



Application of E-Pharmacies in India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Consumer convenience and access are improved through E-pharmacy. This will mostly benefit chronic old patients living in nuclear families, as well as people who are unable to travel to a pharmacy. E-pharmacy also offers competitive prices, making drugs more affordable to those who are less well-off. Consumers in India focused on staying indoors after the COVID-19 lockdown was announced, which forced people to go digital, whether to pay bills or contact doctors. There are no exceptions when it comes to e-pharmacies. Brick-and-mortar pharmacies' home delivery of medicines has also increased. The aim of this paper is to discover and experimentally validate the many characteristics that influence customer acceptance, usage, and intent to suggest E-pharmacy for pharmaceutical purchases. This paper also aims to identify the factors that influence customers on choosing between the various e-pharmacies (PharmEasy, Tata 1mg, Net Meds, Apollo 24x7) providing their service in the market. For this research, the information from 106 respondents was collected and it was found that factors like ease of buying, discounts, user experience, customer care, and availability of the medicines/healthcare products influences their buying behaviour.

Keywords: *E-pharmacies; healthcare; COVID-19; e-commerce; medicines.*

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1. INTRODUCTION

The human life has changed completely since the inception of the internet and 4G. Its use in healthcare is becoming more prevalent. It is being used to retrieve information, self-diagnosis and fetch a variety of other healthcare-related services and goods [1].

E-pharmacy refers to the trade of drugs over the internet and their direct distribution to customers. The increase in the use of e-pharmacies by the customers is due to the availability of high speed internet and efficient supply chain. However, research has revealed that purchasing drugs online has hazards such as counterfeit medications [2].

Adoption of E-Pharmacies is at a nascent stage in India. However, the pandemic has accelerated this adoption process and more people are moving towards e-pharmacies (Pharmacy, Tata 1mg, etc.) for procuring the medicines. The primary objective of this paper is to identify the factors influencing consumers to shift from traditional pharmacies to e-pharmacies in the Generation Y (25 to 40 years) and Generation Z (6-24 years). The age group selected for the research is 20-35 years. The research is based on both primary and secondary research. Methods of primary research include focus group discussion and questionnaires to understand the medicine buying habits and the negative and positive notions associated with the e-pharmacies.

1.1 Background

The internet penetration in India is ever increasing and there were 636 million internet users in December 2019. India ranks second in the world in terms of internet users, trailing only China [3]. The increasing usage of smart phones has resulted in a massive increase in the usage of internet in India. In 2021, the country is expected to cross 750 million internet enables mobile phones. These users are not only concentrated in urban areas but also almost 30% reside in the rural parts of the country.

In India, the emergence of various telecom companies and innovative solutions they offer has made internet very affordable with the price of each GB of data falling by almost 80% in the last half a decade. Technology coupled with affordable internet services has also led to the boom in the number start-ups in the country.

These start-ups use mobile applications as their primary point of contact with their customers. The industry these companies cater to care travel, events, education, and primarily e-commerce, which also include trading of healthcare related products like medicines and medical devices. Internet users in India are shown in Fig. 1.

1.2 E-Commerce

Today's Indian shoppers desire to have instant access to both domestic and international products at cheap pricing. This also applies to rural consumers with better access to the Internet and an increasing economic position. In the long run, this shift in consumer behaviour is projected to be beneficial to the country's economy. Overall, customers are in control, with technology acting as a catalyst for change [4].

In the recent past, we have seen the emergence of the variety of e-commerce business, primarily with the help of the sophisticated information technology and supply chain infrastructure in the country. Online pharmacies is one such e-commerce business which is taking advantage of this business conducive environment and many start-ups have their focus on the online order and delivery of medicines and other healthcare products through mobile applications or web applications.

In today's environment, when most items and services are readily delivered to patients' doorsteps, access models that allow patients and customers to take advantage of the convenience of medicine delivery without having to leave their homes are needed. A working online paradigm that enables access to pharmaceuticals via mobile and Internet-based platforms could meet this demand.

1.3 Covid-19

As the lockdown advanced during Covid-19, there was a substantial increase in online orders, and many consumers naturally switched to buying medicines online (and having them delivered to their homes), as it was now deemed not only the more convenient, but also the safest alternative [5].

