Welcome to the future Control Room Working Environment

Modernizing the Control Room working environment is a necessity to catch up with competition in paradigm shift of the industry 4.0. The world around us is shaping in a rapid speed where the Internet of Things, big data, automation, artificial intelligence, autonomous transportation, cyber security, augmented reality, virtual reality, digitalization are only some of the fields that are shaping the way how we humans will interact with technology in the future.

Maximizing wellbeing in Control Room working environment will be the next challenge for the industrial world. This can be achieved by matching the needs and the requirements of the future Operators.

While digital technologies are becoming a commodity, the biggest challenge remains the Human Factors. Some of the key questions that remain are how can we attract the next generation of Operators in to Control Room working environment? Than after, how can we increase the human performance? Unfortunately, there is not a straight answer to it. Human Center Design is one approach toward the solution where the entire working environment is adapted to the operators needs and parameters. Meanwhile others are thinking about the future while we are inventing it.

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Background

There is a paradigm shift of technological development going on throughout the world. At the same time, the public safety, transportation and utilities sectors are trying to adopt and implement the best technological solutions to enhance productivity, efficiency, quality, sustainability, and health & safety.

The business sector is also eager to implement new technology in the physical working environment with the intention of enhancing efficiency, safety & well-being, and reducing fatigue among their workers.

Unfortunately, recent research indicates that the physical working environment and the automation process do not always provide effective solutions to the all ready mentioned factors. The aim of this paper is to elaborate upon the idea of more perfectly matching the psychosocial working environment with a physical working environment to positively impact operators working in control rooms. Another question is the role of human factors engineering to reduce financial losses by increasing health & well-being with optimal light, acoustics, air quality and ergonomic solutions in the control room working environment.

INDUSTRY

1.0

THOMAS NEW COME BUILDS THE FIRST STEAM ENGINE .

1712
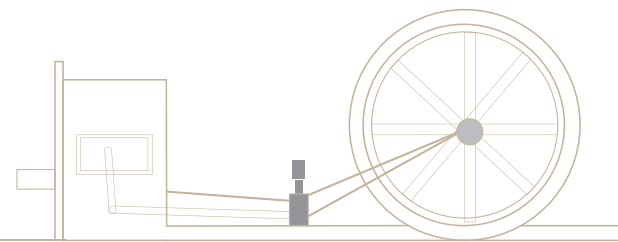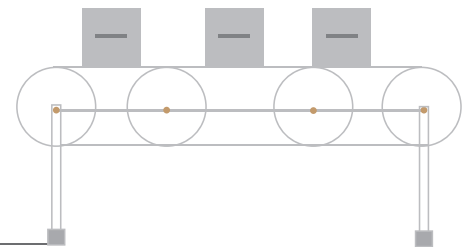
INDUSTRY

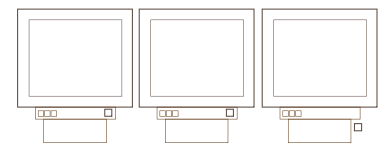## 2.0

ELECTRICITY IS USED FOR INDUSTRIAL PRODUCTION.

1870

INDUSTRY

3.0
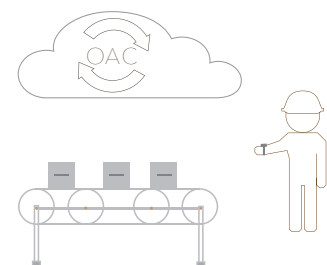
PERSONAL COMPUTER ENTERED THE INDUSTRIAL FIELD

1969

INDUSTRY

4.0

COMMUNICATION BETWEEN **PEOPLE** , SERVICES , AND THINGS .

