Breaking Down Organizational Silos through Normalizing Uncertainty

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Paradox of Uncertainty

- We are in Stochastic Mine Planning Lab where uncertainty is being celebrated as something “great”[1]

- Thanks to digital revolution, engineers found ways to increase mineable resources by taking advantage of stochastic nature of an orebody.

- However, in the human context uncertainty means unpredictability, which could result in insecurity and conflicts.

- The objective of the presentation is to ascertain that uncertainty can, if it is properly managed, also lead to breaking down of silos in mining companies.

[1] Stochastic Mining Concepts, Applications and Contributions – Roussos Dimitrakopoulos

Topics to be covered

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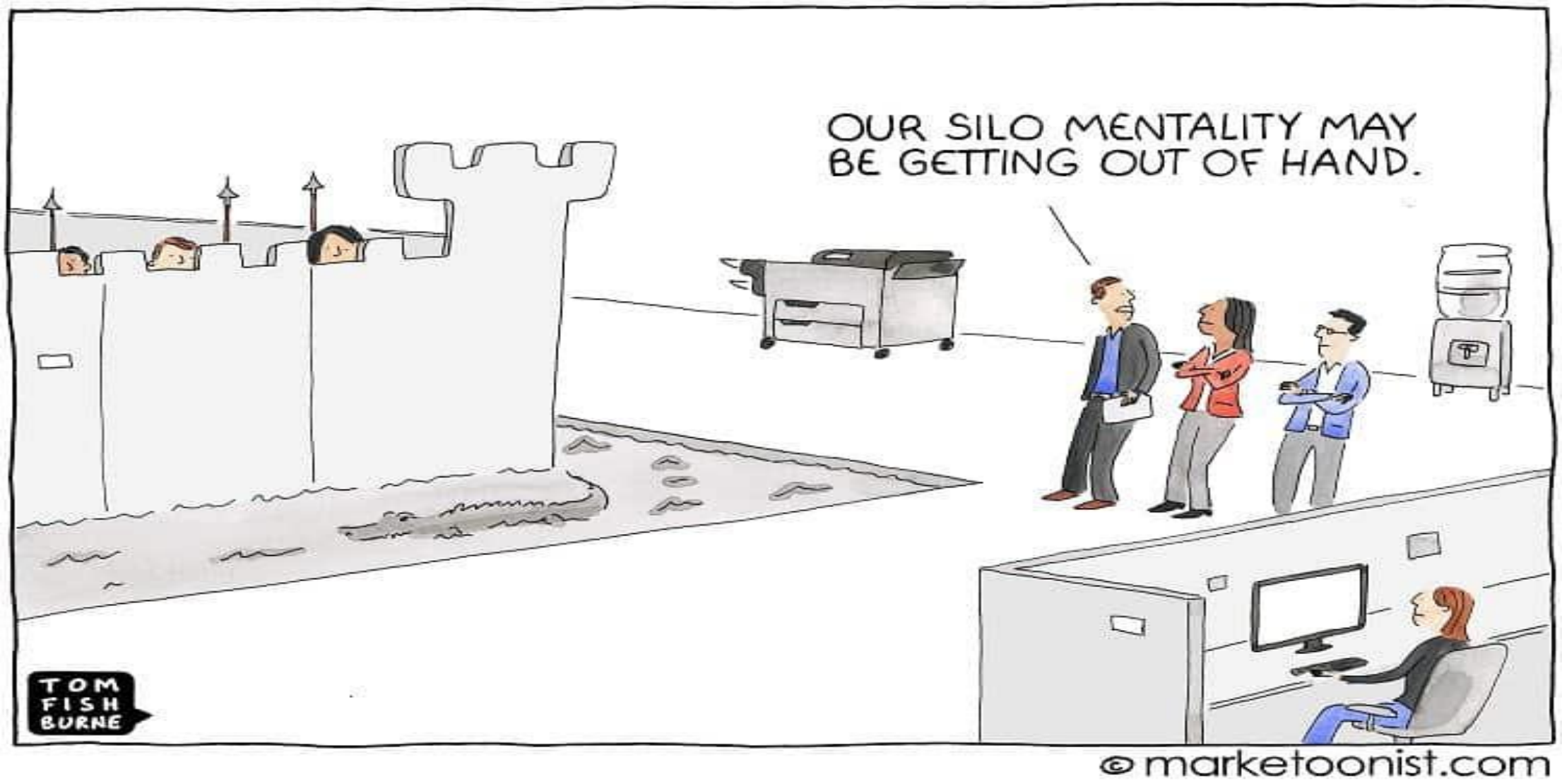
Everyone Talks About Silos, but..



