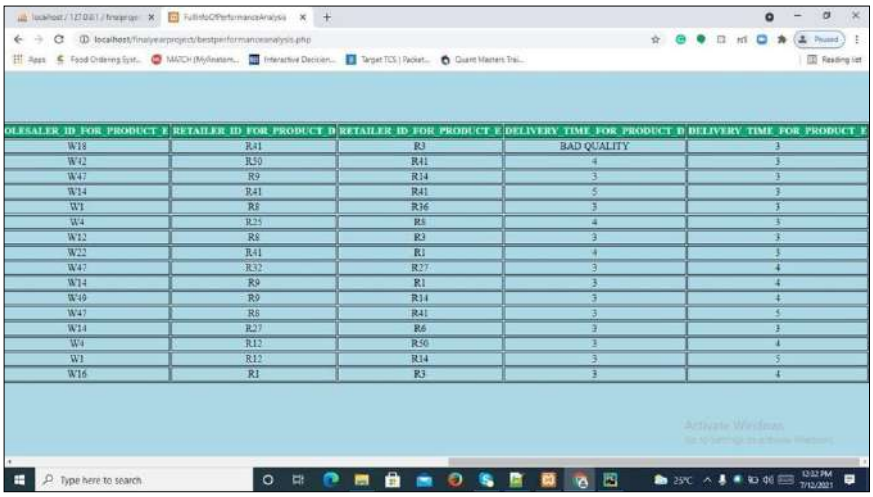
Fig 5.5: Fig 5.6: Continued



PERFORMANCE ANALYSIS OF THE STAKEHOLDERS USING PETRINET

SUPPLIER_ID1	SUPPLIER_ID2	SUPPLIER_ID3	MAUFACTURER_ID	DISTRIBUTOR_ID_FOR_PRODUCT_D	DISTRIBUTOR_ID_FOR_PRODUCT_E	WHOLESALER_ID_FOR_PRODU
S42	S42	S42	M50	D5	D7	W43
S46	S46	S46	M2	D23	D8	W37
S33	S33	S33	M9	D15	D42	W12
S20	S20	S20	M42	D15	D26	W22
S47	S47	S47	M38	D15	D30	W37
S7	S7	S7	M20	D31	D16	W22
S10	S10	S10	M50	D9	D8	W10
S47	S47	S47	M16	D3	D42	W21
S5	S5	S5	M9	D31	D49	W43
S12	S12	S12	M36	D15	D31	W18
S12	S12	S12	M16	D17	D17	W4
S12	S12	S12	M35	D45	D1	W47
S43	S43	S43	M36	D14	D31	W1
S32	S32	S32	M7	D26	D42	W45
S10	S10	S10	M35	D5	D42	W12
S14	S14	S14	M9	D42	D31	W12

Fig 5.7: Stakeholders with best performance analysis



OLESALER_ID_FOR_PRODUCT_E	RETAILER_ID_FOR_PRODUCT_D	RETAILER_ID_FOR_PRODUCT_E	DELIVERY_TIME_FOR_PRODUCT_D	DELIVERY_TIME_FOR_PRODUCT_E
W18	R41	R3	BAD QUALITY	3
W42	R50	R41	4	3
W47	R9	R14	3	3
W14	R41	R41	5	3
W1	R8	R36	3	3
W4	R25	R8	4	3
W12	R8	R3	3	3
W22	R41	R1	4	3
W47	R32	R27	3	4
W14	R9	R1	3	4
W49	R9	R14	3	4
W47	R8	R41	3	5
W14	R27	R6	3	3
W4	R12	R50	3	4
W1	R12	R14	3	5
W16	R1	R3	3	4

