

Effect of ICT application in Manufacturing Industry

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Abstract:- The capabilities offered by Information Communication Technologies (ICT) and manufacturing industries have changed the paradigm of industrial practices. These ICTs have the potential to create new type of industrial engineering. This paper presents the fundamental concepts and issues in manufacturing informatics along with the communication technologies. The author also presents discussion and design process and requirement of communication in manufacturing industrial settings. This paper also explores opportunities for research problems in the field of wireless field bus systems and wireless communications, in the discussion, the author mention differences between theoretical and practical data rates. Therefore, opportunities involve the search for new protocol techniques to improve real-time capabilities in industrial settings.

Keywords: ICT, industrial engineering, Industrial Informatics, real-time, Information technology

1. INTRODUCTION

Industrial informatics has emerged from the development of science, engineering and information technology. The term industrial refers to the approach for real world applications and informatics refers to the infrastructure that provides development and development of real-world applications. The informatics also suggests tools and techniques for information analysis, manipulation, transformation and distribution. Industrial informatics focuses on knowledge based automation as a means to enhance fabrication and manufacturing processes in industries. The industrial informatics is not limited to the manufacturing industries only but knowledge industries like computer based control systems, robotics, vision systems, and data acquisition and signal processing are also applying tools and techniques of industrial informatics.

2. INDUSTRY CLASSIFICATION:

2.1 Primary Industry:

Primary industries are involved in the extraction of resources directly from the Earth. They send raw or crude materials to factories to manufacture a product.

2.2 Secondary Industry:

These are involved in the processing of products from raw materials received from the primary industries.

2.3 Tertiary Industry:

A tertiary industry refers to the group that is involved in the provision of services. They include teachers, managers and other service providers.

2.4 Quaternary Industry:

Quaternary group refers to the group that is involved in the research and development, science, technology, intellectual property management.

Industrial informatics has a collection of techniques and practices that use information analysis, manipulation and distribution to achieve higher efficiency, effectiveness, reliability, and security within the industrial environment. The field of industrial informatics has also emerged as one of the key disciplines for the purpose of intelligent management and production techniques (Acciani, 2011, Gomperts).

Industrial Informatics = Approach for real-world problem +IT tools and Techniques The ICT design tools for industries vary depending on the operating nature of a particular industry. There are four major types of industries as shown in the table 1.1. The application of ICT in manufacturing includes process modelling, production scheduling and control, material management information systems and knowledge management for research. The industrial informatics is a building on the history of the informatics discipline, design, practices and experiments. The industrial design processes can be defined as a set of logically-related tasks performed to achieve defined outcomes. An industrial process is defined based on the customer's requirement and business interest.

The use of information technology starts with the mapping conventional industrial process to IT used process. The product development process or the team can exchange computer Aided Design (CAD) over the large distances, for example, might affect the structuring of a product development process. Therefore, it is highly recommended that consideration of information technology in a process must therefore be done in the early stages of the design. At this stage, a list of the generic capabilities of IT in improving business processes can be prepared. Along with the state-of-art ICT tools, the intelligent techniques like fuzzy logic, neural network and generic algorithm can be coined to make the process adaptive and robust. In the next section we will discuss communication requirements in industrial settings.

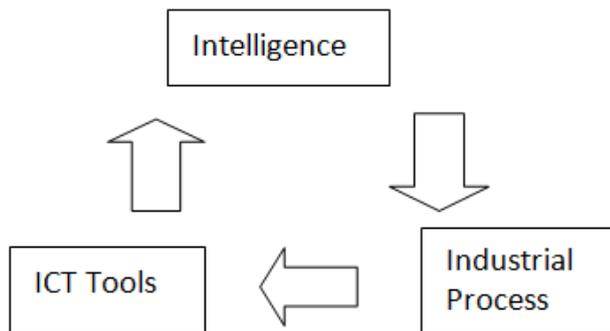


Figure 1: relation between ICT tools, intelligence & Industrial process

3. COMMUNICATION REQUIREMENTS

Each industry has unique requirements issues and challenges with communications infrastructure. The communication within the industry has verticals as granularity, speed, entity and system. The requirement varies from one industry to another. The communication needed at machine level is different from component level like actuator where the response time has to be faster. On the other side, the amount of data transmitted at the actuator level is very less as shown in the Figure 2.

