Research Paper

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The Role of Artificial Intelligence Tools in Pharmaceutical Industries: Special Reference to Expert System and Automation Tools

Management

KEYWORDS : AI in pharmaceutical industries, expert system and automation tool

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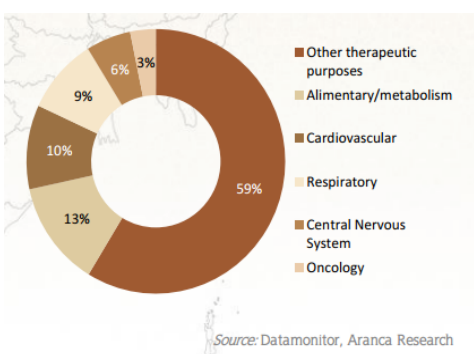
ABSTRACT

The paper is based on survey of pharmaceutical industries. The paper highlights the important role of artificial intelligence tool like automation and expert system in pharmaceutical industries and how these tools are perform the important role in the pharmaceutical business. In this paper it has been highlighted that how India is top third in world to produce the pharmaceutical products. There are various expert system are available in the world and in this paper it also gave the name of companies that produces various expert system to the pharmaceutical industries. In the paper the survey is made on 15 pharmaceutical industries in that 5 are small scale and 10 are large scale industries. Paper highlights important applications of automation and expert system in the industries. Different types of automation tools are explained and what are the uses of these tools in the concern industries. In paper it has also explained that how automation and expert system provide keen role in the production.

INTRODUCTION

India having a life-size vision to make a 'Pharma Vision 2020'. In the entire context Indian is growing very progressively in the world. The pharmaceutical industries are contributing in India's GDP and India is on third position in the world to produce the pharmaceutical drugs. The Indian pharmaceutical industry is a highly knowledge based industry which is growing steadily and plays a major role in the Indian economy. As a highly organised sector, the numbers of pharmaceutical companies are increasing their operations in India. The industry is expected to touch US$ 35.9 billion by 2016.

The Expert system like 'Exsys Inc' perform very important role in pharmaceutical Organizations that can now optimize their most valuable asset, expert knowledge, through powerful interactive Web-enabled knowledge automation expert systems.



Source : http://www.ibef.org/download/Pharmaceuticals-March-220313.pdf

Online sessions follow a conversation with a human expert asking focused questions and producing customized recommendations The decision making skills of your top experts can now be made available to everyone through various Expert Systems. Exsys Corvid development software provides non-programmers a new way to easily build interactive Web applications that capture the logic and processes used to solve problems and deliver it online, in stand-alone applications and embedded in other technologies.

Exsys Corvid Knowledge Automation expert systems interact with users to offer answers whenever needed. Far better than search or FAQs, they provide precise, reasoned situation-specific advice based on the knowledge of top experts.

Exsys expert system software and knowledge engineering consulting services are the result of over 28 years of enhancement, refinement and application to real-world problems. Proven across industries, government and military applications, Exsys is a world leader in knowledge automation expert systems with powerful, but easy to use tools capable of handling the most demanding tasks. As demonstrated by many case studies, these systems provide an impressive R.O.I., and a unique competitive advantage for thousands of users worldwide. In the pharmaceutical production all the expert systems are designed using physical, chemical, biologically inter-related properties of active ingredient and predicted properties of pharmaceutical item. The main output of this system is formulation that consists of a list of ingredients and its proportion. The following are the published application of pharmaceutical product formulation experts system.

Company / Institution	Domain	Development Tool
Cadila Laboratories (India)	Tablets	PROLOG
University of Lodon/ Capsugel	Capsules	C
University of Heidelberg	Aerosols Tablets Capsules IV injection	C/SMALL TALK
Zeneca Pharmaceuticals	Tablets , Parenterals Film coatings	Product Formulation Expert System(PFES
Sanofi Research	Capsules	(PFES)
Boot Company	Topicals	(PFES)

Source: Article published by Nopphadol, Phuriwat and Thepchai , Chiangmai University, Thailand

Following are the AI tools used in Pharmaceutical Industries

1. **CMO :** A Contract Manufacturing Organization (CMO), sometimes called a Contract Development and Manufacturing Organization (CDMO), is an organization that serves the pharmaceutical industry and provides clients with comprehensive services from drug development through manufacture. Services offered by CMOs include, but are not limited to: pre-formulation, formulation development, stability studies, method development, pre-clinical and Phase I clinical trial materials, late-stage clinical trial materials, formal stability, scale-up, registration batches and commercial production.[2]
2. **MES :** Manufacturing Execution System contains MES suites, components , plant intelligence and service and supports. The MES is a suite of software and tailor-made system to access all of real-time process information industry wide.
3. **PC-based Automation** : All most the surveyed pharmaceutical industries the software is used. In this category Industrial PC, PC-based Controller , Embedded controller and embedded bundles / software packages are used as these software are full integration and high performance upgrade of the PLC functionality.
4. **Process Control System** : This software fulfill all the requirements of pharmaceutical industries. It takes on the

automation of all ancillary, upstream and downstream processes and offers whole host benefits. From small laboratory system right through to a large plant network it offers extremely flexible scaling and allows a significance reduction in the total cost of ownership.