Fig 5.8: Fig 5.7: Continued

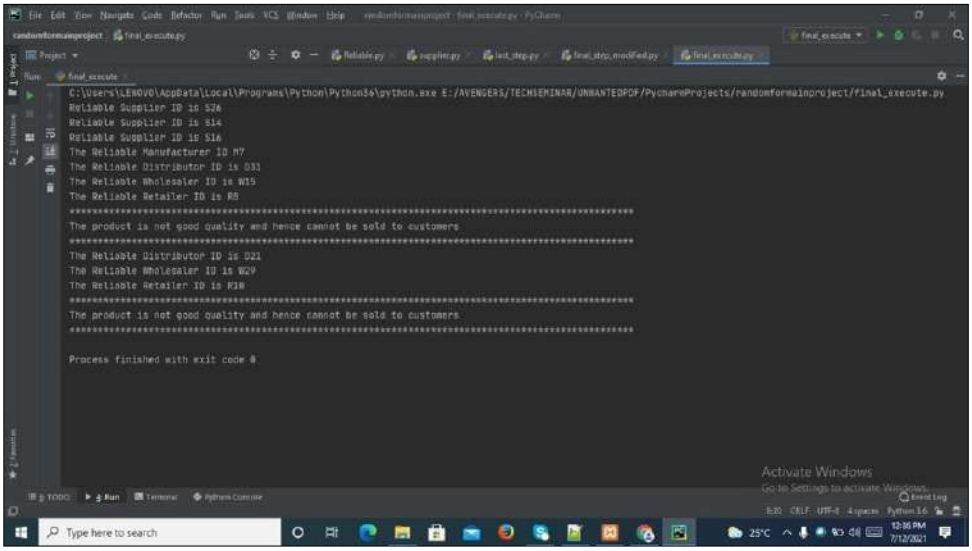


Fig 5.9: Output which says that the product is of not good quality and cannot be sold to customers

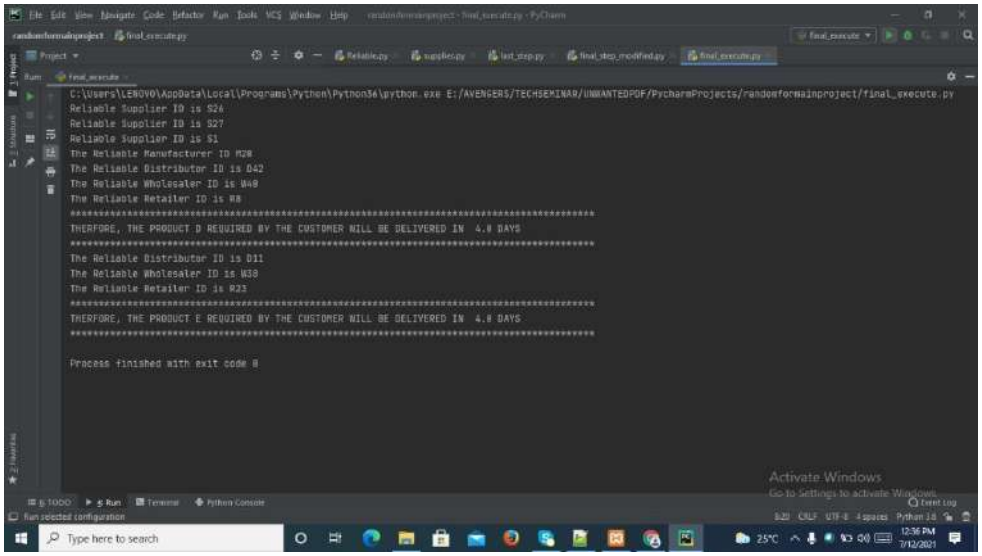


Fig 5.10: Output which says that the product d & e can be delivered to the customer within certain number of days