Due to practical on-the-ground constraints, online pharmacy players encountered major challenges during the initial lockdown phase. Inter-state border closures caused a gap in the first-mile supply chain, affecting pharmacy distributor to

pharmacy transport, resulting in inventory shortages and lower fill rates. However, once supply chain and personnel issues were handled, online platforms were able to meet the rising demand for pharmaceutical delivery to patients' homes.

During the lockdown, consumers resorted to stockpiling drugs for emergencies, which increased demand for the entire medicine's category. Consumer studies verified this, with consumers reporting a decrease in the use of both online and offline retail channels across all commodities during the lockdown period, but a significant increase in medication retail.

1.4 Regulatory Bodies

The Drugs and Cosmetics Act, 1940 ("D&C Act"), and the Pharmacy Act, 1948, are the primary legislation controlling the overall trade of the drugs (medicines) and cosmetics in the country. Several measures in the D&C Act and Rules ensure the quality and standard of the pharmaceuticals [6]. These acts ensure that no one in the country deals or trades any kind of drug that is adulterated or is not of approved quality.

A chapter on "selling of medications by E-pharmacy" is proposed in the Rules by The Ministry of Health and Family Welfare. The word 'E-pharmacy' has been made part of the rules, and it is defined as the business of distributing, selling, stocking, exhibiting, or offering for sale medications via a web portal or other electronic form. An E-pharmacy is an electronic entity which can be a web application or a mobile application, used to trade medicines and other healthcare products. To carry out the business

through an E-pharmacy, the person should have the registration done.

The IT Act and its rules define the provisions and standards for operating a web-portal, whilst the E-Commerce Rules define the obligations of an e-commerce entity or that must be met, as well as the information that must be revealed in the portal [7].

1.5 Working of an E-pharmacy

1.5.1 Below are the steps in the working of an E-pharmacy

- Doctor issues a prescription to the patient.
- A mobile application or a web application that allows customers to scan their prescriptions and add the required medicines to the cart for checkout.
- A team of registered pharmacists will verify and check every order that is received.
- The accepted prescriptions are sent to the partner stores and from these stores, the order is delivered to the customers.

1.6 Pros of E-Pharmacies

Convenience: It is simple to order prescription drugs online. Customers, who do not have any pharmacy in the close proximity, are aged, or with any ailment that restricts their movement. Furthermore, shipping fees are frequently less than the cost of travelling to a typical pharmacy.

Future Advancements: As part of the Digital India project and the Jan Aushidhi Program, the government is working to raise awareness and deliver affordable medications to the general public without sacrificing on quality.

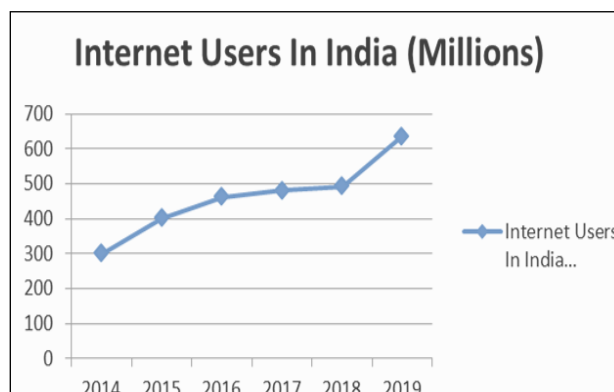


Fig.1. Internet users in India

Time Saving: You may go on to the internet, go to an E-pharmacy website and the required medicine in a few hours. It takes less time and effort than going to the physical pharmacies and gets the medicine you require as availability can be an issue with these brick and mortar stores.

Affordable Cost: Shopping for drugs on the internet allows a customer to apply various promotional offers.

Privacy & Confidentiality: This is very useful for persons who find it difficult to chat with doctors and pharmacists face to face. It can also help people who are embarrassed or ashamed of their problems, such as erectile dysfunction, acne, STDs, hair loss, and so on.

Availability: E-pharmacy provides a wide range of options. They frequently have more medications on hand than a traditional drugstore the probability of the availability of a particular medicine is higher at an E-pharmacy than a traditional pharmacy. Since, most of the e-pharmacies act as an aggregator.

Drug Approval: The majority of these legal retailers have a drug approval process in place.

