

Making Information Useful Again in an Era of Information Overload

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Summary

Information overload is the inevitable result of the flourishing modern digital infrastructure, information economy, and Internet of Things (IoT). The result is that critical events are easily missed in the avalanche of data that teams and managers are expected to monitor. This is especially serious in the utility industry, where even one missed signal—captured by monitoring systems but lost in noise, or possibly missed by monitoring processes altogether—can lead very quickly to catastrophic results. The normal function of communities and society depend on utilities, and losses from these kinds of info-glut failures include facility and service downtime, financial losses, property destruction, injury, and sadly, even loss of life.

Solutions exist for information overload and are improving this situation, but funding constraints and technology compatibilities continue to hinder swift progress solving this challenge. This paper outlines the areas which utility managers can address to improve their operational and safety performance, and contribute to an overall risk reduction for their operations.

Detail

To solve the problem of information overload, one must first understand the nature of the information and its gathering, account for human qualities that lead to failure of critical processes in using this information to greatest effect, and substitute automated digital functions to manage these processes better.

Information and How it is Gathered

Utilities and other critical operations today rely on sprawling interconnected systems, churning out products and services, while generating potentially unlimited amounts of data in the process. Depending on the technical generation of a piece of equipment or device, it might include its own analytics and dashboards to interpret the data it generates, or may not generate data at all, thus requiring another observational system or device to fill the information void.

Information may be simplistic, simply relaying the current status of the thing being observed (like a traditional dashboard gauge), or it may automatically log a running record of activity including a range of data points and measures. It may store this on-site or offsite in the cloud, and the device may only maintain a window of observational data within a set period of time or keep all data ever collected for future analysis of any time period during its operation.

This equipment ranges from electrical generation and transmission equipment, water and sewage management, facilities and cyber security systems, and other networkable devices. Add to that the more recent ability for human workers to send live observed information directly from the field back to a

central management hub, dispatch of drones to autonomously observe and stream data and video, and any number of other new sensing capabilities coming online recently and in the near future.

Indeed, the information ecosystem—even just inside one utility operator—is wide and deep, challenging, and full of non-contemporary generations of equipment making a disparate and incongruous feed of daily information.

The Limits of Human Ability

Place a human inside this information maelstrom and expect them to catch EACH critical moment at the EARLIEST critical moment. It's impossible. And given that scenario, it's incredible that critical situations are managed as well as they are, considering what humans are up against in this challenge.

Human fallibility becomes evident in several key areas within this scenario: repetitive observation, speed of response, and limited reach.

Humans, no matter how much we try and care about the thing we are doing, only have a limited tolerance and ability for observation within a set of time and content constraints. Take the following situation for example:

Let's observe a control room monitoring about 1500 cameras in total across their network of equipment and facilities over thousands of square miles. The control center video wall can comfortably display about 64 camera feeds at a time, in a preprogrammed 10-second rotation, meaning that it takes about 23 rotations of the entire camera system for an operator to briefly glance at every camera feed. This means an operator needs to visually scan 6.4 feeds each second for about 4 minutes straight in order to take in the entire camera system. Then do it again, and again, and again, for their full 8-hour shift.

Clearly, this is information overload, will quickly burn out the control room operator, and is a critically inefficient way to handle the very same task camera feeds and video walls and control center facilities are intended to provide: awareness and a common operating picture.

When something does happen in this scenario, the control room has to hope they see it in the first 4-minute rotation (or the next one, or the next one), and can easily be 12 minutes or more behind the developing situation by the time someone catches a possibly very emergent issue.

Human limitations put us constantly behind the curve in fast-developing critical situations.

When a human observes a critical development, they react. Often a phone call, initiation of an alert procedure or message, and other processes are enacted by people entrusted to manage critical situations. This is followed by the mustering of task forces with key responsibilities, who then gather relevant data and contextually appropriate observations from systems and people. Situation rooms and emergency equipment is assigned to management of the situation, drawing in more people and requiring the further dissemination of critical information, in context, to onsite and possibly offsite and/or mobile resources and teams. This can easily take additional hours of precious reactive time.

