International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

Conceptual Framework to Reduce Inventory Waste of Low Shelf-Life Medicines

Jeevitha D
Student,
Industrial Engineering and Management
RV College of Engineering and Management
Bengaluru, India

Akanksha
Student,
Industrial Engineering and Management
RV College of Engineering and Management
Bengaluru, India

Chirag Cariappa
Student,
Industrial Engineering and Management
RV College of Engineering and Management
Bengaluru, India

Yuvraj Singh
Student,
Industrial Engineering and Management
RV College of Engineering and Management
Bengaluru, India

Bhaskar M G
Assistant Professor,
Industrial Engineering and Management
RV College of Engineering and Management
Bengaluru, India

***Abstract* - Drug expiration is the date after which a medication probably won't be reasonable for use as fabricated. Shoppers can decide the time span of usability for a medication by checking its drug bundling for a termination date. Medications which are past their time span of usability can disintegrate and either be insufficient or even unsafe This project Conceptual framework to reduce inventory wastage of low shelf-life medicines is to reduce the number of medicines that are disposed of by the manufacturers each year by promoting transhipment and by connecting all the standalone pharmacies in an area. This paper explains all the processes that are involved in connecting the pharmacies, storing the medicinal data and sending a trigger to all pharmacies about the medicines that have low shelf life (less than 3 months). The project uses an application/website that is used to collect data such as name, manufacturing date, expiration date and the stock available of each medicine in each pharmacy. The data entered by the pharmacist will be stored in the application server and the data gathered will be transferred to excel sheets and all the calculations and the process of alerting the pharmacist will be initiated from excel. The excel model also shows the details of all the medicines whose shelf life is less than 3 months. There is a provision for pharmacists to order medicines that are low in stock from other linked nearby pharmacies.**

Keywords- Supply chain management, Product Life cycle, Shelf-life, Transhipment

I.INTRODUCTION

Supply Chain Management can be defined as the management of flow of products and services, which begins from the origin of products and ends at the product's consumption. It additionally includes development and capacity of crude materials that are associated with work in progress, stock and completely outfitted merchandise. It is said that, today, the Supply chain network and the executives' framework is the foundation of a business association. This assertion itself shows how significant a segment of business is the inventory network and its administration. At whatever point an item is presented and promoted on the lookout, an interest for the item is made. It is now that the buyer enquires about the item in different accessible retail/discount outlets. Now it is extremely fundamental that the whole market in the nation and every one of the business counters have the item, where the client can purchase and take conveyance.

The supply chain network is the organization made among various organizations that produce, handle, and circulate a particular item in the current examination, the item being researched is drug medication. The inventory network is fundamental to getting medication to advertise and creating income from the interaction. Notwithstanding, we keep in mind that individuals don't comprehend the hardships and difficulties related with this inventory network in spots like India. There was an information hole about successful SCM in underdeveloped nations with a high rate of clinical need. In a worldwide commercial centre, dealing with the inventory network was a critical test, as a result of persistently changing requests of more limited item lifecycles, industry solidifications, variable conditions on the ground. In the medical industry, the inventory network extends from the essential substances purchased by drug producers, and the materials and segments utilized by gadget makers straight up to the patient, and has various capacities relying upon where you remain on that continuum.

The patient needs affirmation that at each stage; care has been taken to guarantee the item is unequivocally. The legal advisors and controllers need total recognizability of each fixing, material and part, the medical care suppliers need items accessible when required and creation administrators need everything 'Just in time'. Deals and promoting need to screen downstream conveyance and bookkeepers need everything at the most ideal cost when spending plans are projected.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