Today

Driving factors and future challanges in the Control Room

Generational shift, the Internet of Things (IoT) and automation are the main factors that are shaping the future of the control room working environment. Financial growth is another aspect that is shaping the future of the control room. Management Consulting company McKinsey predicts that the IoT will grow to $6.2 trillion by 2025. Reducing the cost of health and safety deficiencies is another driving factor for industry. In the UK alone, the total cost of health and safety failures to society could be as high as £18 billion per year, according to the Department of the Environment, Transport and the Regions.
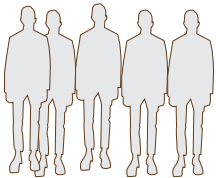
DEMOGRAPHIC IMPACT

In 1950, there were 2.5 billion people on Earth.
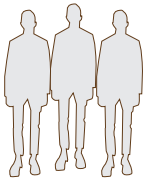
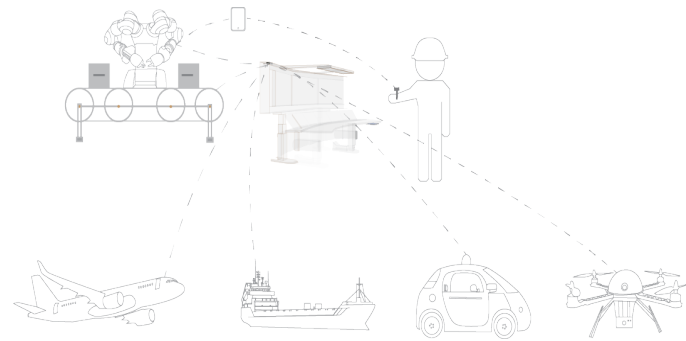2016 there are more than 7 billion people on Earth.

2050, more than 10 billion people on Earth.

ECONOMY

McKinsey thinks that Internet of things it could be as large as $6.2tn by 2025, in terms of economic impact.

TECHNOLOGICAL DEVELOPMENT

KEY WORDS

UNMANNED TRANSPO RTATION

AUTOMATIO N

INTERNET

CYBER SECURIT Y

VIRTUAL REALIT Y

REM OTE

BIG DATA

Future challenges to the Control Room Working Environment

Generational shift will impact business markets and the industry sectors as the older generation (e.g. baby boomers) retire. One challenge will be to attract the next generation of operators, often referred to as the Gaming Generation or Multitasking Generation, into the control room working environment. An average gamer executes up to 300 actions per minute, while the non-gamer executes up to 100 actions per minute. This will be a challenge in the industrial control room working environment where the tempo is often perceived to be 99% boredom and 1% panic.

The only way to encourage the next generation of operators to work in control rooms is by adapting a holistic approach to the control room working environment. Moving from Control Room to Control Center is another challenge. Future operators will have to deal with a multiplicity of control systems, which will raise stress levels in control centers. Acoustic disturbances will playa key role when a host of operators have to share a common working space, communication devices, navigation keyboards, etc.

Illuminance improvement is another area of concern because we know that interrupting individual circadian rhythms can have devastating consequences for shift operators. It has been scientifically proven that night shift workers die five to seven years earlier comparedto staff working regular forty hour work weeks. Air quality, heating, air conditioning and ventilation also matter in order to enhance human performance in the control center working environment.

A Holistic approach to Control Room solutions

Identifying the needs and establishing the requirements of the next gaming and multitasking generation of operators can be achieved by using human-centric design. Technological development driven by the operators' needs will transform the working environment. Designing for people takes aspects of the psychosocial working environment such as gamification, collaboration, individual space, flexibility, learning, sustainability, social presence, emotional engagement, and creativity into consideration.

The knowledge gap is another problem that we will face when baby boomers leave the working field. One way of transferring knowledge from baby boomers to the gaming & multitasking generation is by introducing gamification as a motivation for learning, education and passing knowledge onto the next generation of operators.

Human-centered design that creates intelligent and individual working places is the way forward to meet these demands for the next generation of operators. Science is rapidly producing papers showing how ergonomics affects our daily life at work.

Personal ergonomics are becoming more and more important in order to improve health and well-being in the control room working environment. Personal lighting adjustments are necessary since lighting has a direct impact on health and well-being; the circadian rhythm is directly connected to the amount of light that humans are exposed to.