Silos Are Everywhere and Flourishing

- **The Silo Mentality is a mindset**
  - ✓not wishing to share information with others.

- This type of mentality will reduce efficiency and is bad for moral,
  - ✓**May contribute to poison company culture.**

- In spite of all efforts, silos have not disappeared.
  - ✓**It is the duty of the executive leaders to break down silos.**[2]

[2] Brent Gleeson – Silo mentality: how to breakdown the barriers, Forbes, Oct.2, 2013

Mining is Special with Mother Nature its Supplier

- **Ore is varied and non-homogenous**

- A mining company owns its resources

- Its employees characterize the ore body
  - ✓**Plan, excavate and blend the feed for the process plant.**

- Since variability cannot totally be eliminated,
  - ✓**plants have to balance between grades and recovery**
  - ✓**results are not always optimal**

- When things go invariably wrong
  - ✓**who is to blame?**

Who is the Culprit?

SO, NOW WE HAVE ASCERTAINED WHO IS RESPONSIBLE....

Four Solitudes – When Doing the Best is Not Enough

- Four functions are collectively responsible for quality of concentrates:
  - ✓Geology
  - ✓Mine planning
  - ✓Mining operations
  - ✓Process plant

- Each speaks different languages and focuses on optimizing its own area.

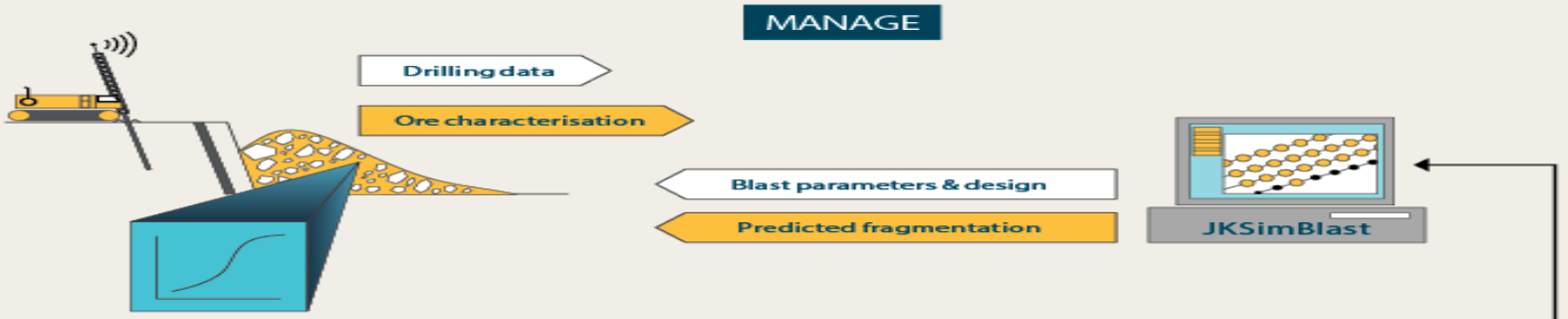
- **Conflicts are natural when results are sub-optimal.**

- Each thinks:
  - ✓**We are doing our jobs the right way.**
  - ✓**Others are not competent.**
  - ✓**They should bring their own houses in order.**