II. LITERATURE REVIEW

The work carried out under literature review ranges from studying logistics capabilities, agility in supply chain, trade off among lean, agile, resilient and green paradigms, sustainability in supply chain, transhipment, issues in the existing flow of drugs in different conditions and places, studying different methods adopted in scm such as TOPSIS, the uncertainties and risks in scm, etc. The agile supply chain: Supply chain dexterity has been viewed as a great deal as of late as a way for associations to quickly answer to changing business climate and further develop their client care levels. To see this idea, it is important to first give the definition of the agile companies. Readiness has been proposed as an answer to the significant degrees of complexity and vulnerability in cutting edge markets (Christopher and Juttner, 2000) [1]. As per Naylor et al. (1999), "agility means applying market knowledge and a vital corporation to exploit profitable opportunities in a rapidly changing marketplace". The connection among agility and adaptability is widely talked about in the writing (Christopher, 2000; Swafford et al., 2006) [2]. It has been suggested that the beginnings of agility lie in flexible assembling frameworks (Gosling et al., 2010) [3]. The objective of an agile enterprise is to enhance or fulfil clients and representatives or satisfy customers and employees. A firm essentially has a bunch of abilities for giving appropriate replies to changes happening in its business climate. The business status in which a ton of organizations comprehend themselves is portrayed by unstable and unpredictable demand. Subsequently, agility may be characterized as the capacity of a firm to answer quickly to changes on the lookout and clients' requests. To be truly coordinated, a firm should control various separating agile suppliers. Tseng and Lin (2011) [4] have fostered an agile enterprise control model. Along these lines, firms need various distinctive traits to quickly manage the progressions inside their current circumstance. Such attributes incorporate four primary components (Sharp et al., 1999) [5]: responsiveness, competency, flexibility/adaptability and quickness/speed. The pharmaceutical industry environment: The drug business is characterized as an arrangement of systems, tasks and associations engaged with the revelation, improvement and creation of medications and meds. The PSC addresses the way through which fundamental drug items are dispersed to the end-clients with the right quality, at the perfect spot and at the perfect time (Mehralian et al., 2012a) [7]. The PSC is extremely complicated and greatly responsible for guaranteeing that the suitable medication is conveyed to the perfect individuals at the perfect time and in the right circumstance to battle against ailment and sufferings. This is a profoundly delicate inventory network in which everything under 100% client care level is inadmissible, as it straightforwardly impacts wellbeing and security. The arrangement which numerous drug ventures embrace is to bear an immense stock in the inventory network to guarantee around 100% of fill rate. Be that as it may, it is an extraordinary test to guarantee 100% of item accessibility at an ideal expense except if store network measures are smoothed out toward client prerequisites and demands (Chandrasekaran and Kumar, 2003) [8]. The drug market is vigorously controlled in numerous nations due to the solitary idea of market interest for drugs (Garattini et al., 2007) [9]. As per the component of the competition in the drug market, governments should balance both clinical and economic interests (Hakonsen et al., 2009) [10].

III.OBJECTIVES

To reduce the inventory wastage of medicines: Among pharmacies, a percentage of medicines and drugs remain unused due to various reasons, that is, the case where a certain drug is no longer useful or has expired. These expired lots of medicines are generally destroyed. The project aims on studying the existing supply chain model of the medicines among the pharmacies and suggesting a solution model to circulate these medicines nearing their expiry date, to the pharmacies where there is demand for that specific drug. At the same time, the cost that is incurred by the process used to destroy them is saved and used in circulating the medicine lots to other pharmacies under the new solution model.

To turn Transhipment into the new normal: Transhipment refers to the transportation of goods to an intermediate destination, then to another destination before being taken to the final destination. It plays a very important role in the distribution of medicines. Pharmacies make bulk shipments from the origin to numerous transhipment centres and therefore the shipper may decide to break up the cargo into small loads to be sent to different individual destinations as per the bill of lading (BOL). This helps to reduce the shipping cost.

IV. PROBLEM STATEMENT

The problem statement for this project may be stated as follows: "Inventory wastage of medicines due to end of their shelf life in standalone pharmacies"

This problem impacts on factors such as

- Agility of the supply chain: The process of destruction of the expired medicines adds in more time affecting the competency and quickness of the supply chain.
- Profit and revenue loss: The organization's profit can be affected due to the investment in the recycling of the expired products.
- Inventory management: It can be adversely affected due to the excess of leftover or surplus expired units left around in the warehouses which may lead to storage issues.

