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Rethinking Off-the-shelf Console Design

Executive Summary

As technology transition expands its reach within C4 operations, the challenge of achieving a balanced integration of people, technology, workspace and workflow becomes increasingly difficult. Understanding these four dimensions of high performance console design provides the necessary freedom to deliver a high return on investment and a lower total cost of ownership in the mission-critical environment.

The selection of command and control consoles for mission-critical facilities has traditionally occurred late in the planning and construction phases of a new facility or the expansion/renovation of an existing one. Until recently, off-the-shelf console templates have been employed and have met the needs of most applications.

The advancement of new command, control, communication, and computer (C4) technology is driving the need for a new approach to console design. Generic, off-the-shelf templates are no longer viable solutions to meet the demands of today's C4 environments.

These environments include a variety of 7/24 workplace functions, such as network operations, 911 centers, incident command, emergency operation centers, process control, medical imaging, security/ transportation management, and many other types of command and control operations centers. These centers now require higher performance levels from their consoles.

High performance console design is an integral element of the overall facility design, and will reap productivity benefits when centers are brought on line. The console must be viewed as an integral part of the technology solution, equal to the hardware/ software solutions being deployed. When executed correctly, this console perspective positively impacts how each employee interacts with the technology, the enterprise infrastructure, and the rest of the working team.

New Dimensions in Design Methodology

Architects, designers, engineers, and facility planners need to consider each of the four dimensions (people, technology, workspace and workflow), as an integral element of the overall operational system and peel back precepts of traditional console design methodology.

People: In C4 environments, people operate at high emotional states, often in anticipation of a critical event taking place. Understanding how people interact with other elements of the system within the environment is the basis of high performance console design.

It's very important to understand who will be interfacing with the console. This information is integral to the design process as business productivity is directly correlated to individual productivity. One must consider the operator level – the individuals in the seat – as well as secondary levels of the operation including supervisors, system or network administrators, facilities engineers, technicians, and even systems integrators who come into contact with the console on a regular basis. The ability to service the technology and infrastructure, while maintaining operational uptime, is directly impacted by the console design and configuration.

Technology: Technology and its supporting infrastructure are the backbone of C4 operations. High performance console designs efficiently and effectively store, cool, power, manage, and secure the technology housed on or within the console.

As the primary human-machine interface, the console can essentially be described as the point at which the data center and mission-critical personnel meet. Consoles tend to house technology locally. Because of this, safeguards must be designed into the console to avoid accidental power or data loss, equipment overheating, or other unintentional consequences resulting from human error.

Power and data cables must be neatly managed and provide easy access for IT and facilities personnel. Yet, they must also be out of reach to avoid accidental disconnection. Airflow management solutions that include material selection must also be in place to ensure that higher density computer and network gear is adequately ventilated. In C4 applications, these measures should not be afterthoughts, because data and power downtime can result in life and death consequences.

Workspace: Physical space is, by far, the most constraining and least forgiving of the four dimensions. The space must be examined independently from the operation and from the console itself. Space planning identifies the space available for console design.

Additionally, physical and conditional attributes of the space, such as cable cut-outs in raised floors, power drops from ceilings, ADA requirements, and other local building codes, also play an important role in the design of a high performance console for a C4 environment.

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New Dimensions in Design Methodology (cont.)

The main objectives in space planning are to ensure that the space can support the appropriate number/types of consoles and that the consoles can be adequately located to meet the workflow demand of the overall operation. Cabling, data, and power distribution requirements of the operation must also be accommodated appropriately. In addition, it's important to build in as much modularity or scalability – to allow for future system upgrades and equipment transitions – as operational needs change and technologies evolve.

Workflow: Workflow is the integration of people and technology working collaboratively in the physical workspace, as well as individuals in various operations center job functions interacting seamlessly while functioning at peak performance.

It's important to understand the relationship between the work types within the center. This includes managers, supervisors, operators, engineers, risk managers, and each employee seated at the consoles.

Additionally, the interaction of all people who may not be seated at a console must be clearly understood. These can be technical or administrative staff, facilities or support personnel, or even in some cases, the general public.

Is an uninterrupted sight line to the entire facility required by a supervisor or manager? During critical events, will supervisors or managers need to have remote access or need to monitor an operator station? Are there specific times or physical points where there is interaction between supervisors, office administrators, other center personnel, or the general public?

In C4 environments there are two distinct workflow modes: normal day-to-day operations and critical event or crisis mode. The interdependencies of all the personnel working within any mission-critical C4 environment need to be considered and evaluated to ensure that operator consoles are designed to meet these requirements and optimize operations.

Transitioning to High Performance

As the primary human-machine interface, today's sophisticated consoles play a central, critical role in mission-critical C4 environments. Console design has evolved to the point at which it is as effective a contributor to operational performance as are the people and technology that work at them.

Higher levels of ownership and buy-in are achieved when the mission-critical team has greater input into the four dimensions of the discovery process. This detailed input ultimately enables higher performing people and more efficient operations during normal operational periods, and especially, during periods of crisis management.

Understanding the four dimensions of high performance console design provides the necessary freedom to deliver a high return on investment and a lower total cost of ownership in the mission-critical environment.

Eaton
Electrical Sector
1000 Eaton Boulevard
Cleveland, OH 44122 USA
Eaton.com

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