Medicinal Information: Some online pharmacies give links to medical resources such as universities, government organisations, and health associations, as well as relevant information regarding medications and ailments.

1.7 Cons of E-Pharmacies

Lack of Physical Evaluation: The absence of physical evaluation infrastructure is the biggest drawback of the e-pharmacies. Physical evaluations and scenario analysis can be done quite well in specific instances. Even if such infrastructure is made available, the assurance that it is carried out by the qualified professionals is not guaranteed.

Lack of Personal Connect: Another drawback of E-pharmacy is that you can't talk to somebody face to face. It is extremely difficult for patients to contact a professional pharmacist with inquiries concerning the medications they are taking. As a result, patients may not be able to get their medication the same day they need it.

Reliability: Some online pharmacies are able to provide medications to individuals without a prescription. Patients may get far more ill as a

result of this, rather than healing. As a result, pharmacists must always ask for a prescription when purchasing medications from a drugstore. Some unlawful online pharmacies sell over-the-counter drugs by endangering people's health, and it's impossible to stop them.

Data Protection: The protection of personal and financial information is one of the issues that the E-pharmacy application raises. As a result, internet pharmacies should adopt their own privacy policies and ensure that personal and financial information is not shared with third parties.

2. LITERATURE REVIEW

Consumers can efficiently ensure that the healthcare requirements are met by using online purchasing platforms [8]. These kind of pharmacies also benefit consumers by overcoming the location and financial constraints that have been associated with traditional healthcare distribution channels. Consumers may now understand the many current health concerns and establish a proactive approach to their health thanks to the shift from traditional to mobile application-based services. Nonetheless, there is apprehension about using such services, which has an effect on consumer acceptance and usage patterns.

68 percent of those polled buy medicine offline or from brick pharmacies, with 50% buying medicine without a prescription and approximately 90% willing to buy medicine via online or e-pharmacies [9]. There can be certain dangers, issues, and challenges of selling drugs online. Illegal or unethical online pharmacies, sources of obtaining medicine, substitution of drug based on availability, and inability to execute order due to lack of legitimate prescription were among the issues [10].

The use of internet health services requires special attention since they are crucial to the purchasing behaviour for the consumers. It found that the perceived utility of information obtained through various internet searches is linked to an individual's views and behaviour in his study [11]. The researcher outlines the Health Belief Model focuses on four beliefs: vulnerability, severity, benefits, and barriers. According to the model, the individual's behaviour towards his health is dependents on the factors listed above. The usage of online services for health information, like other e-services, demands a consumer's willingness to engage with the provider either

through a platform or through technology applications of an e-service [12]. The existing research literature on online health services says that a consumer's trust, belief, and perceived utility of the e-service influence their use of the e-service. In [13] studied about impulsivity, reward and loss sensitivity in decision making using Iowa Gambling Task and investigate how impulsivity affects decision-making using sing BIS/BAS scale [14].

3. METHODOLOGY

For this research, to identify the factors influencing a customer to buy from an online pharmacy or a physical pharmacy, primary research was conducted using a detailed questionnaire that was floated to the target audience [15]. The target audience comprises of the Gen Y and Gen Z falling in the age bracket of 20 to 40 years. A total of 106 responses were received in a period of 15 days.

3.1 Data Collection

The questionnaire was divided into three parts. The first part collected the information related to the demographics (age and gender) and their locations [16].

The second part of the form was used to collect the information from the respondents regarding their preferences. These questions collected data regarding the presence of any member in the family suffering from chronic diseases diabetes, cardiac, blood pressure, thyroid, etc. In this part of the survey, we also tried to capture the buying frequency and the E-pharmacy used by the respondents. The last question in this part was used to understand what factors influenced the buying behaviour. The options in this question included factors like offers and discounts, availability of medicines, delivery time, ease of payment, customer support, user experience, etc.

The last part of the questionnaire was used to collect the respondent's rating on user experience factors like ease of search of products, availability of discounts, ease of payment, diagnostic bookings, customer service, refunds and cancellations, and friendliness of the app. The rating was collected on the Likert scale.

4. RESULTS

Analysis: Once the data was collected, the next step was to analyse the data and interpret the findings. To analyse, we used Chronbach's Alpha and Factor Analysis.