V.METHODOLOGY

The methodology of the project carries an in-depth study of the existing flow of medicine. There is a need for a new flow to prevent excess wastage of medicines due to the end of their shelf life. The process involved in disposing the expired medicines is quite expensive and therefore the transportation cost associated with destroying the expired medicines will be reduced. This includes identification of the drawbacks of the existing flow, the need for a new flow and the stakeholders

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

involved. There is a need for a new flow to prevent excess wastage of medicines due to the end of their shelf life. The process involved in disposing the expired medicines is quite expensive and therefore the transportation cost associated with destroying the expired medicines will be reduced.
Once this is done a new flow for the drugs is proposed. This flow promotes transhipment among stand-alone pharmacies. The expired goods return policy is studied in detail to understand all the processes involved in eliminating all the expired drugs. The next step is the methodology is data collection which includes the determination of medicines, their manufacturing date, expiry date, stock details, etc. The plan to collect the data was to personally visit pharmacies and gather information about the medicines but due to lockdown restrictions that could not happen so a dummy data is populated as a part of the data collection plan.

To present this data in a structured manner, a front end of all the data is made in the form of an application. With the help of Google Sites, a front end of the website is created and it's a place where pharmacies can track medicines stock easily. Furthermore, the collected data is stored in spreadsheet, which is used to develop the model that will store and filter the medicines based on their shelf-life. All the data will be sorted into the respective pharmacy sheet. The objective is to check if the model works, therefore an arbitrary data is generated and the model is developed to display all the medicines that have shelf life less than three months and also to check whether a particular medicine is available in the other nearby stand-alone pharmacies. The first sheet includes the information of all the pharmacies that are available from the application. Their location, contact number and other such basic details will be stored for the reference.
The model is based on alert message principle where a trigger is activated to alert the stand-alone medical shops. So, the logic for this is to get an input from the pharmacist and check with the list of medicinal data stored in the server and revert back the availability status. And the further action will be taken by the pharmacist based on the result.

STUDY OF EXISTING METHOD: The first step in the existing flow is sourcing. Pharmaceutical companies regularly engage with external vendors/suppliers for the provision of a variety of services and materials that can be used throughout the PLC from product development right through to commercial distribution. Next there are manufacturers. Drug production contains actual cycles like mixing, pressure, filtration, warming, epitome, shearing, tableting, granulation, covering, and drying. Next in the organization are discount merchants who buy drug items from makers and circulate them to an assortment of clients, including drug stores

