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YOKOGAWA

5 Key Innovation Concepts to Impact Frontline Engineers In 2020

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Across North America, there are more than 2,500 processing plants in the gas processing, oil refining, bulk petrochemicals, and chemicals markets. This plant population represents a large number of frontline engineers and technical managers whose professional lives will become increasingly impacted by the growing adoption of disruptive digital technologies and digital platforms.

WHY FOCUS ON FRONTLINE ENGINEERS?

Frontline engineers and managers represent the large cohort of people who are, and will continue to be, impacted the most by Industry 4.0 shifts and trends. They constitute a large proportion of the overall labor pool and in many countries are a big influencer of competitiveness of domestic manufacturing. As illustrated below, senior management has the biggest ability to orchestrate major change in these plants. However, the implications of such changes are felt the most by operators through the actions of frontline engineers and managers. It is crucial that these 12 key areas for effective operations are given appropriate consideration and then matured accordingly.

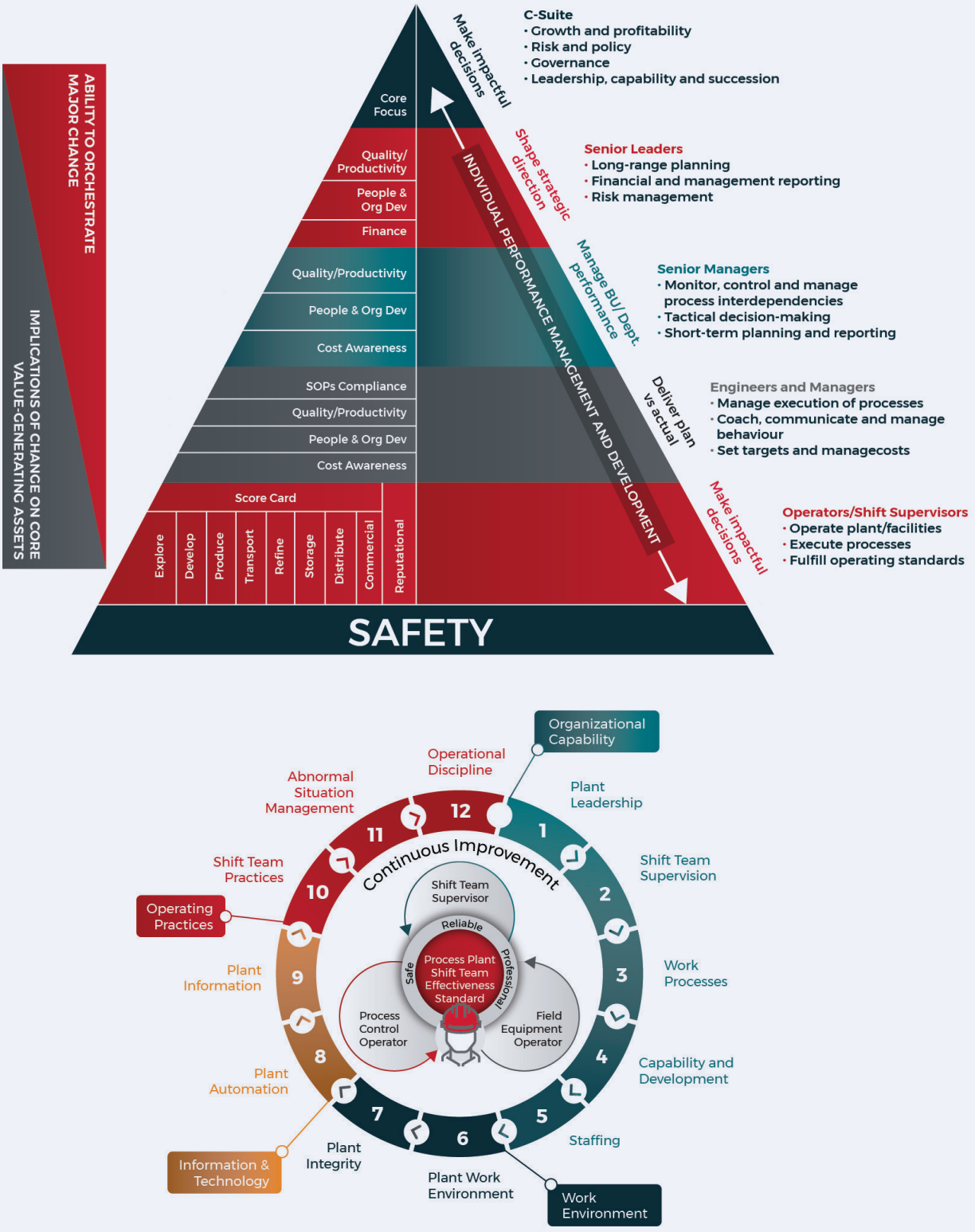

Figure 1 – Effective Operations

CAN PLANT MANAGEMENT GET A HEAD START ON HOW TO ADVANCE THESE KEY AREAS?