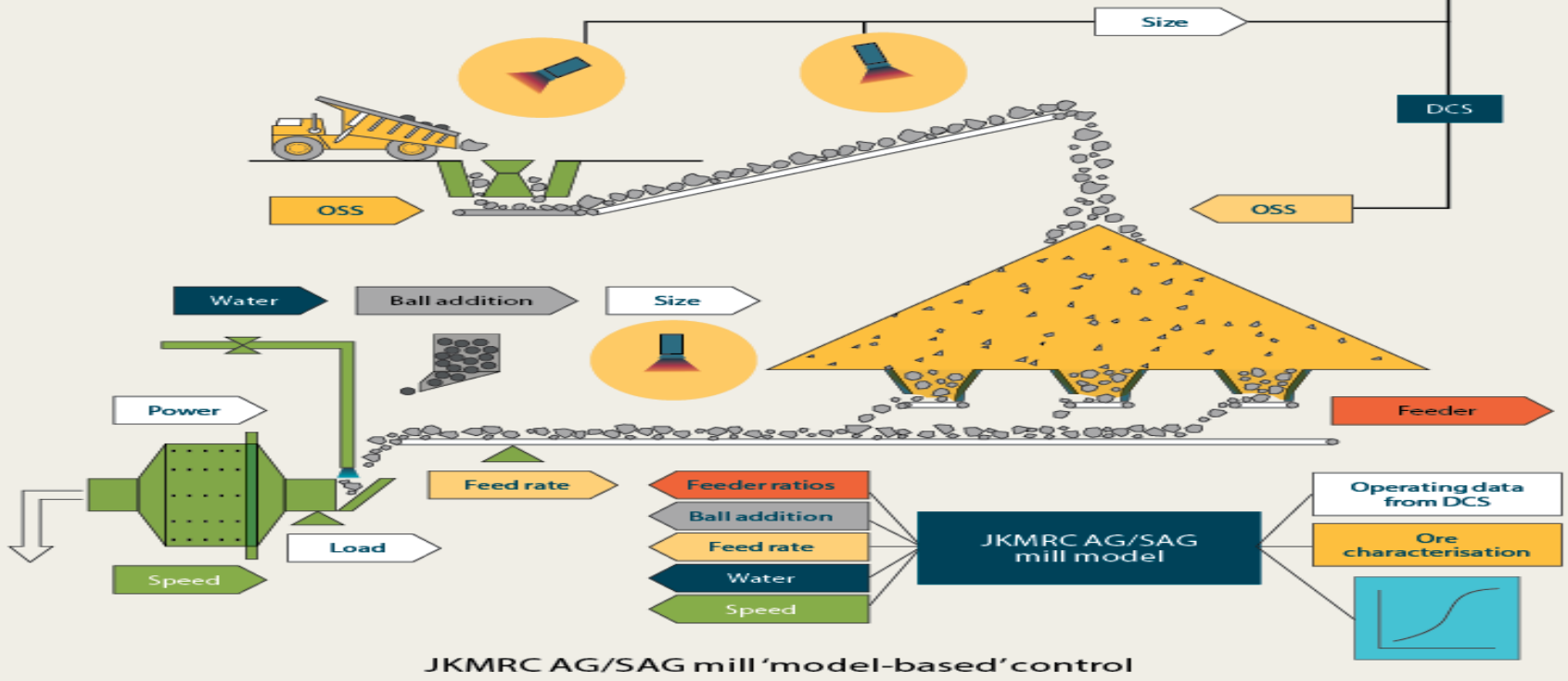
- **Ultimately, the whole organization suffers.**

If it Cannot be Fixed, Automate.

Figure 1. Extract from the Julius Kruttschnitt Mineral Research Centre's 1999 Mine to Mill brochure.



JKMRC blasting and fragmentation 'model-based' optimisation



JKMRC AG/SAG mill 'model-based' control

Effective utilisation of Split-Online™, JKSimBlast and the JKMRC AG/SAG mill model can deliver significant increases in productivity.

In Technology, We Trust!

- Mine to mill automaton was developed in the 1990s to increase productivity[3].
  - ✓Need to survive in persistently low metal price environment

- This advancement was made possible by:
  - ✓Research and development in fundamental knowledge and sensor technology
  - ✓Availability of high speed digital tools to manage a vast amount of data

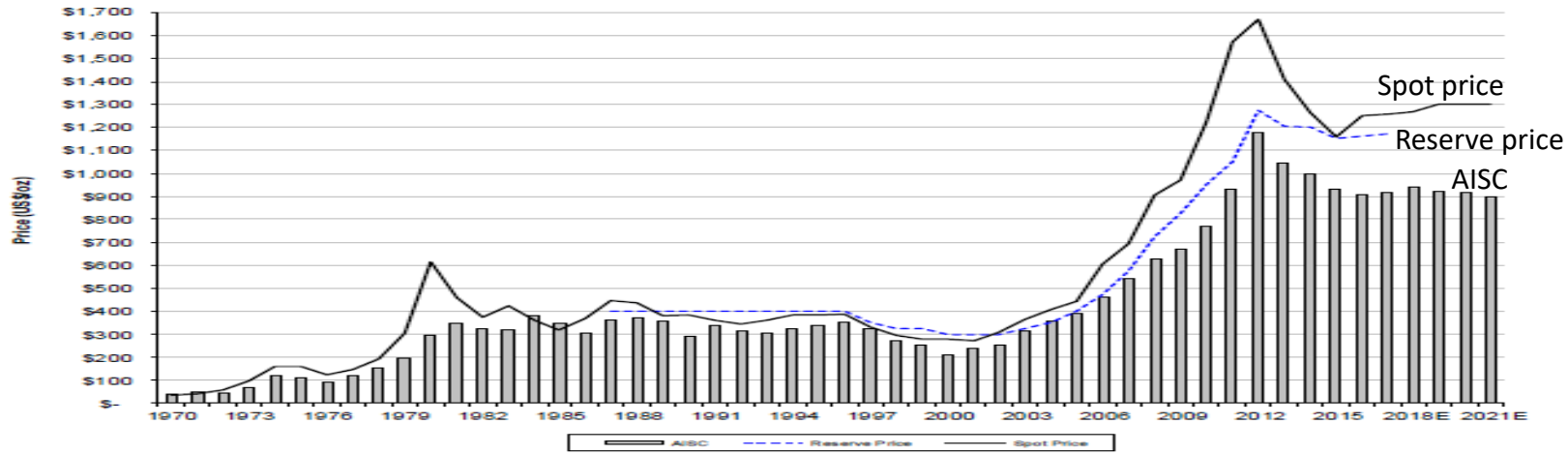
- The projects were successful in achieving 10-20% improvements:
  - ✓**Through management support and co-operations between all functions**
  - ✓**Developers hoped for more gains through continued co-operations**

