

Automated Diagnostic Systems

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What is Automation

- Use of laboratory instruments and specimen processing equipment to perform clinical laboratory assays with only minimal involvement of technologist .
- Automation in clinical laboratory is a process by which analytical instruments perform many tests with the least involvement of an analyst.
- The International Union of Pure and Applied Chemistry (IUPAC) define automation as "The replacement of human manipulative effort and facilities in the performance of a given process by mechanical and instrumental devices that are regulated by feedback of information so that an apparatus is self-monitoring or self adjusting".

INTRODUCTION

- A diagnostic test is any kind of medical test performed to aid in the diagnosis or detection of disease.
- It may be used to diagnose diseases or measure the progress or recovery from disease or confirm that a person is free from disease.
- Some medical tests are parts of a simple physical examination which require only simple tools in the hands of a skilled practitioner and can be performed in an office environment.

Introduction contd.....

- Some other tests require elaborate equipment used by medical technologists or the use of a sterile operating theatre environment.
- Some tests require samples of tissue or body fluids to be sent off to a pathology lab for further analysis.
- Some simple chemical tests such as urine pH, can be measured directly in the physicians office.

History

- Began-1950
- Escalation of Demand for test.
- Larger work loads :
 - Increase in 15 % /Annual
 - Doubling- 5 Yrs.

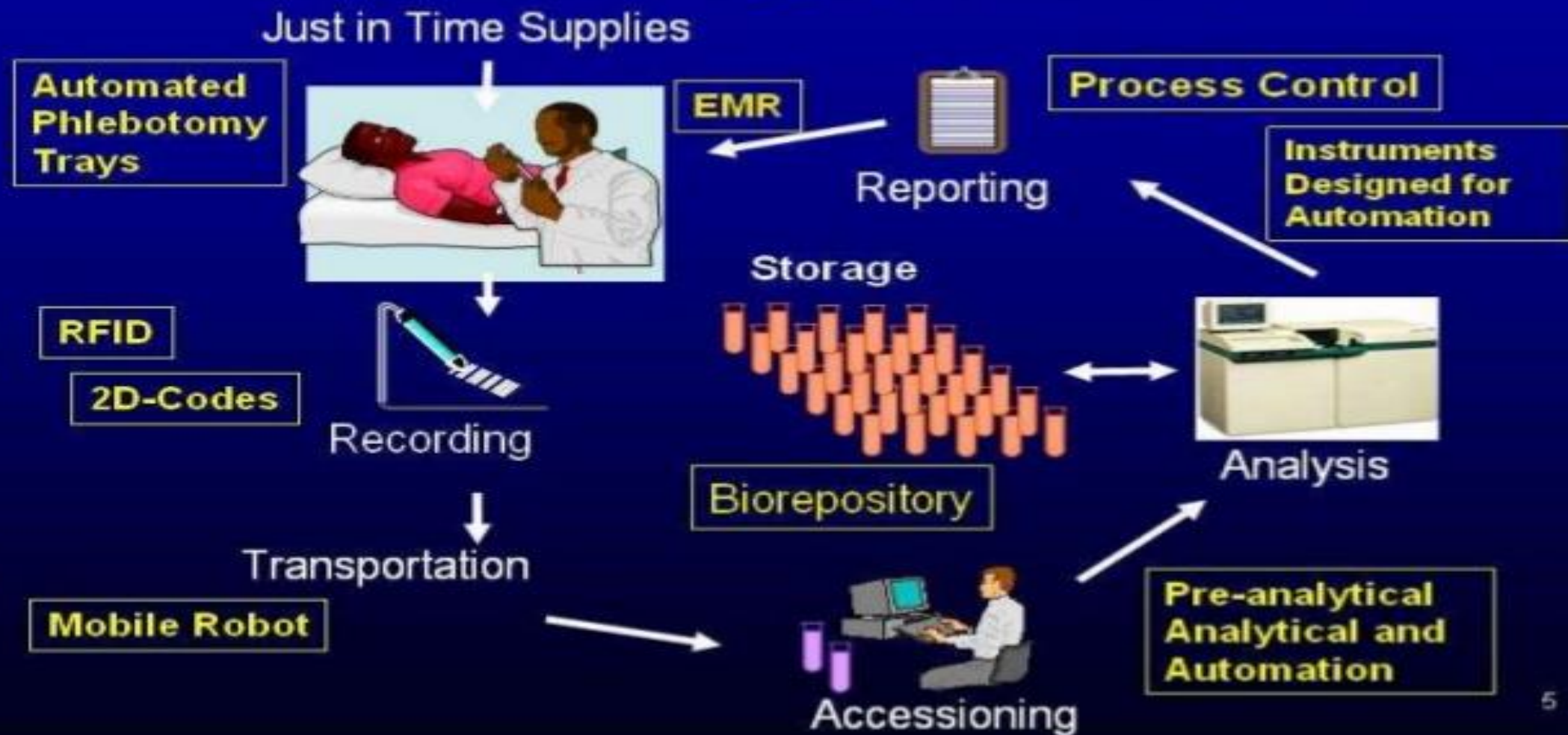
How to handle ?