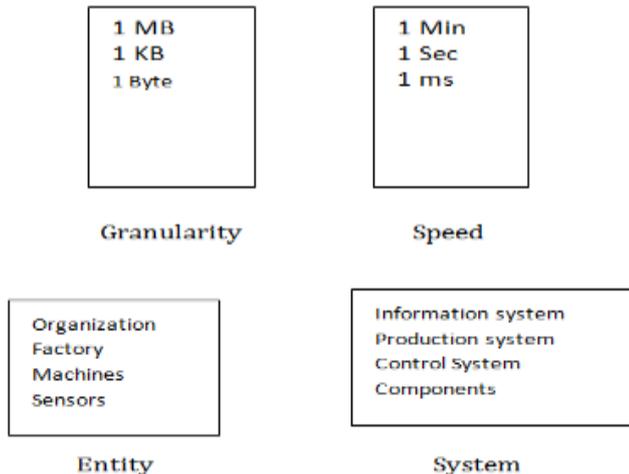


Figure 2: Communication requirements at different levels

4. REDUNDANT COMMUNICATION REQUIREMENTS:

The rapid shift in industrial electronic as affected the design of safety systems for many industries. The present safety system provides more information about the process to the process control computer. The equipment is connected to multi-drop network using one network cable. The network may be based on different protocols and hardware specifications. The communication in such network is not through legacy communication protocols.

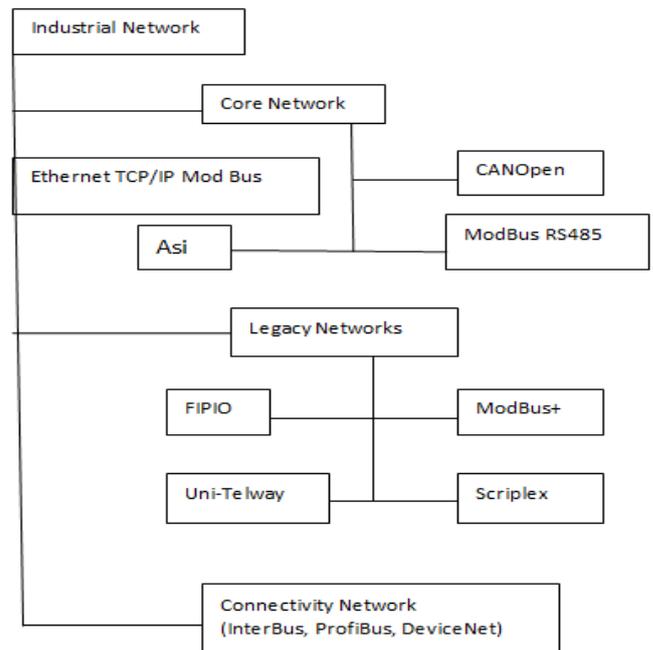


Figure 3. Communication required at different levels

This is very difficult to replace the existing serial communication based equipment. In such scenario, the network communication can be made redundant. The redundant links can be deployed to make communication more reliable and safe.

5. CONTROLLING THROUGH NETWORK:

Every machine in industry are controlled by means of a controller and operated by means of pneumatically, hydraulically, electrically or by means of electronically. This controller may be based on hardware or programmable logic. Generally, programmable logic controller (PLCs) is used in manufacturing industries which are based on commercial programs and plays key role in industrial automation. These helps in automatic controls including rapid fault finding and error elimination for different processes. Recently, hardware devices very much attractive towards industrial automation. The new standards of control system and communication protocols are replacing legacy proprietary hardware.

6. COMPUTATIONAL INTELLIGENCE IN INFORMATICS

The survival of any industry is based on effective decision making process and also makes manufacturing processes easy, roust and fault-tolerant. Fuzzy logic, Rough set theory, artificial neural networks, Novel Meta-Heuristic optimization, Adaptive Network and Evolutionary computing techniques tools are used to provide decision support systems for profitability quantification in any manufacturing industry.

7. PERFORMANCE EVALUATION PARAMETERS

The communication network is primarily evaluated on the basis of physical structure called topology. The topologies are calculated based on their cost (size, degree, diameter, bisection width etc) and performance measures.

8. INDUSTRIAL NETWORK DESIGN

Ethernet are used in most of the industrial network and it has the capability to accommodate a wide range of applications. The Ethernet easily encapsulates industrial equipments protocols and is quickly becoming unique choice for short-range communication links.

9. WIRELESS COMMUNICATIONS

The traditional communication model has been overtaken by Ethernet and it has the capacity to accommodates a wide range of industrial applications

10. CONCLUSION

It has been discussed that the fundamental issues in industrial informatics along with the communication technologies and the design process with requirements of communication in industrial settings.

Again wireless technologies can bring many benefits to industrial settings, one of them being the reducing machine setup and maintenance times by avoiding cabling. The assessment of the many emerging wireless technologies like MIMO, wireless ad hoc, smart antennas and sensor networks is equally important use in industrial application to improve real-time capabilities in industrial settings.

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