5. **Production Lifecycle Management Software**: In this type are two sub-systems i.e. PLM solution by Product Line and PLM solution by Industry. The software works collaboratively with companies to deliver open solution that help them turn more ideas into successful product. The software takes a smarter decision.
6. **Sensor Systems**: The sensor system perform very significant role in the industries. Processes instrumentation, Process Analytics , weighting and Batching Systems, Vision Sensors, measuring systems, Conditional Monitoring and Solution for the problems are done by the sensor systems.
7. **Automation Systems**: The Artificial Intelligence perform very crucial role in Automation system in pharmaceutical industries. During survey it was found that many industries have implemented Industrial Automation Systems, Monitor Control Systems, CNC automation systems , cabling systems and Automation software.
8. **Operator Control and Monitoring Systems**: Under this category all industries are using operator devices, panel PC systems and monitors , HMI(Human Machine Interfaces) devices . HMI Software and customized automations.
9. **Code reader** : This software is used for flexible reading and verification . industries are using stationary code reading systems, hand-held reading systems, verification systems and OCR(optical Character Recognition).
10. **Automatic Identification Technology**: In all Pharmaceutical industries two identification systems are used. RFID(Radio Frequency Identification) systems used for material handling and distribution and second one is Code Reading Systems[3]

OBJECTIVE OF THE STUDY

- To visit the pharmaceutical Industries.
- To prepare the questionnaires for the research
- To collect the data from the various Pharmaceutical industries
- To analyze the data and formulate it in the form of table and graph to check the hypothesis.
- To make the Conclusion, recommendation on the basis of survey

HYPOTHESIS OF THE STUDY

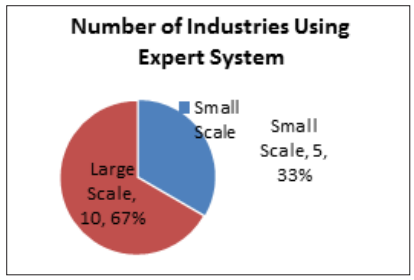
- Are human experts are replaced by the Expert System and Automation Tools?
- Are All Experts systems and Automation tools performing accurate formulation according to the requirement?
- Are Expert system and automation tools reduces the cost of the production?

Data Collection and Interpretation

Expert Systems in Pharmaceutical Industries: During the data collection from pharmaceutical industries it was founded that many industries are using following Artificial Intelligence software in the organization:

The survey is done on 15[10 large scale and 05 small scale] pharmaceutical industries including small scale and large scale. During the observation it has been observed that :

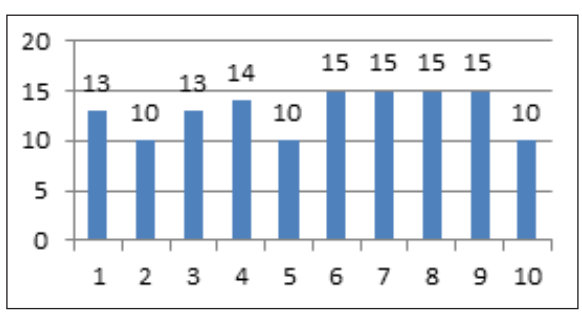
Name of AI tools	No. Small scale industries are using IT tools	No. of Large scale industries are using IT tools	Total
Expert System	5	10	15



Automation Tools in Pharmaceutical Industries : During the data collection from pharmaceutical industries it was founded that many industries are using following Artificial Intelligence software in the organization:

Sr.No.	IT tools	No of Industries are using the Tools
	CMO	13
	MES	10
	PC-based Automation	13
	Process Control System	14
	Production Lifecycle Management Software	10
	Sensor Systems	15
	Automation Systems	15
	Operator Control and Monitoring Systems	15
	Code reader	15
	RFID	10

Graph Shows the Applications of Artificial Intelligence in Various Devices in Pharmaceutical Industries



Conclusion

The conclusion of the research is that almost all small scale and large scale pharmaceutical industries have implemented automation tools but small scale industries cannot afford the expenditure on maintenance of Automation System. The first hypothesis is concluded with that no 100% replacement of human with automation and expert system. Partially there is need of human power. Due to automation, IT tools and software there is reduction of employment but Automation provides quality product in market and industries get benefited

RECOMMENDATIONS

The operator level staff should of knowledge oriented.

Limitations:-

- The industries are not allowed to give exact profit and expenditure figures of the industries.

REFERENCE

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