The much-publicized Gartner hype cycle for graphically representing the maturity, adoption, and social application of new technologies is a neat and simple source of insight. However, it is not helpful for assuring frontline engineers of what their workplace will look like in the future. It is also not helpful for future decision-makers who are trying to allocate resources to build, buy, or make purchase decisions around materials, equipment, hardware, software, and services. These decision-makers – human or machine – are trying their best to make optimal decisions on the best, albeit imperfect, information at their disposal. The hype curve adds yet more noise and cloudiness into what is already a fast-paced decision space; one that is only getting faster.

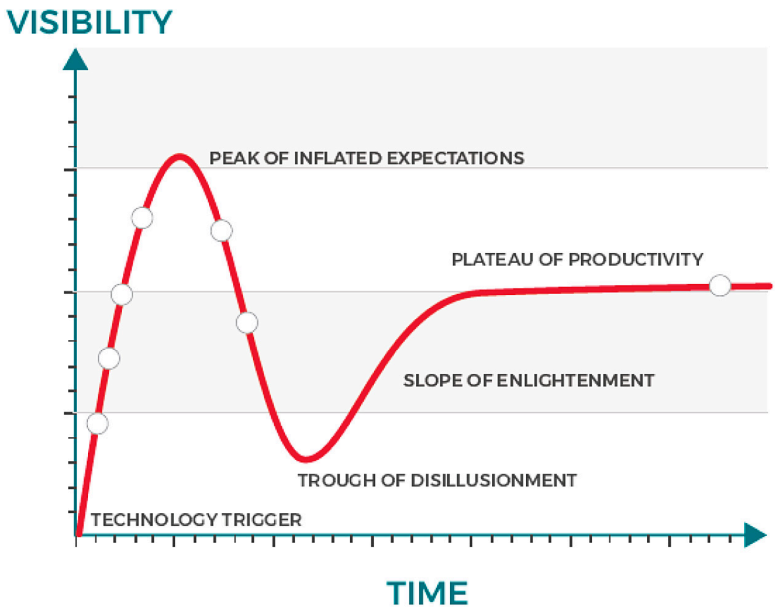

Figure 2 – Gartner Hype Cycle

It is called a "hype" cycle – sometimes fad cycle – for a reason: lots and lots of innovations, driving huge expectations, existing on the up-slope, with only a few making it through to the trough of disillusionment and out the other end for mainstream adoption. To help cut through the noise and smoke/mirrors, there are five key innovation concepts for 2020, that will be essential to understand and adopt, giving those that do, a head start on delivering effective operations.

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WHICH KEY INNOVATION CONCEPTS SHOULD ENGINEERS GET CLUED UP ON AND TAKE INTO 2020?

1. Outcome-orientation.

The sheer speed of innovation that is currently happening means that there will undoubtedly be other tools and technologies out there that will become superior to yours in one way or another. You will not be able to sit on the fence and wait for them to come; business must continue. You need to put in place the best you can today and then plan for high levels of obsolescence. A large determinant of the future value of individual tools and technologies will become about how compatible they are within a wider ecosystem/technology stack, and the cumulative benefits of this integrated ecosystem/technology stack. Being focused on outcomes and value as your principal concern will ensure you do not fall into the "inputs" trap.

2. Understand how solutions or decisions are arrived at

"Black-box thinking" (educated guesswork) is not the future. If you have defined your own personal identity around knowing all the answers and being the expert in the field based on your experience, rather than data, you are going to find yourself getting increasingly disrespected (unintentionally) by the younger generation of engineers. This is because a lot of the information accumulated through your extended years of experience will become better supported by data and available on the web; essentially it will become commoditized. What might have defined "you" and your leadership style – perhaps technical leadership through experiential learning in the plant – will be challenged. There will be a requirement to always understand how solutions or decisions are arrived at; instinct and experience will become less acceptable. Engineers will require the ability to see, tune and customize the inner workings of the tools they use.

The value of experience in managing abnormal situations and knowing what good looks like will continue to be treasured, but how "good" is achieved will require broader input, especially given the new technologies that now exist and their pace of change. There must be a realization that there are major efforts going on across the industry to codify implicit knowledge to make it transferable. Embracing this, rather than fighting it, by being open-minded and developing transferable skills for lateral moves will be key to ensuring you are a part of the future.