- Increase in Staff
- Improvement in Methods
- Use of Automation.

Shortage of trained technicians- Work simplification

Manual- Machine (Various stages of Analytical Procedures)

Technological Improvements for All 166 Steps in the Diagnostic Process



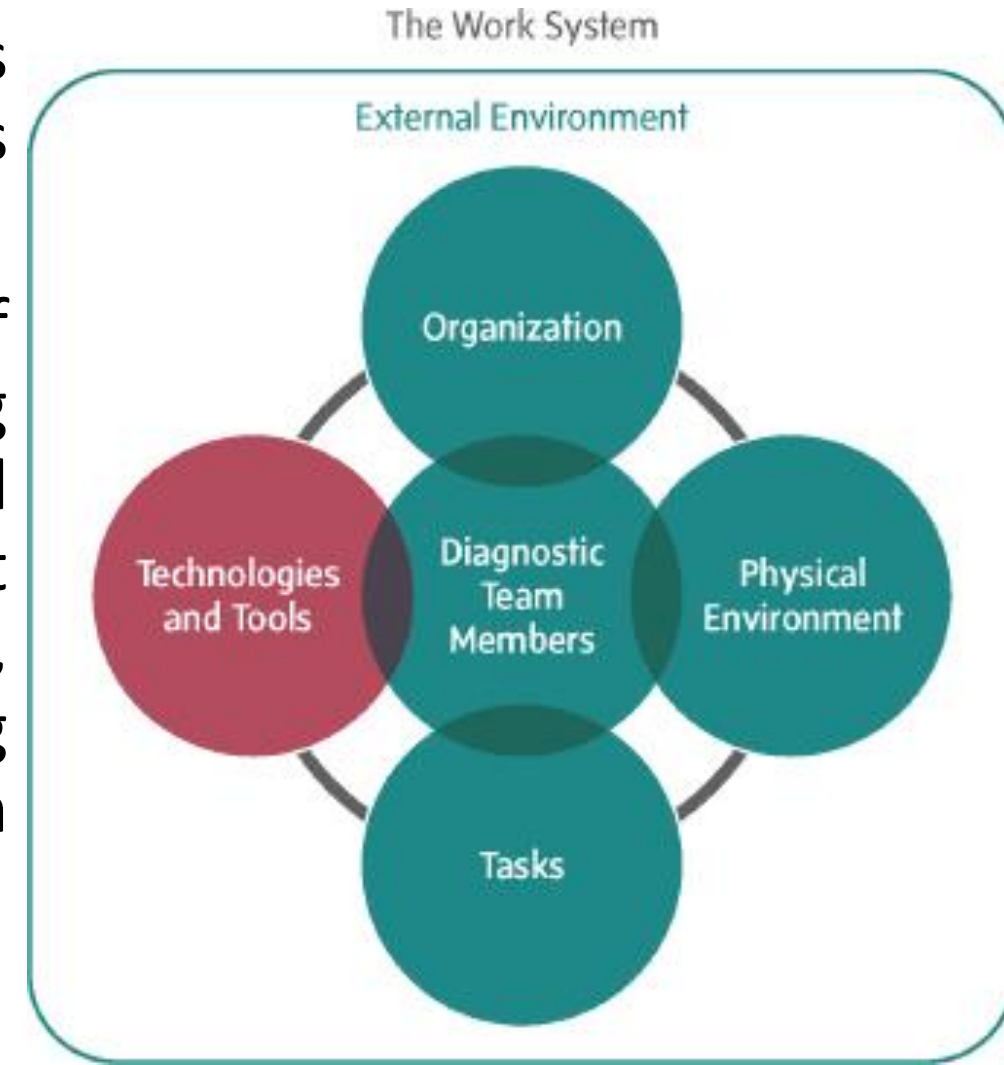
Scenario



Processes used in Automation

- Continuous flow
- Discrete Processing

- A wide variety of technologies and tools are involved in the diagnostic process as shown in figure.
- Health IT covers a broad range of technologies used in health care, including electronic health records (EHRs), clinical decision support, patient engagement tools, computerized provider order entry, laboratory and medical imaging information systems, health information exchanges, and medical devices.



- Medical diagnosis is an important but complicated task whose automation would be very useful.
- A scarce resource could be made less so and diagnosis could be made more accurate and efficient in both monetary terms and in reduced suffering or pain for a patient.
- To automatically find good utility values for the decision theoretic model, temporal difference reinforcement learning is used to increase the system's accuracy.

