Utilization of Information Technology in Innovation in the Pharmaceutical and Natural Cosmetics

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Abstract: The pharmaceutical and cosmetics industries have experienced steady growth over the past few years, especially with the rise of information technology. This article describes how information technology's applications have aided in both industry's innovation and growth. We observe the convergence of the pharmaceutical and cosmetic industries, which highlights the importance of information technology in the development of related goods and practices. In this section, we explore a variety of information technology implementation approaches in the researching, sourcing, and marketing of pharmaceutical and cosmetic products. The study will give an overview of how information technology has been used to increase safety, effectiveness, and transparency in both of these industries. The findings of our study indicate that the application of information technology can improve product quality, increase product longevity, and reduce waste, all of which contribute to the advancement of innovation in the pharmaceutical and cosmetics industries. In addition to that, the article offers insight into the potential for using information technology in the future to reduce soaring unemployment rates in the industry. Futhermore, the article highlights the importance of collaboration between the two industries in using information technology to reach higher goals in research, development, and the sale of safe products.

1 INTRODUCTION

In the ever-changing landscape of the pharmaceutical and natural cosmetics industries, the integration of information technology (IT) has become a key driver of innovation and progress. This transformative synergy between cutting-edge technology and these two essential sectors has ushered in a new era of research, development, manufacturing and consumer engagement. (Vora et al., 2023) As our world continues to witness a constant need for revolutionary solutions in the health and beauty sector, the role of IT cannot be underestimated. This article explores the dynamic of the IT and the pharmaceutical then the relation with natural cosmetics industries. Exploring the role of information technology in the innovation of pharmaceutical and natural cosmetics industry. Recent trends in the utilization of information technology in both industries, case study of information technology implementation in natural cosmetic product research, threats to natural cosmetic products and pharmaceutical, and traceability of natural cosmetic products with information technology.

2 METHOD

The data are collected from several public databases, including ScienceDirect, Scopus, PubMed, and Google Scholar, were used to search for primary research demonstrating the utilization of information technology in innovation in the pharmaceutical and natural cosmetics. Appropriate information from the data is presented in this review.

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3 THE ROLE OF INFORMATION TECHNOLOGY IN INNOVATION IN THE PHARMACEUTICAL AND NATURAL COSMETICS INDUSTRY

Nowadays, there is a lot of data stored in IT that was written by people with complaints and issues in the healthology and the cosmetology problems. The dissemination of this knowledge may turn into a trend in the creation of the innovation that cater to the consumers make the IT plays a crucial role in driving innovation in both pharmaceutical and regular beauty care product ventures. Afterward integrity of the data generated by any pharmaceutical and natural cosmetics organization is of fundamental importance to the quality system of products. With the introduction of IT software solutions, maintaining the integrity of the generated electronic data is challenging; hence the products quality system should integrate the right data governance system as required by regulatory authorities. The efforts and resources allocated to the data governance should be proportionate with the risk related to product quality and patient safety (Jain and Jain, 2019).

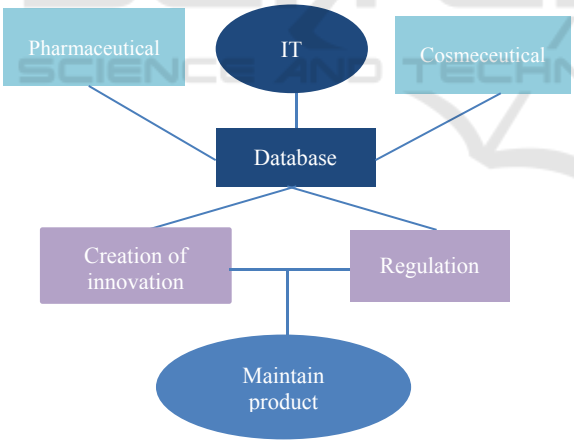

Figure 1: Role of IT in innovation pharmaceutical and natural cosmetics industry.

Hence, its role is conjectured as working with these remotely situated authoritative organizational experiences established in the noticeable information coalitions and imperceptible information networks among firms (Dong 2015). The job of IT in the drug business isn't just to support correspondence frameworks, but also to give a computerized stage to the sharing of information between a virtual community of pharmaceutical projects, in this way bringing about more useful innovation processes (Narayanan *et al.*, 2004).

4 RECENT TRENDS IN THE UTILIZATION OF INFORMATION TECHNOLOGY IN BOTH INDUSTRIES

The latest trends in the use of information technology in the pharmaceutical industry are that operations would be controlled by human minds and performed by computerized robots. It is a cutting edge thought where different assembling tasks and administrations are given to clients utilizing man-made brainpower, distributed computing energy, human-robot working, and enormous information, where satellite and modern artificial intelligence (Computerized reasoning) empowered robots would help (Chourasia *et al.,* 2022). Incorporated independent and mechanical frameworks consolidate constant and online information with modern creation processes and man-made consciousness to upgrade assembling and venture the executives. Different information sources can be acclimatized to interface outer and inside data. For instance, in drug producing, outside data, including factors, for examples, patient experience, market interest, stock providers, and general wellbeing crises, can mix with the inside data, for examples, energy and asset the board, displaying and reproduction results, and lab information. Incorporating inside and outside information sources empowers uncommon ongoing reaction, observing, control, and expectation. The outcome is too much controlled, profoundly associated and digitalized drug biological system and worth chain for producers (Arden *et al.,* 2021).