Chronbach's alpha was used to measure the internal consistency of the questionnaire prepared for the respondents. Cronbach's Alpha is a scale that spans from 0 to 1, with higher values suggesting a more credible survey or questionnaire [17]. The steps involved in analysis are.

Collect and feed the data in excel: In the last part of the survey, the data with respect to the various factors was collected and this data was fed into the MS Excel. It consists of 8 columns; each column is for a factor and 108 rows, where each row is for a respondent. In our data, we had asked the respondents to rate each factor on a scale of 1-5. An example of how it looks like is given in the Fig. 2.

2-Factor Anova without Replication: The second step is to perform the two-way Anova without replication. For this step, Analysis Tool Pack has to be installed in the MS Excel [18]. Once installed, the Data Analysis option in the Data tab is used to perform the 2-factor Anova. Click on Data Analysis and choose Anova: Two-Factor without Replication from the dropdown menu that appears. Select the input and output range and then click ok.

Safety during Covid	Ease of Payment	Availability	Multiple Features	Customer Service	Shorter Delivery Time	Offers and Discounts	Trust and Authenticity
4	3	5	1	3	3	4	4
4	3	4	4	4	3	4	4
4	5	5	4	5	5	4	4
5	4	5	3	4	4	5	4
4	3	5	2	3	3	4	4

Fig. 2. Factors considered and ratings

Apply Formula: In the final step, the Chronbach’s alpha can be calculated using the formula:

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{i=1}^k \sigma_{y_i}^2}{\sigma_x^2}\right)$$

Where k-refers to the number of scale items

$\sigma_{y_i}^2$ refers to the variance associated with item i

σ_x^2 refers to the variance associated with the observed total scores

- After calculating the Chronbach’s alpha, the factor analysis is done.
- The Factor Analysis method was used to identify the key elements influencing the performance of online pharmacies [19]. We used 3-Factor analysis for the 8 identified factors using IBM SPSS [20]. We discovered that the eight factors were further integrated into three separate dimensions/ factors that influence the purchasing of medicines from e-pharmacies after running the Factor Analysis Test [21].

5. FINDINGS

5.1 Frequency of Using E-Pharmacies

From the responses received, we extracted the data of the frequency of online medicine buying

behaviour and observed that 42 out of 106 (39.62%) respondents in the target age group did not buy medicines online. Table 1 shows the frequency using E-Pharmacies. Whereas 16 respondents are bought medicines for every two months. Almost, 12% of the respondents who took the survey bought the medicines through e-pharmacies every 15 days and 30 respondents used e-pharmacies once every month. From the responses, it can be inferred that just over 4.50% of the respondents bought medicines online every week. Thus, almost 60.50% of respondents have used e-pharmacies at least once. Along with the classical LBP, features from the completed modelling of LBP are also utilized for the classification using K-Nearest Neighbour (KNN).

5.2 Consumers

From the responses received, it can be inferred that 90 out of the total 106 respondents bought medicines online for their parents, which is almost 85% of the respondents is shown in Fig. 3. Only 24.50% of the respondents bought medicines through e-pharmacies for themselves. A sizeable number of respondents used e-pharmacies to buy medicines and other healthcare products for their grandparents and just 8 respondents used the online services to buy medicines for their siblings. It can also be observed that very few customers bought the medicines online for their friends.

Table 1. Frequency table of buying from an E-pharmacy

Frequency	Count	Percentage
Never	42	39.62%
Every 2 months	16	15.09%
Fortnightly	13	12.26%
Monthly	30	28.30%
Weekly	5	4.72%

