



Brief Introduction the Idea of Laboratory Workflow Intelligent

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Abstract. Intelligent trend is now inevitable, catch the opportunities can make a preemptive advance in the future compete, laboratory testing is an industry which have to do a lot of data processing in daily work, make all work flow from system to data-processing be intelligent can bring positive influence to whole industry, this article make a brief conceive of laboratory workflow intelligent.

Keywords: Intelligent · laboratory · workflow

1 Introduction

Our life has already turn upside down in the first twenty years of the 21 century, The miniaturization of electronic products is accelerating, and the market applications that come with it are spreading rapidly, with a large number of traditional devices being integrated with microprocessor chips, giving them simple computing ability, and having a primary interface, known as generally intelligent products [1]. Smartphones, smart wearables, smart cars, and so on, have spread all over our world, these intelligent products have a basic common denominator, is the processing power of information and real-time information feedback, our touch on the screen, sliding, input characters, are converted into a series of binary data, put to the processor to operate, and ultimately output on the screen for the results we need, which is a very intuitive way of interaction.

We can be inspired by the fact that the supporting laboratory is a complete quality management system [2], and the laboratory workflow in the quality management system determines whether the testing work can be carried out properly. If the laboratory workflow can be intelligent, the running status of each link in the process can appear on the screen in real time, managers only need to be able to coordinate the entire laboratory work arrangement according to the corresponding status, at the same time, the problems that arise in each link will also be reported in the first time feedback, non-compliance with the work control of the emergency will be effectively resolved in the first time, which will certainly improve the operational efficiency of the laboratory, greatly speed up the processing of inspection and testing work, At the same time, it can reduce the leakage in the process of work arrangement, the accuracy and authority of inspection and testing work will also be guaranteed.

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2 Introduction to the Intelligent Vision of Laboratory Workflow

Intelligent laboratory workflow, simply put, is to abandon the traditional paper documents, to complete data transmission by computers and networks according to the requirements, while the workflow dynamic tracking processing, combined with data to arrange the instruction of the work methods, is based on the existing information to further optimize the laboratory workflow (Fig. 1).

3 How to Build Intelligent Laboratory Workflow

3.1 Comprehensive and Unified Management of Laboratory Resources

Establish a database belonging to the laboratory, cover all the resources contained in the laboratory, realize the dynamic management of each experimental resource, track the workflow, realize the integration of each experimental resource library and the ability library, as the elements of the experimental capacity library, and achieve the efficient use of experimental resources.

3.2 Implement the Lab Workflow

Through the combination of database and management system, the workflow is fully electronic and reflected in the information system, the workflow is monitored in real time, improve the operational efficiency of various departments.

3.3 Establish the Capacity Library and the Experimental Standard

Through the establishment of capacity library and experimental standards, the experience combined with experimental instruments will provide reference for similar related experiments and work.

3.4 Realize Full Workflow Management of the Laboratory

All aspects of the laboratory workflow will be displayed in real time online, visualizing the entire laboratory's workflow, and can effectively monitor the progress of the experiment and the abnormality in the course of the experiment, progress and results will be the fastest way to feedback, intelligent workflow will improve work efficiency and promote the overall capacity of the laboratory.

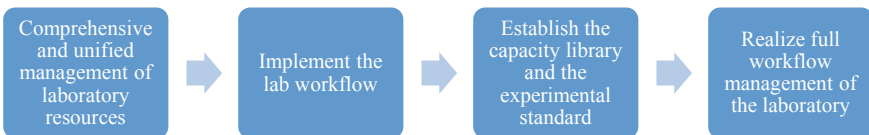


Fig. 1. Build the intelligent laboratory workflow steps

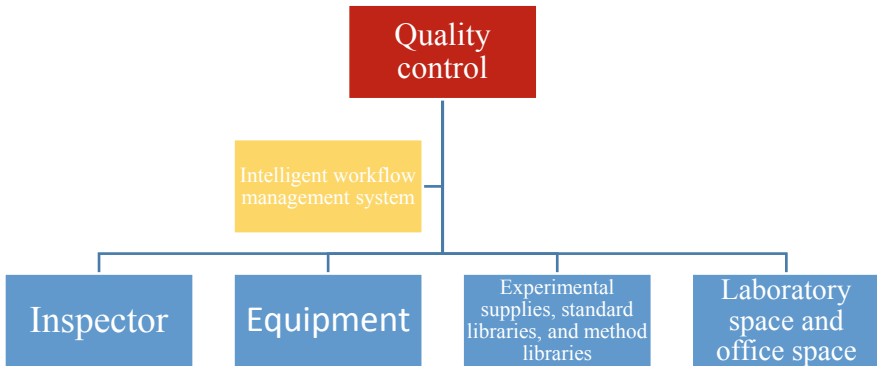


Fig. 2. Intelligent resource management diagram of laboratory workflow

4 The Result of Intelligent Laboratory Workflow

4.1 Lab Basic Resource Management

The management of the whole laboratory is the most important function of the intelligent workflow, and the content of management is divided into basic resources and quality management [4], basic resources refer to the laboratory necessary inspection and testing personnel, with the necessary equipment and equipment to meet the requirements, inspection and testing supplies and media, supporting the experimental standard library and method library and matching laboratory sites and personnel office space, quality management is through the analysis of work flow, work responsibilities and work docking coordination distribution, To ensure that the work procedures and working methods in line with the relevant regulations, to ensure the effective conduct of the work, and the introduction of intelligent workflow to assist in the work, can make the work of timeliness and accuracy to a higher level, real-time data changes will be the first time reflected in the laboratory management system, according to the rules set by the process operation, to carry out the next step of the guidance, effectively improve the speed of work and participation, so that the whole workflow is more controlled, work procedures more smooth and stable (Fig. 2).