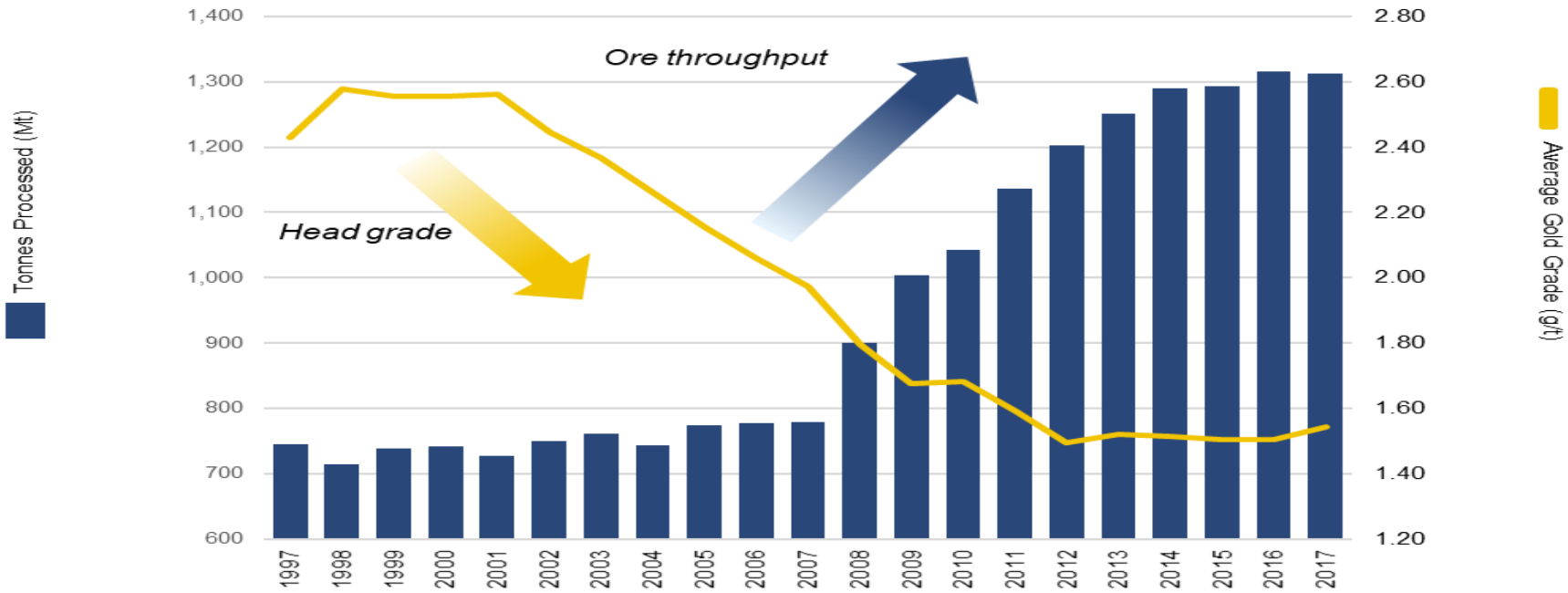
- In time, functions retreated back to their silo mentality.
  - ✓**Understanding in human behaviour was needed to sustain gains through technology**

[3]Based on " The ABC of mine to mills and metal price cycles by P. Cameron, D. Drinkwater and J. Pease – Feb. 2017