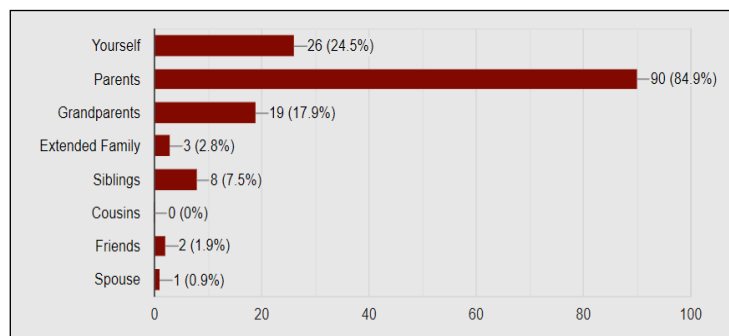


Fig. 3. Percentage of consumers

5.3 Factors Influencing Customer's Buying Decisions

From the responses, it can be inferred that availability of the medicine is important 59 respondents, which is almost 55% of the respondents. 43% of the respondents feel that shorter delivery time is one of the incentives of using online pharmacies and 37.70% of the respondents believe in the authenticity of the medicines ordered from the e-pharmacies. Another important factor that influences the decision-making process is great offers and discounts. 38 out of 106 respondents are attracted to these discounts and hence have shifted from offline to online pharmacies. The survey also reveals that other important factors considered by the consumers are ease of payments, helpful customer support, and non-availability of any physical pharmacies in the vicinity. Buying Decisions factors is shown in Fig. 4.

5.4 Ratings of Factors

In the last part of the survey, the respondents were asked to rate the each of the factors that influence their decision of choosing online pharmacies over offline and these factors also help them decide which E-pharmacy to opt for. They were asked to rate each factor on a Likert scale from 1 to 5, with 5 being of highest

importance and 1 being lowest. After adding the ratings received by all the respondents for each factor, availability of medicines comes out to be the single most important factor for the customers. Respondents' sum of ratings is shown in Fig. 5.

The second most important factors are trust and authenticity and non-availability of medicine shops in the vicinity. Surprisingly, for the target age group discounts and offers come at the fourth place. Based on the analysis, it can be inferred that multiple features like reminders, uploading prescriptions, etc. are important, but only after other factors like customer service, ease of payments, and shorted delivery time. The shorter delivery time received a total of 404 ratings, whereas customer service and ease of payment received a total rating of 392 and 391 respectively.

5.5 Chronbach's Alpha

In the next step of the findings, we used Chronbach's alpha to measure the consistency of the questionnaire prepared and factors considered. This is done with the help of the Anova test function, which is available on the MS Excel. Anova test analyses the variance between the factor ratings and measures the significance. This is shown in Fig. 6.

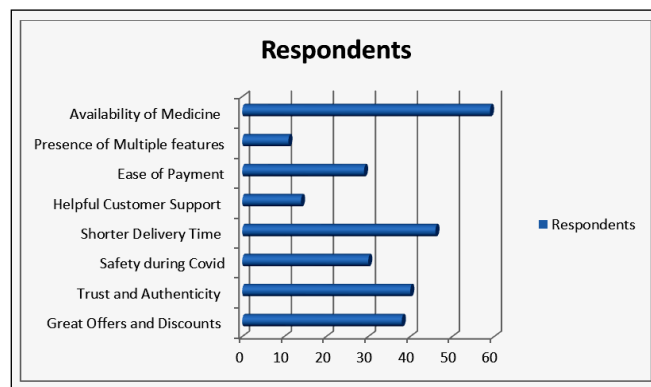


Fig. 4. Factors considered in buying decisions

Safety During Covid	Trust and Authenticity	Offers and Discounts	Shorter Delivery Time	Customer Service	Multiple Features	Ease of Payment	Availability
429	429	420	404	392	296	391	463

Fig. 5. Sum of ratings given by respondents

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Rows	335.967	105	3.199686	5.987379	5.05E-50	1.259528
Columns	159.9623	7	22.85175	42.76111	1.08E-50	2.02202
Error	392.7877	735	0.534405			
Total	888.717	847				

Fig. 6. Results from anova test

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Fig. 7. Chronbach's alpha consistency matrix

After running the Anova test, the Chronbach's alpha can be calculated as $(1 - (0.534405/3.199686))$. We get the Chronbach's alpha value as 0.832982, which lies between 0.8 and 0.9.

If the value of Chronbach's Alpha is greater than 0.9, it is considered to be excellent. If the value is between 0.8 and 0.9, then the consistency is considered to be good. The value of alpha is between 0.7 and 0.8, then the consistency is acceptable. If the value of alpha is below 0.7, then it is questionable and some changes might be required in the questionnaire. This is shown in Fig. 7. Alpha value is considered to be poor when the value is below 0.6 and 0.5 and in this case the survey or the questionnaire should be completely discarded.