Designing the workflow, measuring the workload and understanding the function and tasks of each operator is a key to success.
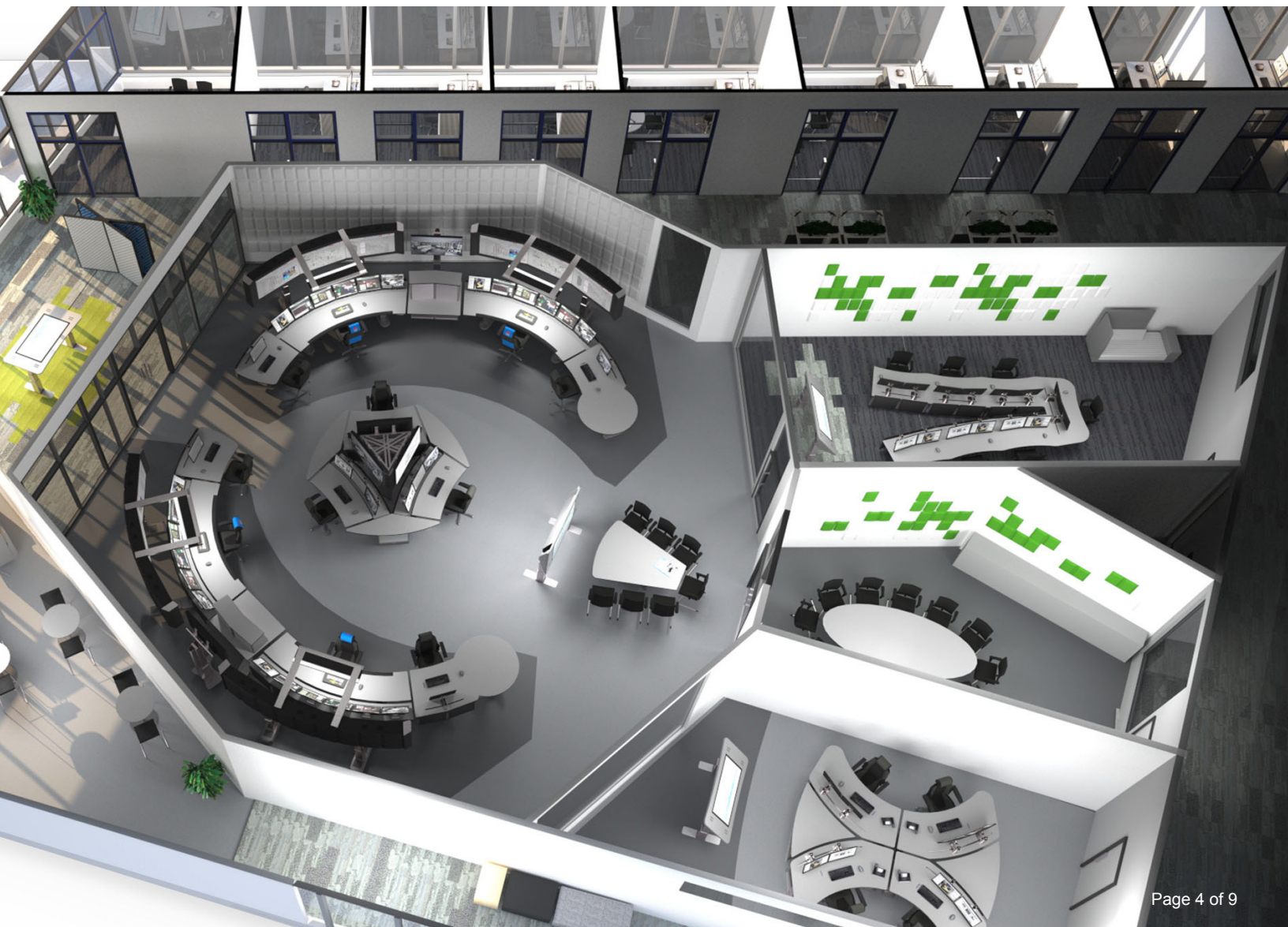
Addressing the needs of the Next Generation Operators

Human-centered design makes sense when we address the operators needs and enable them to adjust their entire working environment. CGM has developed intelligent and modular platforms to improve the operators' working environment by introducing a state of the art platform called the Extended Operator Workplace-Intelligent (EOW-i) model. Experience has taught us that each individual is unique and has different requirements.