5 CASE STUDY OF INFORMATION TECHNOLOGY IMPLEMENTATION IN NATURAL COSMETIC PRODUCT RESEARCH

IT plays a role in the discovery and development of natural cosmetic products, because it enhances the efficiency of the entire process, from sourcing natural

ingredients to formulating and marketing these products. For example, a database of natural ingredients that have potential as cosmetics can be obtained through previous research results that have been published via online media, then Geographic Information System (GIS) technology can help obtain ingredients from suitable suppliers (Khater *et al.,* 2022). Artificial intelligence (AI) algorithms can analyze vast data sets to identify trends, consumer preferences, and can predict the safety and efficacy of ingredients, streamlining the discovery process. (Elder *et al.,* 2021). Electronic lab notebooks (ELN) are a means of ensuring research data is well documented so that researchers can track and document each step of the research process electronically (Higgins *et al.,* 2022). The article written by (Dong *et al.,* 2015) formulated a conceptual model using a panel data set from the United States pharmaceutical industry that explained how a company's IT investments moderated its organizational learning processes in alliances and knowledge networks, highlighting the role of IT as an important driver of absorptive capacity for obtaining various innovation results..

6 THREATS TO NATURAL COSMETIC PRODUCTS AND PHARMACUTICAL

Natural cosmetics are beauty and skincare products formulated with ingredients that are sourced primarily from nature, frequently with an accentuation on plant-derived and not comparable to dynamic fixings artificially duplicated in the lab. The future catchphrases of the beauty care products area are "sustainable" (18.9% in 2020 contrasted with 13.2% in 2018, in view of the responses of the talked with test), "normal/natural" (10.9%), "care" (7.8%), "morals" (7.5%), "web based business" (7.1%), "social excellence" (7.0%), "personalization" (6.7%), and "security" (6.3%) (Dini and Laneri 2021). The pharmaceutical industry is one of the quickest developing areas of the economy, with overall deals of more than $1228.45 billion out of 2020. Starting around 2017, the drug market has developed at a yearly pace of 5.8%. The worldwide pharmaceutical market revenue was 1.143 billion US dollars in 2017 and will surpass 1,462 billion US dollars in 2021 (Hole *et al.,* 2021). The main test was to find a point balance between the "natural" and the "chemical". Safety is one of challenge and a threat for natural cosmetic products. Both in terms of regulatory compliance, ingredients containing allergens related to skin sensitivity, and the authenticity of natural cosmetic products. In the pharmaceutical industry, there are several threats and challenges that one must contend with. Some of these challenges include research and development (R&D) risks for pharmaceutical products, counterfeit drugs, litigation and product liability, supply chain vulnerabilities, market access, environmental issues, and many more. Research and development costs as an element of medication valuation assume a significant part in conversations in regards to the affordability of pharmaceutical products. Item valuing once in a while focuses on the necessity for creative prescriptions and high research and development costs. In any case, by and large, the connection between research and development pricing isn't straightforward for business reasons (Van der Schans *et al.*, 2022). Furthermore, fake drugs threat dangerous situation and danger to general wellbeing that lead to a deficiency of confidence in medicines, medical care suppliers, and wellbeing frameworks. The primary purposes behind the pervasiveness of fake items overall are popularity for less expensive medicines, low accessibility of clinical items, intricate and delicate stock chains, and feeble public administrative arrangements in regards to the production and promoting of drugs (Bakker *et al*., 2021, Odiase 2021).

7 TRACEABILITY OF NATURAL COSMETIC PRODUCTS WITH INFORMATION TECHNOLOGY

Traceability is a wide idea that alludes to the act of identifying an object or work thing and getting access to any or all data about it. Makers who produce, disperse, or market actual items are probably going to be affected by various product guidelines or regulations. Makers should recognize synthetic substances present in blends, fixings, plans, natural substances, and parts of completed items. This results in a profoundly manual and asset-escalation course of gathering synthetics in item information, which definitions rise up out of inward necessities, industry principles, providers, and clients and are frequently obtained from multiple supply chain actors (Takhar and Liyanage 2021). Traceability of a product can be achieved through IT systems such as blockchain technology, RFID (Radio Frequency Identification), QR codes and smart labels. Blockchain technology is

a developing tracking technology that has the characteristics of openness and transparency, encryption protection, and anti-tampering (Kamble *et al*., 2019). When contrasted and other following advancements, like RFID innovation, blockchain technology enjoys the benefit that shoppers can more readily assess quality and distinguish item legitimacy (Creydt and Fischer 2019). Another reason is being able to monitor product quality in real-time.

RFID technology likewise enjoys benefits for application in programmed identification proof and detectability frameworks, for example, how much information that can be obliged in a tag, high information understanding rate, the chance of perusing a few labels all the while, and the chance of non-contact. One of the fundamental disadvantages of RFID innovation is the expense of execution and the expense of a solitary tag. The utilization of RFID technology in an item detectability framework will enormously impact the cost of an item (Šenk *et al.,* 2013). Meanwhile, QR codes can store sufficient amounts of data and have excellent readability even on small labels, even if there is physical damage to parts of the code. The traceability system is significant in light of the fact that the technology contained in it is used in the anti-counterfeiting of products, especially medicines and natural cosmetics, which have become major problems in the pharmaceutical industry (Han *et al.*, 2012). The pharmaceutical industry operates on a global scale, and regulatory compliance across multiple geographies is fundamental to ensure that supply chains remain transparent and safe.

8 CONCLUSIONS

Artificial intelligence (AI) algorithms can analyze vast data sets to identify trends, consumer preferences, and can predict the safety and efficacy of ingredients, streamlining the discovery process. Integrity of the data generated by any pharmaceutical and natural cosmetics organization is of fundamental importance to the quality system of products. Some of these challenges include research and development (R&D) risks for pharmaceutical products, counterfeit drugs, litigation and product liability, supply chain vulnerabilities, market access, environmental issues, and many more.

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