Back to Square One: Costs Gone Up & Grades Deteriorated

(Ref. Scotia Capital-Gold Statistics, Feb. 2019 & National Bank Financial Markets)





Automation 2.0 in the Digital Age of IoT and AI

- Mining is challenged in the aftermath of recession that began in 2012:
  - ✓**Falling metal prices**
  - ✓**Rising costs base and falling grades**
  - ✓**Need to survive in volatile macro-economic environment**

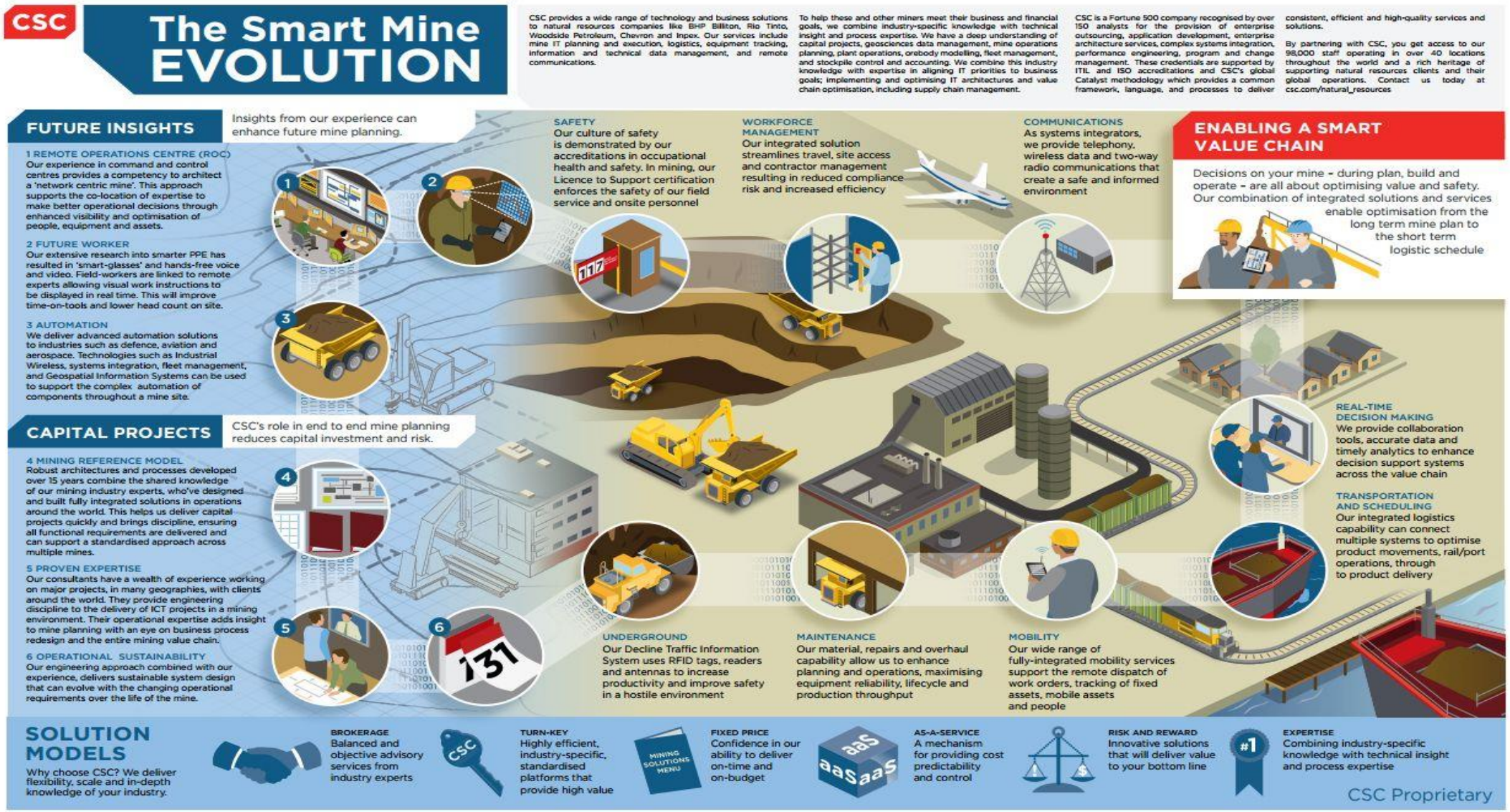
- Mining was connecting autonomous equipment and remote operation of equipment to build “mines of the future”.