From the above explanation, it can be inferred that that, since the value of Chronbach's alpha obtained is 0.83, which lies between 0.8 and 0.9, it is a good value and we can say that our questionnaire or survey is consistent.

Now, the next step would be to analyse the results of the factor analyses to get the deeper insights into the eight factors considered for the research.

5.6 Factor Analysis

The results from Fig. 8 shows that the slope starts to flatten after the third factor and only the first two factors had the variance (Eigen values) greater than 1. The first factor had the variance of 3.99 and the second factor had the variance of 1.312. Also, the change in Eigen value reduces when more than 4 factors are used. The percentage of variance shown by factor 1 is 49.98% and the percentage of variance shown by factor 3 is 11.74%. Analyses the variance between the factor ratings and measures the significance.

From the Fig. 9 of rotated component matrix, it can be identified that Component 1 consists of "multiple features" with factor loading 0.798, "Customer Service" with factor loading 0.752, "Shorter Delivery Time" with factor loading 0.844, and "offers and discounts" with factor loading 0.655.

Component 2 consists of "availability" with factor loading 0.844, "trust and authenticity" with factor loading 0.663 and "safety during covid" with factor loading 0.808. Component 3 will consist of only "Ease of Payment".

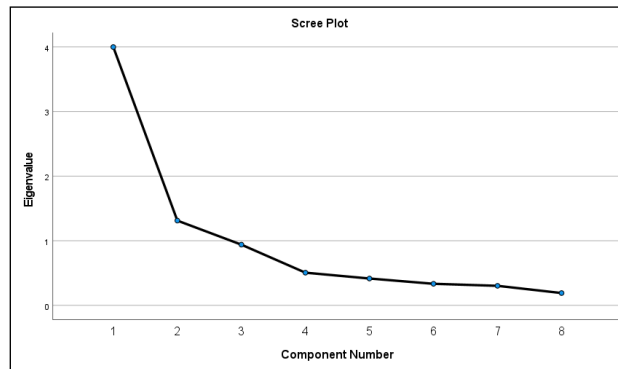


Fig. 8. Screen plot obtained from factor analysis

	Component		
	1	2	3
Safety during Covid	.116	.808	.347
Ease of Payment	.129	.242	.911
Availability	.044	.844	.099
Multiple Features	.798	-.127	.371
Customer Service	.752	.432	-.014
Shorter Delivery Time	.844	.129	.082
Offers and Discounts	.655	.604	-.116
Trust and Authenticity	.552	.663	.077

Fig. 9. Rotated component matrix

6. DISCUSSION AND CONCLUSION

Existing research in the healthcare domain on the adoption of online pharmacies has been limited, and the association between the various factors that influence behavioural intention to adopt and intention to suggest online pharmacies for pharmaceutical purchases has not been adequately addressed. Thus to bridge this gap researchers have previously used Chronbach's alpha and factor analysis to draw conclusions. Upon data analysis, it was found that factors like availability of medicines, delivery time, safety during Covid, trust and authenticity of medicines, and ease of payment play a crucial role in influencing the customer medicinal buying behaviour and these factors were found out to be internally consistent with the help of Cronbach's alpha.

The human life has been completely changed with the inception of internet and 4G. This study will provide intriguing insights on consumer uptake, usage, and desire to recommend behaviour toward E-pharmacy on an academic level. The suggested model displayed convincing explanatory power in predicting consumer adoption, usage, and intent to advocate behaviour toward E-pharmacy in empirical studies. The e-pharmacies have opened up a wide range of options for the consumer is a boon to the patients suffering from chronic diseases. The e-pharmacies provide the efficiency and ease required by the GenY and GenZ, who order medicines mostly for their parents. The target audience also believes in the authenticity of the medicines ordered online and are attracted to the special offers and discounts offered. The findings drawn from the study will help the managers

focus on business aspects like availability, safety and trust while making the production, marketing, and sales decisions. This research can be a boon for the managers as they will be more aware about which aspect of the operations requires more resources.

6.1 Future Scope

Like any other research, this can also be carried forward. The future researchers should try and understand the impact of demographical factors like income and gender while understanding the factors influencing the buying behaviour from e-pharmacies. The researchers can also evaluate how emerging technologies like AI and block chain can be integrated with the mobile apps/websites to get deeper insights into the influencing factors.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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