



## CONTROL ROOMS

# A Place of Learning

## Control Centres As a Place of Learning and Development As a Part of Its Daily Functions – Presentation of a New Control Room Handbook

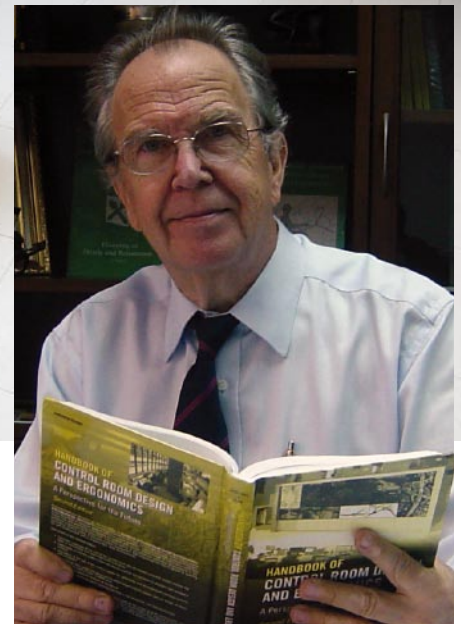
**In recent years the concept of 'control rooms' has changed enormously. As their roles and functions have expanded, it is often more appropriate to talk about control centres. A new Handbook of Control Room and Ergonomics describes and illustrates the new trends in the change from Control Rooms to Control Centres.**

The handbook also presents a lot of facts and guidelines for future design. A modern approach for considering work in control centres uses recent concepts of creativity and learning/developing environments. Today, process control encompasses a new generation of computer systems which have enormous capabilities but which tend only to be used for a small proportion of their operating time. This surplus capacity can be used for simulations to support decision-making and learning, and also for development of processes and technology. In other words advanced technologies have today a potential of being, to a very large extent, integrated and in-

terrelated with human factors, organizational and technological development.

### New Objectives of Control Centres

Primarily, the main function of control centres is to fulfil its main objectives and missions. Obviously this will also be so in the future. Monitoring and supervising all relevant prime and secondary functions are dominating parts of control centre tasks. But to an increasing extent the control centre should support the development of the operators' skill and knowledge (including building on operators' current tacit knowledge



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and ability). Control centre work can also provide data and information supporting the continuous development of an organization's proc-

esses and technologies. In this way the operators will be better prepared for, and also more able to anticipate, early warnings. In other words the operators will not only react to incoming and displayed data, signals and alarms but they are also able to anticipate and predict critical situations. In a way the future control centre will become a kind of advanced "university" within its own scope and paradigm of knowledge. This will – in some ways – be a large difference from control rooms of past.

New innovations over the last decades in form of large scale information displays influence the design and layout of the control centre, and offer unprecedented possibilities. However, there is a marked lack of a well-informed, well-structured body of knowledge of ways of employing these new technologies. Of particular importance is the relationship between the new display technologies and the use of controls. Currently, even with up-to-date systems, operators still mainly rely on keyboards. This weakens the potential development of the operators' tacit knowledge. Development of this tacit knowledge is very clearly related to the interaction and symbiosis between control actions and display configurations and design. For example, apart from their function as a means of controlling the process, old forms of controls were simultaneously a means of information display. This multi-functionality is largely missing when keyboards replace knobs and dials.

### New Areas of Application

New developments in display technology are important steps forward. But it is important not to rely solely on visual displays. The use of sound as a means of conveying information is not only to add redundancy. Sound also has advantages in itself. Reaction to sound stimuli is not dependent upon the operator looking towards the sound source. The operator can thus have freedom of movement and be looking in other directions and still perceive information in the form of sound. Obviously this is of particular importance for alarms and other attention-attracting messages. People tend to react more rapidly to sounds than to visual information, and this is particularly true for more complex messages. There are also theories and ideas that sounds enhance tacit learning. In the context of control centres, this might be of value for the operators to build conceptual mental process models and this is related to the operators' preparedness to predict and foresee future critical and important events. This is in turn important to enable early interventions and preventive actions.

The past decade has seen a rapid growth in new areas of application of control centres (presented here in order of scale of recent growth):

1. Security and Safety
2. Trading and Business (including 'carbon' and energy trading).
3. Central, Local and Regional Government sectors (next step of eGovernment)

4. International Organizations (including global environmental concerns)
5. Centralized Control in Manufacturing
6. The Service and Tourist sectors (merging of a number of e-systems)

Mathematical modelling and usage or advanced simulation techniques will probably – even to a higher degree – have an enormous influence on the function, capability and efficiency of future control centres. Each of the application areas listed above requires its own research and development to obtain adequate capabilities of modelling for its own preconditions. There are also many possibilities for mutual learning based on joint research between the different application areas. It is a necessity to avoid rapid change which is more ad hoc than systematic and planned. The emerging roles, functions, and potentials of control centres in these new application areas need to be supported by research. Initially, there is primarily a need for independent survey studies and evaluations of the existing new application areas (e.g. security and safety) of control centres. It would be helpful to have case studies of best practices. It is also important to review and reuse the knowledge from earlier control room evaluations (including ergonomics) in the context of the new application areas.

### Stimulating and Optimizing

Concepts of knowledge management, data mining and AI (including the use of logistics, queuing theory, decision methods, AR, simulations, etc) also have high potential in the creation of the control processes and control centres of the future. Ideally, future control centre work is no longer a tedious, boring, or monotonous task solely focused on low vigilance of work processes or overloading of perception and highly repetitive tasks. Rather it is a stimulating creative design opportunity for optimizing system performance and shaping the future as part of business and safety development efforts to improve competitiveness while conserving scarce resources and saving the environment. However, at present, there is only a marginal use of the potential of this new way of managing and operating control centres. Substantial development and research projects need to be devoted to this particular area.

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