4.2 Laboratory Risk Control

On the other hand, intelligent workflow will enable the laboratory to have stronger risk control [4], problem early warning and emergency response capacity, the real-time monitoring of the whole process will analyze the operation of the laboratory law, in the event of abnormalities timely reminder reporting, the risk elimination in the embryonic stage, the possible quality of accidents to do timely avoidance, while being able to alert repeated abnormal problems, to help managers find gaps in the workflow and unreasonable rules, timely improvement and change of management procedures. In the event of a serious problem, through the development of a good emergency plan, the emergency treatment methods will be issued in real time for risk treatment, notify the

relevant personnel to cut off the workflow, to prevent the subsequent occurrence of “break the bank”, at the same time can inform managers to deal with the problem in a timely manner, the consequences as harmless as possible, and record relevant cases to prevent the recurrence of similar incidents.

4.3 Laboratory Data Processing

In addition to the above two aspects, intelligent workflow will bring strong data processing capacity, and data is the dynamic embodiment of the entire workflow operation, the laboratory every day will produce a large amount of data, requires a large number of people to spend a lot of energy to process it, and for laboratory quality management, equipment status tracking or test report issuance, therefore, intelligent laboratory workflow will enable the laboratory to have a strong data processing capacity, Calculate the desired results from a large amount of data, identify errors and anomalies, and help the inspection work run accurately and efficiently.

Laboratory-owned test personnel, experimental equipment and experimental supplies are important basic resources, these basic resources after data processing to establish a database, and dynamic tracking, real-time attention to change, the ability of test personnel to verify the length of tracking, to ensure that there is always recognized detection capacity, test equipment to do verification/calibration status statistics, in time to remind the relevant personnel, improve the equipment verification / calibration status, to ensure that the equipment normal testing work. To ensure the accuracy and reliability of experimental results, for experimental supplies and media can be real-time statistics, in the absence of consumables media or related reagents to the near shelf life to do early warning, timely supplement or update, to ensure the normal operation of laboratory testing work (Fig. 3).

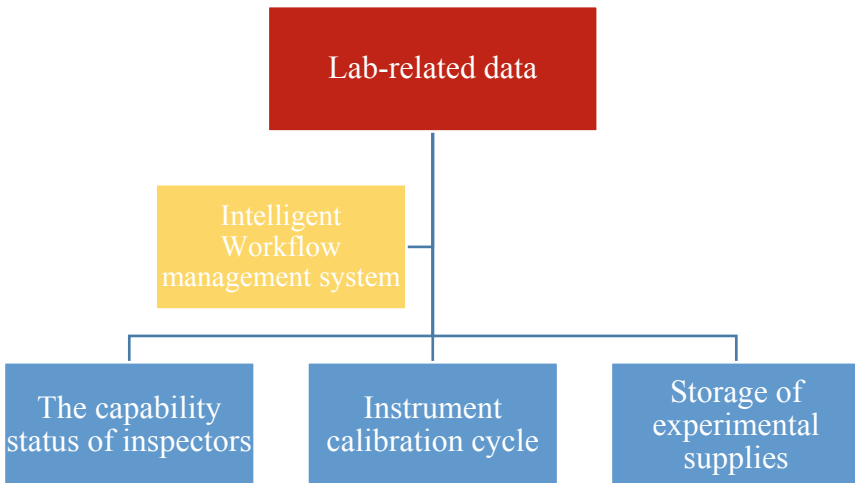


Fig. 3. Intelligent data processing diagrams of laboratory workflow

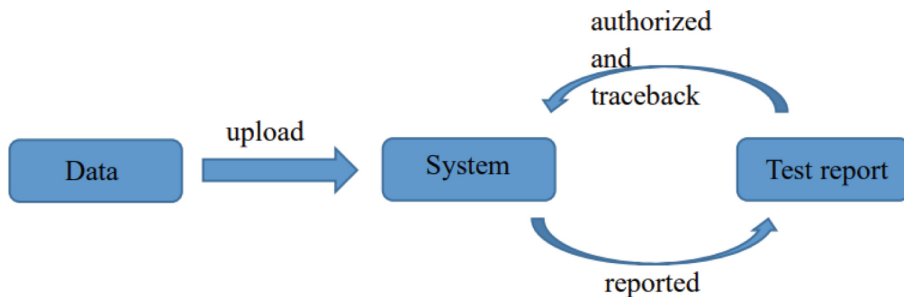


Fig. 4. The intelligent laboratory workflow of the test report

4.4 The Issuance of the Test Report

Data processing capacity also has a very important application, the experimental data will be used to automatically generate the test report of related items, the electronic original record generated by intelligent equipment will be automatically filled in the corresponding detection standard report format after processing, a one-time generation of electronic version of the detection report, reduce the error caused by the manually entered the original data to produce the report, make the detection report more accurate, but also can be electronic security processing of the report, so that it is more authoritative, And can be electronic traceable processes and results, not only that, intelligent data processing can also be issued by the test report to make detailed statistics reflected in the workload, and the results are produced into relevant documents for the detection results report (Fig. 4).

5 Conclusions

Overall, the process of intelligent laboratory workflow will provide great help to the existing testing work, will bring the laboratory in the competition and the changing times of the first advantage, and with the maturity of AI technologies and big data applications to the traditional industry [5] quickly sink, the intelligent laboratory workflow will become inevitable, I would like to make a simple statement of the laboratory workflow intelligent in this article.

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