SCOPE

- Introduction
- IPHS standards for availability of laboratory services at various hospitals.
- Classification of diagnostics tests
- Immunopathology
- Molecular Biology
- Clinical Chemistry
- Haematology
- Cytopathology
- Histopathology
- Radiology
- Electrophysiology
- Endoscopy
- Summary



CLASSIFICATION

- The various modern diagnostic technologies can be classified as
 - Immunopathology
 - Molecular Biology
 - Clinical Chemistry
 - Haematology
 - Cytopathology
 - Histopathology
 - Radiology
 - Electrophysiology
 - Endoscopy

PIC & PLACE

- Automated pick up and delivery for medical specimens
- Does not interrupt busy technologists
- Point of origin to point of need connectivity



Mobile Robot Conveyance



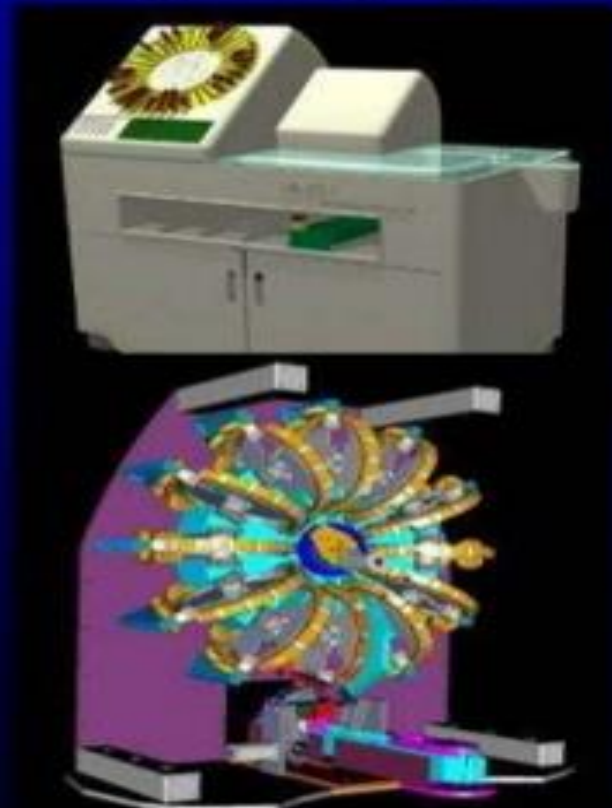
Centrifugation Options

- Robot friendly centrifuge
- Axial Separation Module

- Autofuge
- Multifuge
- Speedyfuse



Video courtesy of A&T Corporation



Automated Storage and Retrieval



IDS, Japan



BIOPHILE, Inc., Charlottesville, VA



Error Reduction Through Automation



http://www.cbc.ca/disclosure/archives/0202_mistake/story.html

Simple Load and Go Operation

Load Samples



Press Run



And Go!