- **Next phase: collecting all data and optimize by using massive computer power.**

- **Some Consultants are advocating an all embracing digital transformation to develop smart mines.**

- **Might there be an ultimate technology based solution for mining’s salvation?**

A Formidable New World of Smart Mines



http://www.csc.com/natural_resources/insights/83698-mining_technology_the_smart_mine_evolution

A Stochastic Pattern may not be Accurately Predicted.

- IoT and AI can improve understanding of orebodies, but:
  - ✓cannot totally eliminate variability
  - ✓cannot prevent periodic upsets

- Digitization should be carried out in a step by step:
  - ✓**Existing systems are delivering 70-80% of benefits of automation**
  - ✓**Last 20-30% will require enormous time and resources**[4]
  - ✓**Taking on too big projects could be wasteful**

- What are needed to be ensured:
  - ✓**People are talking to each other**
  - ✓**Instead of blaming, cooperating to solve issues**

- **How would we dismantle entrenched barriers, which are embedded in the culture?**

[4] Cameron Harris : So we have survived, what now?

Change begins when Uncertainty becomes a New Normal

- As the first step, Management team must propagate a clear message to all employees:

✓**Uncertainty is a norm in mining**
✓**Things could always go wrong.**
✓**It does not have to be somebody's fault**

- Messaging might not be enough to instill trusting relationships.

- Relationships have to be redefined as between internal customers and suppliers:

✓**Each has to serve its customer's needs**
✓**Customer has to communicate with supplier**
✓**Both have to be transparent to each other**

- Management must ensure that the process is properly followed.

All Customers Count, Also Internal Ones[5]

- **"Our customers are the reasons for our existence" – W. Edwards Deming**
  - ✓This is often overlooked in captive internal customer-supplier relationships.

- Because of uncertainty, it is critical in mining operations to have awareness of:
  - ✓**Interdependency between functions to satisfy common external customers (Figure 1)**

- Serving external customers needs requires satisfying demands of internal customers
  - ✓**Institute understanding and satisfying needs of internal customers (Figure 2)**

- Satisfaction of external customers' requirements is possible only when:
  - ✓**Customers will specify their service requirements to their suppliers**
  - ✓**Service levels have to be based on consensual agreements**
  - ✓**Each supplier delivers right intermediate products/services to its internal customers**

[5]Based on Author's Edumine course – Achieving Sustainable Improvement through Behaviour Change

Satisfaction Through Eyes of Customers

Figure 1 (Ref. Glen Steyn and Associates – Core Competencies)

Figure 2 (Ref. C^3 Plus Consulting – Lean QCD)

Trust, but verify – Words do not count, but Actions do!

- Establishment of a formal structure is simple,
  - ✓ **But, changing mindset and ingrained silo culture will be difficult.**

- People want to see others change first before they are willing to change themselves
  - ✓ **It might take five years or longer to change the culture.**

- Employees should receive training to adapt to the new way
  - ✓ **Acceptance will happen when employees see that management is committed**
  - ✓ **convinced of benefitting themselves.**

- **Setting measurable goals and communicating successes will help buying into the process.**

Sustaining Cultural Transformation Process

- Normalization of uncertainty is the start of a paradigm shift,

✓**Internal customer and supplier relationship is the key to breaking down of silos**

- Sustaining the process requires a strong CEO commitment with the support from a full time champion, who will be dedicated to administer the process.

- S/he should be an honest broker respected in the organization to ensure:

✓**The process is fair and based on consensus**

✓**Resources are allocated to support desired service levels**

✓**The system is working on a mutual trust basis**

- This will lead to:

✓**Early recognition of problems**

✓**Prompt initiation of remedial actions**

Listening to the Voice of Customers

- Critical factors to sustain the process:
  - ✓ **Maintaining dialogues between functions.**
  - ✓ **The process is mutually beneficial.**

- Maintain confidence in the process, management must ensure:
  - ✓**The operation is guided by the voice of customers**
  - ✓**The relationships work both ways.**

- The hallmarks of customer focused culture are as follows:
  - ✓**From a concern about themselves to a concern for customers**
  - ✓**From suspicion to co-operation**
  - ✓**From withholding information to sharing**
  - ✓**From turf protection to commitment to a common goal**
  - ✓**From quantity to quality**
  - ✓**From blaming to motivating**
  - ✓**From isolation to understanding the dual position as customers and suppliers**

If it is properly managed, uncertainty can be “great” to expand possibilities.

Thank you, any questions?