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This platform will be focused on improving health, well-being and ergonomics, raising the level of awareness by educating operators on health and well-being, optimizing their working environments by using gamification as a method for motivation and engagement, and optimizing processes for a more sustainable use of both energy and resources.

The Workplace as a Cockpit Solution

The physical aspects of working environments such as light, sound, air quality and ergonomic have direct impact on the psychosocial factors of the working environment and how the operator feels cognitively. The key to fulfil the needs of the operator in the control room working environment is to optimise and improve physical as well as psychological factors. Usability goals such as safety, satisfaction, fun, entertainment, helpfulness, motivation, and creativity are also tightly conntected to the psychosocial and physical working environment.

Accomplishing these goals goes hand in hand with usability principals such as efficiency and ease of use, as well as simplified learning to use the cockpit solution. Personal light adjustments with cold and warm light possibilities, ergonomic adjustments to operator anthropometrics, integrated personal communication, alternated posture, and personal air quality in the workplace are only some of many other factors that CGM take into account in the EOW-i.

Extended Operator Workplace - Intelligent (EOW-i).

Operator Activity Cloud and the IoT

The industrial revolution started with water and steam power, continued with electricity and then personal computers. Now we are facing the paradigm shift of the Internet of Things. Big-data, predictable maintenance, automation and artificial intelligence are only some of the buzz words of IoT. Fifty billion devices will be online by the year 2020.

Measuring all kinds of data in order to predict upcoming faults or unplanned down times are the main focus of the industrial world. Collaborating with different universities and research institutions, CGM have gathered a wealth of knowledge in the field of IoT, and generated new ideas about how to implement that research for the benefit of control centre operators. For example, sensors measure both bio-data as well as working environment data to opportune the optimization of the operator's health and well-being.

The Operator Activity Cloud will play a key role in the operator's daily work efficiency with personal adjustments of the operator's working environment. Everything will be integrated into a cockpit extended workplace solution. Individual user profiles, including elements like desk height, lighting and personal temperature settings, follow operators from one seat to another, after they log on to their workstation with a WEY Technology multifunctional keyboard.

One Keyboard to rule them all!

The keyboard used in the EOW-i is a multifunctional keyboard with an interactive touch screen that is completely integrated into the Operator Activity Cloud. Built-in brightness sensors enhance ergonomics by automatically adjusting the brightness of the LCD to the working environment. Movement sensors enhance data security by putting the keyboard into sleep mode when unattended.

Operators can easily control and adjust their own workplaces using the intuitive touch screen. Desk positions, lighting variations and personal speaker volume can all be controlled from the interactive touch screen on the multifunctional keyboard. The Smart Touch keyboard is the master console in the center of the EOW-i.