Ongoing coordination of people, activities, and information adds to the burden of the communication systems and teams involved in resolving the situation. Email is slow and often out-of-sync with fast-

moving developments; text messaging is siloed and one-dimensional; workstations and conference room displays are fixed in location and often have limited visibility into the full operational picture; people are physically locked in time and space and despite our often adamant insistence at multithreaded multitasking mastery, humans can actually only effectively do one thing at a time in one place at a time.

Humans excel at thinking on our feet, inferring a course of action from limited data by supplementing observation and experience from other situations that may vary widely from our current focus. We intake vast quantities of information from a variety of sources, though in our experience and industry, most of it visually. Of the senses used for managing a critical situation among a diverse team of participants, eyes are by far the most used, followed by ears, and distantly followed by nose, then touch, and I can't imagine how taste would ever play in, but maybe in some strange situation.

Therefore, supplementing our human visual intake with enhancements that increase the efficiency of our data gathering can most quickly add to our decision-making dataset, thinking on our feet and collaborating most effectively in a developing situation.

[Adding Robots and Tech to Augment Human Situational Management](#)

Large utilities and other control rooms have been using and upgrading video walls and control rooms for the display and management of the vast river of data generated by modern operations. In addition, individual and team workstations offer narrow specialized windows into different aspects of the data fed into the control room. Maybe there is a situation room in the facility as well.

But is this the best we can do? Does the full video wall SCADA offer operators a full picture of an incident at its beginning, then offer the ability to easily share a growing common operating picture, in context, with key decision-makers as a situation develops? Can that be done automatically, on the wall, on targeted workstations, for specific people, and to mobile devices, using live content piped from the field, from drone feeds, and remote workers' mobile devices? Can it incorporate the data and dashboards from various systems of different age and incompatible interfaces?

Connecting people automatically to a contextually-appropriate common operating picture which can be shared and collaborated, in real-time, at the moment a critical incident begins, is the best way to shortcut human observational and functional failures and augment human decision-making with up-to-the-second situational awareness.

The challenge at the beginning of an incident is to sense that an expected condition on or observed by a piece of equipment has reached an unexpected state outside a set boundary of what is considered normal. New systems can now intake this kind of information, and trigger instant relevant changes to video walls, control room workstations, displays in situation rooms, and mobile devices, while simultaneously sending alert messages via email, text or other means, to the appropriate decision-makers and those who need to know.

With the latest advanced visualization systems, this action is instant. Just this one improvement can save minutes, possibly hours, alerting and informing a team in a fast-moving scenario. This time advantage at the most critical early moments can easily be the difference between a well-managed incident and a multi-billion-dollar disaster. And this advantage requires no human action at all, because this is what robots are good at.

So, what does this automated system show the people who need to know about it? Now, we have the ability to incorporate virtually any visual source of information into the network for display on the control room video wall and workstations, without the addition of specialized hardware. SCADA, live and recorded video feeds, application dashboards, documents and other files, screen captures and more: if it's available on the network, it can be piped directly to the control room, and disseminated automatically by programmed processes that react to predefined alert conditions.

If any of that visual information comes from a source with an API, it can likely trigger these alerts as well. For example, a smart camera monitoring equipment or secure areas can trigger instant situational awareness for the entire control room and relevant team members. Limit excessions in measuring devices, alert messages received via email, virtually anything can become an alert trigger, and augmented by an automated, holistic, and collaborative visualization approach to team coordination.

Modern systems now make this information highly portable in real-time. A manager in the field surveying a developing situation need not be disconnected from the hub of information available in the control room. They can stay connected through mobile devices that automatically access and update the same rich data that the rest of the team does, no matter where they are. And that team member can easily enrich the collaborative information environment by streaming live video, images, and audio from the site of the incident. This instant communication within a real-time untethered collaborative container keeps all team members informed in context seamlessly.

Conclusion

Advancements like these leverage the advantages of modern software, cloud computing, and generally-available consumer-grade computing power—meaning that broad, automated situational awareness, in context is within reach of virtually all utilities and control room operations.

Key to a utility or control room reducing risk, increasing efficiency, and gaining proactive advantage in fast-developing situations, is the understanding and acceptance of the best and worst qualities of the people and tools which play roles in those situations; then finding and implementing solutions that remove as much of the risk as possible from each of those factors. Thankfully, hardware and software technology now offers a very comprehensive solution to the challenge of knowing what you don't know, and coordinating a team around a challenge inside the information maelstrom.