

Chapter 1

Fundamentals of Industrial Informatics and Communication Technologies

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ABSTRACT

The capabilities offered by Information and Communication Technologies (ICT) and business process have changed the paradigm of industrial practices. These ICTs have potential to create new type of industrial engineering. The chapter presents fundamental concepts and issues in industrial informatics along with the communication technologies. The authors also present discussion on design process and requirement of communications in industrial settings. The chapter also explores opportunities for research problems in the fields of wireless fieldbus systems and wireless industrial communications. In the discussion, the authors mention differences between theoretical and practical data rates. Therefore, opportunity involves the search for new protocol techniques to improve real-time capabilities in industrial settings.

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 develop-

ment and deployment 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

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Table 1. Industry classification

| Industry Type | Definition |
|---------------|--|
| Primary | Primary industries are involved in the extraction of resources directly from the Earth. They send raw or crude material to factories to manufacture a product. |
| Secondary | Secondary industries are involved in the processing of products from raw material received from primary industries. |
| Tertiary | A tertiary industry refers to the group that is involved in the provision of services. They include teachers, managers and other service providers. |
| Quaternary | Quaternary group refers to the group that is involved in the research and development, science, technology and intellectual property management. |

control systems, robotics, vision systems, and data acquisition and signal processing are also applying tools and techniques of industrial informatics.

Industrial informatics has a collection of techniques and practices that use information analysis, manipulation, and distribution to achieve higher efficiency, effectiveness, reliability, and/or 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, 2011).

Industrial Informatics = Approach for real-world problem + IT Tools and Techniques

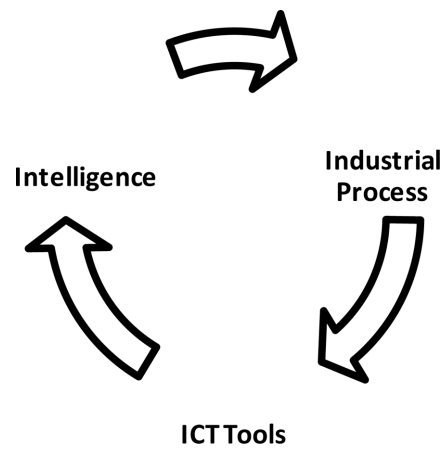
The ICT design tools for industries vary depending on the operating nature of a particular industry. There are four major types of industries as shown in the classifications in Table 1.

The application of ICT in manufacturing includes process modelling, production scheduling and control, materials management information systems and knowledge management for research. The Industrial informatics is a building on the history of the informatics discipline, design, practices and experiences. The industrial design processes can be defined as a set of logically-related tasks performed to achieve a defined outcome. An industrial process is defined based on the customers requirement and business interest (see Figure 1).

The usage of Information technology starts with the mapping conventional industrial process

to IT based process. The product development process or the team can exchange Computer Aided Designs (CAD) over 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 genetic 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. Relationship between ICT tools, intelligence, and industrial process



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