3. Decisions made with expanded support from a scalable digital twin.

A digital twin is a virtual digital copy of a device, system, human, or process that accurately mimics actual performance in real-time, that is executable and can be manipulated, allowing a better future to be developed. It consumes data from connected sensors to tell a richer story – past, present, and future – about an asset throughout its lifecycle. Being a virtual digital copy of a device, system, human, or process means that today there are multiple different digital twins covering various aspects of the asset lifecycle and value chain. The majority of them serve distinctly different purposes and run off siloed/limited data sources and at fit-for-purpose compute speeds. However, over time these digital twins will become increasingly holistic and connected for multi-purpose/-dimensional deployment, and will be running off increasingly ubiquitous data sources. In this future world, no one vendor will have the best of everything. Therefore, vendor agnosticism and high switch in/out capabilities in the enlarged digital twin "platform" will be key.

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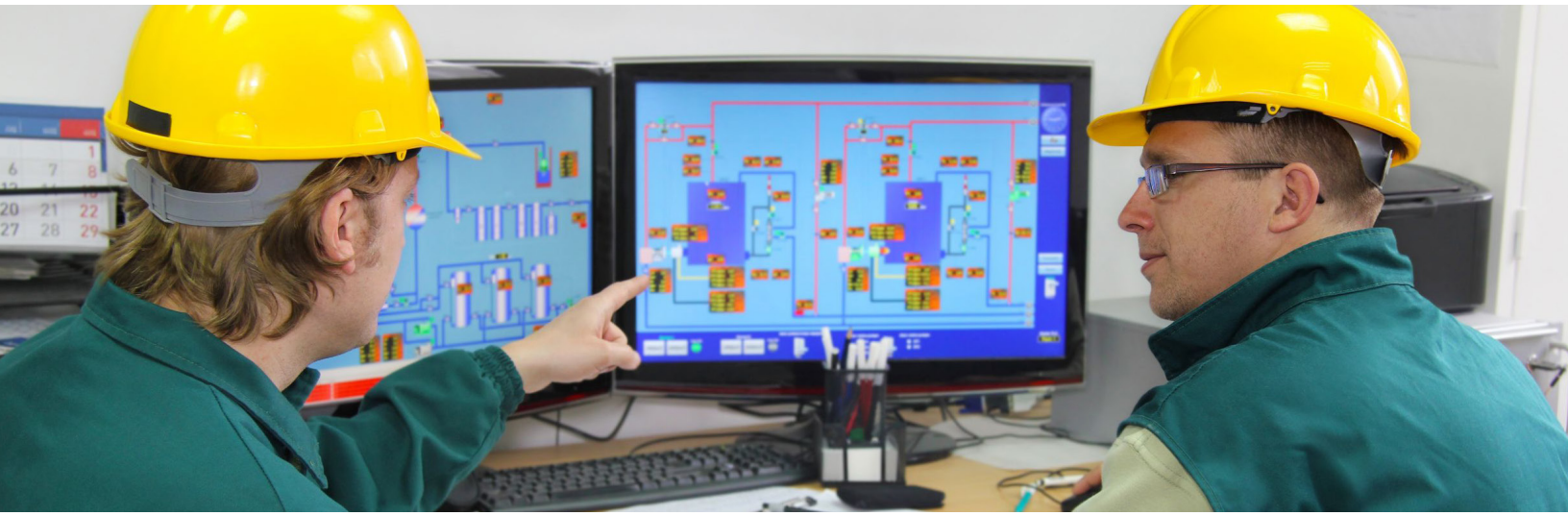
DESIRED OUTCOMES OF DIGITAL TWINS

- Asset and supply chain optimization
- Advanced production
- Advanced analytical chemistry
- Automation and control integrity assurance
- Human capability assurance
- Instrumentation productivity
- Holistic enterprise insight
- Plant design



> *Digital twin insights streamed in real-time to wearable accessories on frontline staff will better equip operators to make more holistic decisions.*

4. Holistic real-time actions through accessorizing

Digital twin insights streamed in real-time to wearable accessories on frontline staff will better equip operators to make more holistic decisions. Sensory augmentation overlay of information on top of what is already observed and perceived by the operator will deliver additional measured information for operators to act on. Furthermore, inferred information derived through application of complex physics and chemistry-based algorithms to measured data will mean new insights will become available for parts of the asset where traditional measurement is not feasible or viable for whatever reason.

5. Expert uses for less expert users, through new user interfaces

Through native integration with new commonly-accepted visualization tools and user interfaces, complex technologies and associated capabilities will be made readily usable and accessible by users who are not experts. In many instances, the myriad technologies "running" behind the scenes will no longer be apparent to the user. The respective individual technology user interfaces will no longer exist; instead, these technologies will interface to commonly accepted visualization and/or spreadsheet tools with embedded workflow capabilities. Users will be unaware of what is happening in the background. This will, in turn, lower the barrier to entry of some engineering roles and also enable some engineering tasks to be undertaken more efficiently in other parts of the organization. This will bring impactful new meaning to making the complex simple.