VIDEO 1   CGM1_PC4   28.07.2016   13:46

Video communication through multifunctional keyboard
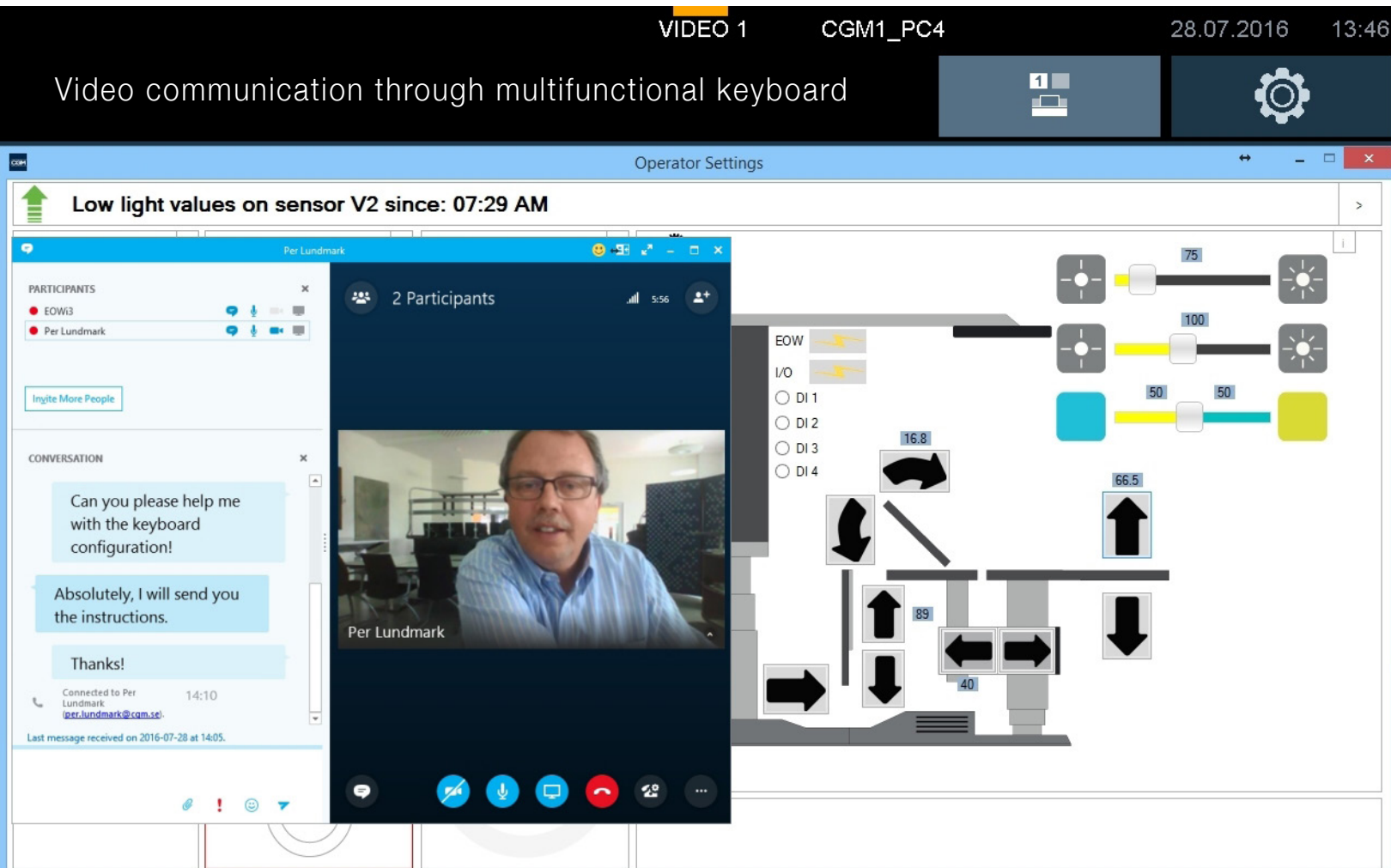
Future Operation Center

The Future Operation Center is located in Borås Sweden and is our research center specializing in Control Room/Control Center solutions. Many projects are conducted with Chalmers University, Lunds University, KTH, Skövde University and other research institutions. Together with Chalmers University The Future Operation Centre is participating in a project called Digitalized Wellbeing (DIGIN) where the correlation between working environments and bio-data is measured to ensure that through optimization and synchronization of this data one can improve and enhance the performance, health and well-being for operators.

Another project is the Gamification of the Operator Activity Cloud with the main focus on motivating and engaging operators to optimize their processes and increase their awareness of personal health and well-being through a gamification process.

In early 2017, the Future Operation Center will become a hub for universities and research institutions performing a multitude of science and observation having to do with 24/7 working environments. All parameters that are key to improving health and well-being will be part of the research, with a focus on the development of upcoming services.

Scientific fields such as human factors, ergonomics, light, sound, heat, air quality, health, nutrition, sports, smart textiles and gaming will be part of future 24/7 working environments. The main focus is to enhance human performance while improving health and well-being in Control Room working environments.