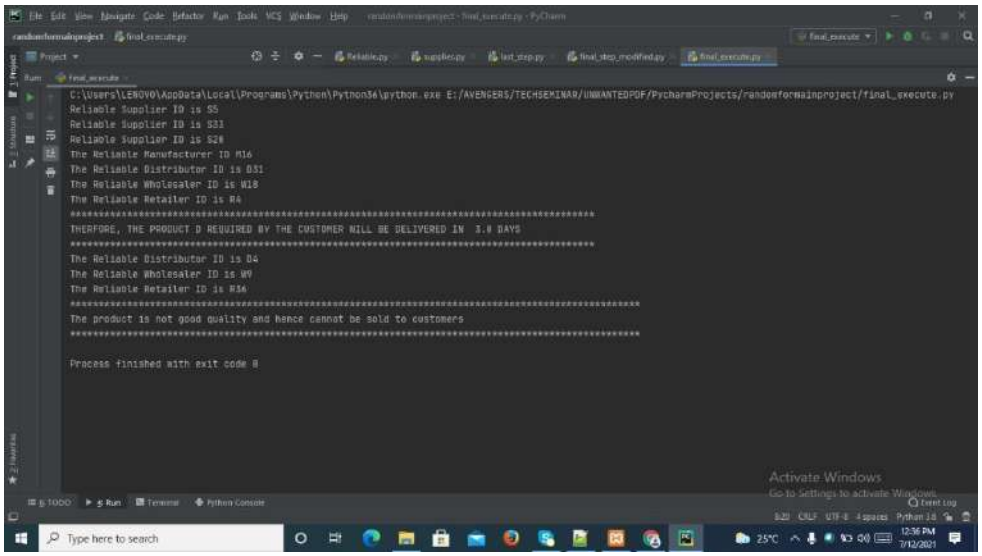


Fig 5.11: Output which says that the product d can be delivered to the customer within certain number of days and product e is of not good quality and hence cannot be sold to the customer

Conclusion

All the reliable stakeholders are involved in the E-SCM and get information about the number of days in which the product reaches the customer. Finally a dashboard is designed to view the reliable E-SCM.

References

1. Nizar Hussain M, Dr. Suresh Subramoniam, “Electronic Supply Chain Management: Some Latest Issues and Practices”, in CiteSeerX. 2004;1(1):01-05,.
2. Jun M, Yang Z, Kim D. "Customers' perceptions of online retailing service quality and their satisfaction", in Proceedings of International Journal of Quality & Reliability Management. 2004;21(8):817-840.
3. Yulia vakulenko, Poja Shams, Daniel Hellstrom, Klas Hjort. “Online retail experience and customer satisfaction: the mediating role of last mile delivery”, in the International review of retail, distribution and consumer research, 2019, pp.306-320.
4. Mohamed Dawood Shamout. “Examining the impact of electronic supply chain management processes on customer satisfaction”, in BEH - Bussiness and Economic Horizons. 2017;12(3):141-163.
5. Aalst Wil. “The Application of Petri Nets to Workflow Management”, in Journal of Circuits, Systems, and Computers. 2004;8:21-66.
6. Prabhu SS. E-Bayesian estimation of the shape parameter of Lomax model under symmetric and asymmetric loss functions. International Journal of Statistics and Applied Mathematics. 2020;5(6):142-146.
7. Nimna VP. “Role of Supply Chain Management in E-Commerce”, in International journal of advance research and development. 2017;2(10):60-64.
8. Abdul Gaffar Khan. “Electronic Commerce: A Study on Benefits and Challenges in an Emerging Economy”, in Global Journal of Management and Business Research. 2016;16(1):50-75.
9. Abdirad M, Krishnan K. “Customer Satisfaction Assessment of E-Supply Chain Quality in Online Shopping: A Case Study”, in Preprints. 2020;1:5-20.
10. Chayapa katawetawaraks, Cheng Lu Wang. “Online Shopper Behavior: Influences of Online Shopping Decision”. in Asian Journal of Business Research. 2011;1:66-74.
11. Robert Curtice M. “Stakeholder Analysis: The key to Balanced Performance Measures”, in BP Trends. 2006;1(1):1-6.
12. Wang J. "Petri net based resource modeling and analysis of workflows with task failures," 2013 10th IEEE international conference on networking, sensing and control (ICNSC), 2013, 655-659.
13. Kotb YT, Badreddin E. "Synchronization among activities in a workflow using extended workflow Petri nets," Seventh IEEE International Conference on E-Commerce Technology (CEC'05), 2005, pp. 548-551.
14. Caputo AC, Cucchiella F, Fratocchi L, Pelagagge PM, Scacchia F. "Analysis and evaluation of e-supply chain performances" Industrial Management & Data Systems. 2004;104(7):546-557.
15. Ajmone Marsan M, Andrea Bobbio, Donatelli S. "Petri nets in Performance Analysis: An Introduction" April, Lectures on Petri nets |Basic models, 2006, pp211-256.
16. Wang J. “Petri Nets for Dynamic Event-Driven System Modeling”, in Handbook of Dynamic System Modeling 2007;1:1-19.