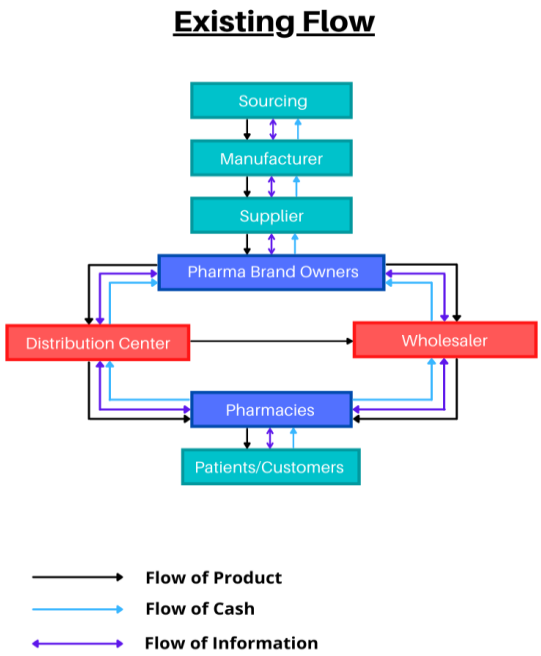

Fig 1: Supply chain process of the existing flow in pharmaceutical industry

Drug stores are the last stop before drugs arrive at the patient. Drug stores buy drugs from wholesalers or straightforwardly from producers. In the wake of buying items, drug stores should keep an adequate load of medication items and give data to buyers about the protected and viable utilization of professionally prescribed medications.
The stakeholders in this flow includes the employees working in the organization, the medical research institute, company suppliers, the company shareholders and consumers using the company's pharmaceutical product.
There are a few drawbacks in the existing flow such as the flow does not include all the expired medicines or the medicines whose shelf life is less than three months. It does not connect all the stand-alone pharmacies and the inventory wastage of the drugs due to expiration is also not discussed in this flow.
There is a need for a new flow to prevent excess wastage of medicines due to the end of their shelf life. The process involved in disposing the expired medicines is quite expensive and therefore the transportation cost associated with destroying the expired medicines will be reduced. There is a need to develop a common platform to exchange medicines among various stand-alone pharmacies and an alert system with a certain period of time (three months) before the shelf life of a medicine ends to alert the pharmacist about the stock and the medicine that is about to expire.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

STUDY OF PROPOSED FLOW

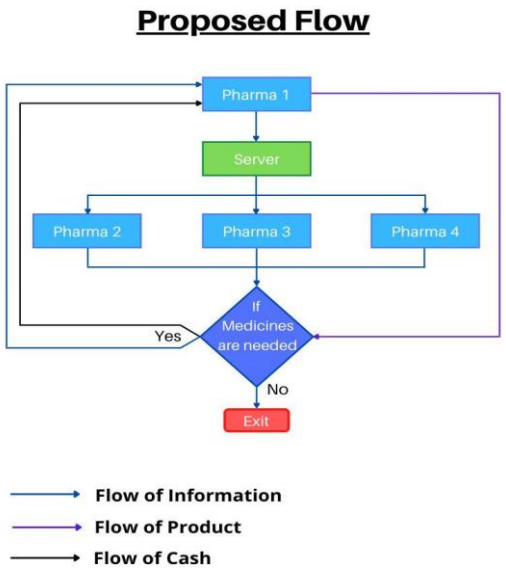

Fig 2: Supply chain process of the proposed flow

The disadvantages in the current flow process leads to the need to foster another proposed flow. The products/items move from the end client back to the vendor or producer. It can incorporate returns from online business and retail. The items might be exchanged or discarded for all time. The items in this cycle are sent back for super removal by utilizing different removal techniques as referenced in the past area.

There are three unique kinds of flow in the production network: the product flow, Information/Data flow, and Money flow. The material flow here incorporates the meds. The material flow includes the development of products from a client to the producer/ maker. This supply chain network the flow likewise concerns client returns and administration needs. The data flow fixates on communicating requests and refreshing the situation to bring conveyance back. The monetary money includes credit terms, instalment timetables, and transfer and title possession game plans. The monetary stream likewise incorporates the cost of the conveyance of new loads of medications.

The information regarding the number of medicines that are about to and are expired is generated by individual pharmacists and is then transferred to the manufacturers so that a return process can be initiated to collect the expired medicines. The product flow included the new set of medicines in return for the old ones.

The first step in the proposed flow is to link all the nearby standalone pharmacies within the radius of 5km. Once the pharmacies are linked to the application, the basic details about the individual pharmacy will be updated. Each pharmacy then enters the list of all the medicines along with the name, manufacturing date, expiration date, and the number of medicines in stock into the application. Once the data is manually entered, all the data will be stored in the application server. The information will then be tabulated into excel sheets. The same process is followed by all the pharmacies that will linked to the application

The next step involves calculating the shelf life of individual medicines and checking for the medicines that have shelf life less than three months. The medicines that have shelf life less than three months will be highlighted and an alert message will be sent to the respective pharmacy with the details of the medicines and the number of medicines in stock. Another message will be sent to the other linked pharmacies from that area regarding the availability of a medicine that is soon going to expire.