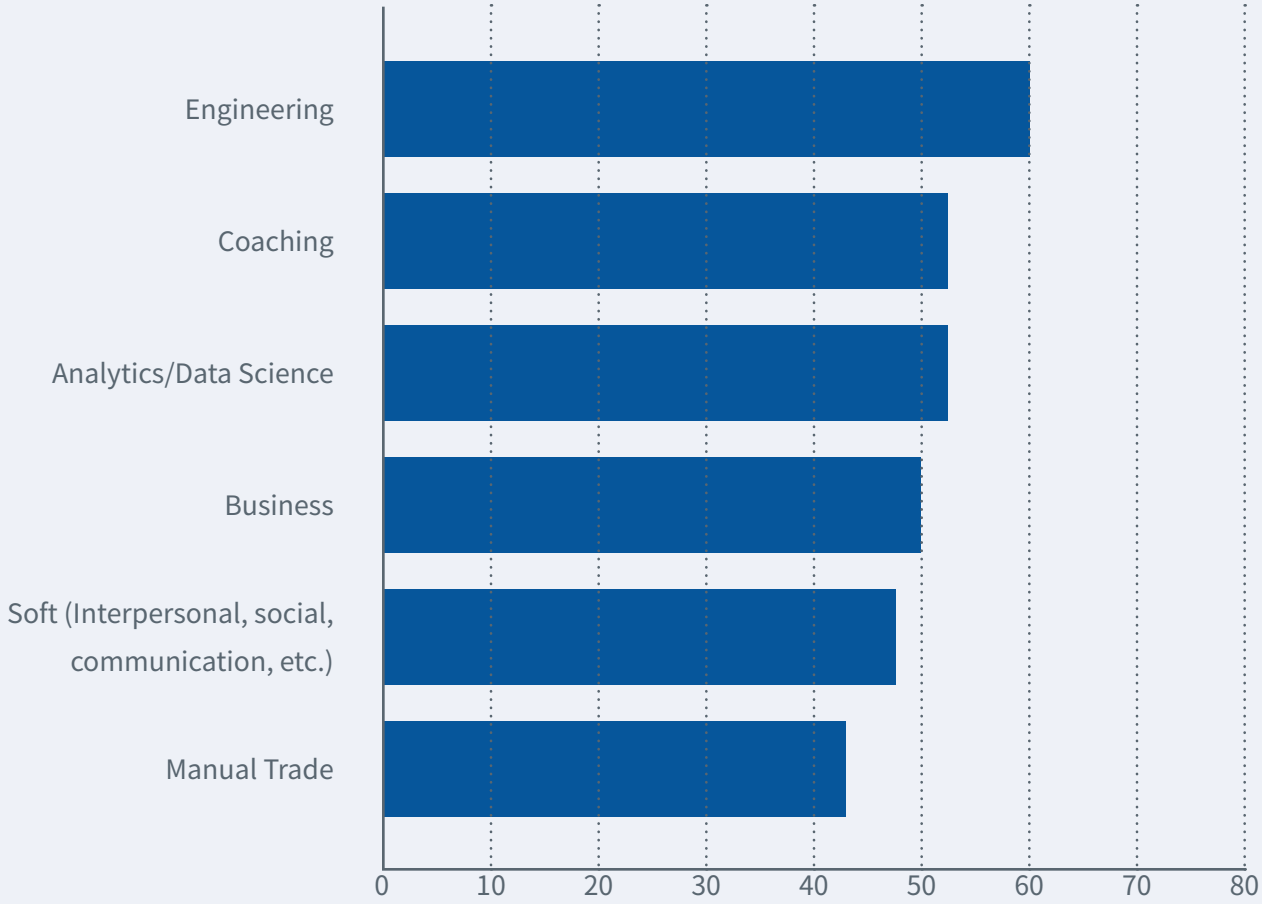


Figure 3 - Survey respondents rated the importance of these core skills over the next 5 years in achieving Operational Excellence.

Operational Excellence is the desired outcome and it is clear that technological developments will continue to cause disruption to the job specification of frontline engineers. Operations leaders across the refining and petrochemicals industry still believe in engineers having certain core skills as a necessary requirement (figure 3), but know that adaption in line with the key innovation concepts is the best way to achieve consistent and maintainable operational excellence.

Yokogawa's rich history and deep capabilities in real-time data capture and processing, information flows and integrated execution across OT and IT domains provides assurance to decision-makers that the investments they make in an increasingly unpredictable technology landscape and business environment will deliver expected returns.

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