The flow also uses an if condition to check if the medicine is needed by other pharmacies if yes then an order will be placed along with the number of medicines if no then the flow is exited. This process works with all the pharmacies that are a part of the application. This is the proposed flow and how each flow of product, information and cash flow is stated.

The stakeholders in this flow includes the employees working in the organization, the medical research institute, company suppliers, the company shareholders and consumers using the company's pharmaceutical product.

DESIGNING OF THE WEBSITE: The work invested in making a website for the internet or an intranet (a private network) is termed as web development. Web development can go from developing a basic single static page of plain information to complex web applications, electronic organizations, and informal network services. A more extensive rundown of undertakings to which Web development regularly alludes may incorporate Web design, Web engineering, client liaison, Web content development, Web server and network security configuration, client-side/server-side scripting and e-commerce development.

Among Web experts, "Web development" for the most part alludes to the fundamental non-design parts of building Websites: composing markup and coding. Web development might utilize a content management system to roll out content improvements simpler and accessible with fundamental technical abilities.

Google Sites is a structured wiki and web page-creation apparatus included as a component of the free, web-based Google Docs Editors suite offered by Google. The assistance likewise incorporates Google Docs, Google Slides, Google Sheets, Google Forms, Google Drawings, and Google Keep. Google Sites is just accessible as a web application. The application permits clients to make and alter documents on the web while teaming up with different users simultaneously.

With the help of Google Sites, a front end of the website is created and it’s a place where pharmacies can track medicines stock easily.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

Fig 3: The front page of the website used to track medicines

The above is the screenshot of the website developed and the number of pharmacies considered are 6 which are located within 5km radius to each other. As of now the location is concentrated to some places like electronic city, Whitefield, Indiranagar, Jayanagar, Church Street, Koramangala. The study is narrowed down to the location of the electronic city. More pharmacies can be added to the website and their data can be added to the website accordingly. If any new pharmacy needs to be part of the application, then the option is there to add a new pharmacy. New login users need to login and give all details about their location, their pharmacy details etc.

After verification of the pharmacy, they will be added to the website and can easily access it. They can add their medicines to the website on a daily basis. Once a user opens the website the above picture is shown, where he/ she can see all the locations and select the location. Once the location is selected it is redirected to the available pharmacies that are present in that area. In that user can select the pharmacy which he/she desires to open. Then once the pharmacy is selected, the name of the medicines, availability of stock, date of manufacture and expiration of the date is shown on the screen. In this manner the user can see and track the medicines details of his choice.

DESIGNING OF THE EXCEL MODEL: The model uses windows excel to store and recover information. Excel is a product program made by Microsoft that utilizes sheets/pages to arrange numbers and information with different functions and capacities. Excel can store a lot of information about exercise in its workbooks that contain at least one worksheet. In any case, rather than filling in as an information base administration framework, for example, Access, Excel is advanced for information analysis and computation. He/she can utilize this adaptable software to assemble models for separating information, compose straightforward and complex recipes to perform estimation on that data, turn the data any way that you need, and present information in an assortment of expert looking graphs

The data collected from the application will be stored in the excel sheet. All the data will be sorted into the respective pharmacy sheet as shown in figure 5. The objective is to check if the model works, therefore an arbitrary data is generated and the model is developed to display all the medicines that have shelf life less than three months and also to check whether a particular medicine is available in the other nearby stand-alone pharmacies. The first sheet includes the information of all the pharmacies that are available from the application. Their location, contact number and other such basic details will be stored for the reference.

Pharmacy Name	Location	Contact Details	Opening Time	Closing Time	Home Delivery
Amardeep Medicals	2nd Cross Rd, Konappana Agrahara, Electronic City, Bengaluru, Karnataka 560100	9035174890	8:30 AM	10:00 PM	No
Med Pharma Medicals	Celebrity Paradise Layout, Doddathogur, Electronics City Phase 1, Electronic City, Bengaluru, Karnataka 560100	9164016864	11:00 AM	11:00 PM	Yes
Hari Om Medicals	1st Main Rd, Doddathogur, Electronics City Phase 1, Electronic City, Bengaluru, Karnataka 560100	7947161825	8:30 AM	11:00 PM	No
Spring Leaf medicals	60/3, Konappana Agrahara, Electronic City, Opp. Infosys, Hosur Main Road, Bengaluru, Karnataka 560100	9108977995	9:30 AM	9:30 PM	Yes
Himalaya Medicals & Drugs	Velankani Drive, Doddathogur, Electronics City Phase 1, Electronic City, Bengaluru, Karnataka 560100	7259656901	7:30 AM	12:00 PM	Yes

Fig 4: Basic details of the pharmacies linked to the application

The upcoming sheet include the data of all the medicines that are available in each individual pharmacy. This detail will be entered by the pharmacist as and when he receives a new stock of each medicine. The details such as name of the medicine available, manufacturing and expiration date will also be available. The available stock of each medicine will be updated by the pharmacist. Using this data, the shelf life of each medicine will be calculated with respect to the present date. The medicines that have shelf life less than 3 months will be highlighted and a Trigger will be sent to the pharmacist with the name and no of stock available. Another trigger will be sent to all the other pharmacists that are linked to that area communicating that this medicine is available in this specific pharmacy and if any of the others require that medicine then they will contact and place a request for the delivery of that medicine along with the no of medicines needed and their price.

Amardeep Medicals

Name of the medicine	Date of Manufacturing	Date of Expiry	Current Date	Shelf life(days)	Stock in Register	Trigger	Medicine about to be Expired
Arctic Relief Pain Relieving	10-12-2019	10-12-2021	08-07-2021	155	1179	NO	-
Abacavir, dolutegravir, and lamivudine	06-10-2020	06-10-2022	08-07-2021	455	303	NO	-
Aripiprazole, ARIPiprazole Lauroxil	15-05-2021	15-05-2023	08-07-2021	676	1457	NO	-
Aspirin and Dipyridamole Capsules	24-06-2020	24-06-2022	08-07-2021	351	153	NO	-
Asacol 800 Oral, Rectal	12-02-2021	12-02-2023	08-07-2021	584	487	NO	-
Bacitracin, Neomycin, Polymyxin B, and Hydrocortisone (Ophthalmic)	06-04-2020	06-04-2022	08-07-2021	272	59	NO	-
Aviax II	08-01-2021	08-01-2023	08-07-2021	549	1317	NO	-
Balminil Dm Sugar-Free	25-05-2020	25-05-2022	08-07-2021	321	1367	NO	-
Beclomethasone inhalation	30-11-2019	29-11-2021	08-07-2021	144	1418	NO	-
Benadryl Allergy Ultratabs	16-08-2020	16-08-2022	08-07-2021	404	1399	NO	-
Abaloparatide	23-04-2020	23-04-2022	08-07-2021	289	1351	NO	-
Abaloparatide Subcutaneous	04-11-2019	03-11-2021	08-07-2021	118	1477	ALERT	Abaloparatide Subcutaneous
Abametapir	18-02-2021	18-02-2023	08-07-2021	590	449	NO	-
Acetaminophen/Dexbrompheniramine/Pseudoephedrine Controlled-Release Tablets	11-10-2020	11-10-2022	08-07-2021	460	714	NO	-
Adapalene and benzoyl peroxide Topical application	08-08-2020	08-08-2022	08-07-2021	396	1296	NO	-
Alefacept Intramuscular	13-06-2020	13-06-2022	08-07-2021	340	265	NO	-
Alendronate Effervescent Tablets	14-03-2021	14-03-2023	08-07-2021	614	542	NO	-
Altachlore ophthalmic	01-10-2019	30-09-2021	08-07-2021	84	995	ALERT	Altachlore ophthalmic
Antivenin (crotalidae) polyvalent immune fab Intravenous	01-01-2021	01-01-2023	08-07-2021	542	959	NO	-
Aquavit-E	25-06-2020	25-06-2022	08-07-2021	352	603	NO	-
Benzoin Tincture Swab	26-02-2020	25-02-2022	08-07-2021	232	407	NO	-
Benznidazole Tablets	04-08-2020	04-08-2022	08-07-2021	392	342	NO	-
Benzoyl Peroxide and Hydrocortisone	28-02-2021	28-02-2023	08-07-2021	600	1051	NO	-
Bepotastine Besilate	14-12-2020	14-12-2022	08-07-2021	524	989	NO	-
BiferaRx (Polysaccharide-Iron Complex, Vitamin B12, and Folic Acid)	17-09-2020	17-09-2022	08-07-2021	436	1384	NO	-
Brom Mal Phenyl HCl Dex HBr	23-07-2020	23-07-2022	08-07-2021	380	955	NO	-

Details | pharmacy 1 | pharmacy 2 | pharmacy 3 | pharmacy 4 | pharmacy 5 | Medicine

Fig 5: Excel sheet storing the data of medicines available in Pharmacy 1

Also, when a pharmacist requires a medicine that is out of stock then he/she will enquire about the availability of that medicine from the nearby linked pharmacies and if available an order will be placed for that medicine.

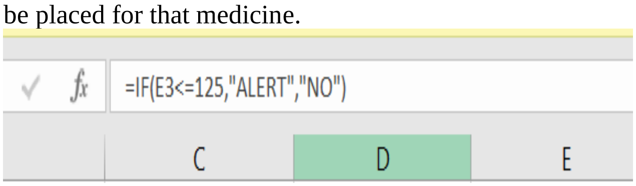

Fig 5: Formula used to develop a trigger

The formula used to raise a trigger in this model is stated above. First the shelf life of each medicine is calculated using the expiration date and the current date. Then the formula is used to check if the shelf life is less than 3 months. The formula uses if statement The IF function runs a logical test and returns one value for a TRUE result, and another for a FALSE result.

So, in the formula the value if true returns to alert and the value if false returns to No. Also, once the formula is applied and the results are obtained, in the next column the names of medicines with an alert message are highlighted. So, the logic for this is to get an input from the pharmacist and check with the list of medicinal data stored in the server and revert back the

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

availability status. And the further action will be taken by the pharmacist based on the result.

List of all the Medicines that are about to Expire

Amardeep Medical	Med Pharma Medicals	Hari Om Medical	Spring Leaf medicals	Himalaya Medicals & Drugst
Abaloparatide Subcutaneous	Loestrin Fe 1.5/30	Dexbrompheniramine and Pseudoephedrine Tablets	Abacavir, dolutegravir, and lamivudine	GaviLAX
Alrex/lore ophthalmic	Nephrocaps	Oxybutynin	Asacol 800 Oral	Retavase
Buprenorphine injection - Sublocade	Lidocaine (Ophthalmic)		Iopamidol	Rituximab-pvvr
Cometriq			Oxybutynin	Solriamfetol Hydrochloride
			Asacol 800 Oral	Thyroid desiccated

Fig 7: The list of all the medicines that are about to expire.

List of all the medicines from each pharmacy is listed in the figure 7. This is all the medicines whose shelf life is less than 3 months. This process is applicable for all the standalone pharmacies that are linked to the application. The details regarding all the medicines that are about to get expired are also tabulated and will be stored in the application server.

VI.RESULTS

This report has discussed the development of an alternative solution for the problem of inventory wastage due to the low shelf life of the medicines. The objective is to reduce the inventory wastage of medicines. At first, the few drawbacks of the existing flow are identified. It's identified how the stand-alone medical shops faced problems with the existing supply chain and how the expired products were dealt with.

The process of destruction are quite expensive and there is a need for a new alternative. This project focuses on the new proposed flow wherein a common platform is developed for the stand-alone medical shops to exchange medicines before they expire

The project aimed at developing a working model for the website / the platform. The tool that is used for developing the model is Microsoft Excel which successfully alerts a trigger when an expired product is reaching the end of its shelf life so that it can be transhipped to the nearby stand-alone medical shop which is need for the drug or medicine thus the project achieved the objective of reducing the inventory waste.

Although there is still scope for development of the website but due to the limited knowledge and skill set on website development, the backend programming has been limited. Hence in order to arrive at a product, the prototype of the website/platform is designed using Google sites. This shows the frontend of the platform wherein the end users interact with the retailers. Hence the project also satisfied the innovation of a new transhipment model, a retailer might prefer to place a transhipment request with another retailer to satisfy the need of the customer. From the user point of view, the website is expected to provide the following key benefits:

- Reduced inventory loss
- Regular alerts on the shelf life of medicines
- Comfortable business with the standalone medicals
- Easier interface to work with

VII.CONCLUSION AND FUTURE SCOPE OF PROJECT

The development of a model for reducing the inventory wastage was carried out keeping in mind the objectives and the end results to be achieved. The website once fully developed, the growth of it could affect the industry for various reasons. It would impact the agility of the pharma supply chain by indirectly reducing the time wasted on destruction of the expired drugs. The website could link not only the standalone pharmacies together but also the community pharmacies. A model was developed to test out the project's theoretical framework. Light was thrown on the importance of developing a new proposed flow with respect to the existing pharmaceutical supply chain flow. The study on transhipment was carried out and implemented in the project. Future scope of work:

- Use of technology such as ML, AI, Big data etc. for faster updating of live data.
- Connecting retailers on local and domestic scale
- Expansion of the website into a miniature online pharmacy

REFERENCES

[1] David M. Gligor Mary C. Holcomb, (2012),"Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review", Supply Chain Management: An International Journal

[2] https://www.researchgate.net/publication/277606081_Developing_a_model_for_an_agile_supply_chain_in_pharmaceutical_industry

[3] Ali Rajabzadeh Ghatari*a*, Gholamhossein Mehralian, Forouzandeh Zarenezhad*c* and Hamidreza Rasekh , (2013) ,"Developing a Model for Agile Supply: an Empirical Study from Iranian Pharmaceutical Supply Chain"

[4] Bramel, J., Simchi-Levi, D., 1997. The logic of logistics: theory, algorithms, and applications for logistics management, Springer,1st edition. Câmara, G., & Onsrud, H., 2004.

[5] Open-source geographic information systems software: Myths and realities. In J.M. Esanu & P.F. Uhlir (Eds.), Camm, J. D., Chorman, T. E., Dill, F. A., Evans, J. R., Sweeney, D. J., Wegryn, G. W. 1997. Blending OR/MS, judgment, and GIS: Restructuring P&G's supply chain. Interfaces, 27: 128- 142.

[6] Comtrade: http://comtrade.un.org ESRI (1995) Environmental Systems Research Institute: Understanding GIS-The ARC/INFO Method, GeoInformation International, United Kingdom, i, 1-10. Foresman, T.W., (1998) The History of Geographic Information Systems: Perspectives from the Pioneers. Prentice-Hall, Upper Saddle River, NJ.

[7] Ab Talib, M. S., & Abdul Hamid, A. B. (2014). Application of critical success factors in supply chain management. International Journal of Supply Chain Management, 3(1), 21-29.

[8] Abraham, B., & Ledolter, J. (2009). Statistical methods for forecasting (Vol. 234). Hoboken, NJ: John Wiley & Sons. Acar, Y., & Gardner, E. S. (2012).

[9] Forecasting method selection in a global supply chain. International Journal of Forecasting, 28, 842-848. doi:10.1016/j.ijforecast.2011.11.003 Acharya, A. S., Prakash, A., Saxena, P., & Nigam, A. (2013).

[10] Sampling: Why and how of it? Indian Journal of Medical Specialties, 4, 330-333. doi:10.7713/ijms.2013.0032 Adhikary, A., & Bora, B. (2014).