BIG DATA: KEY QUESTIONS FOR PRODUCTION AGRICULTURE

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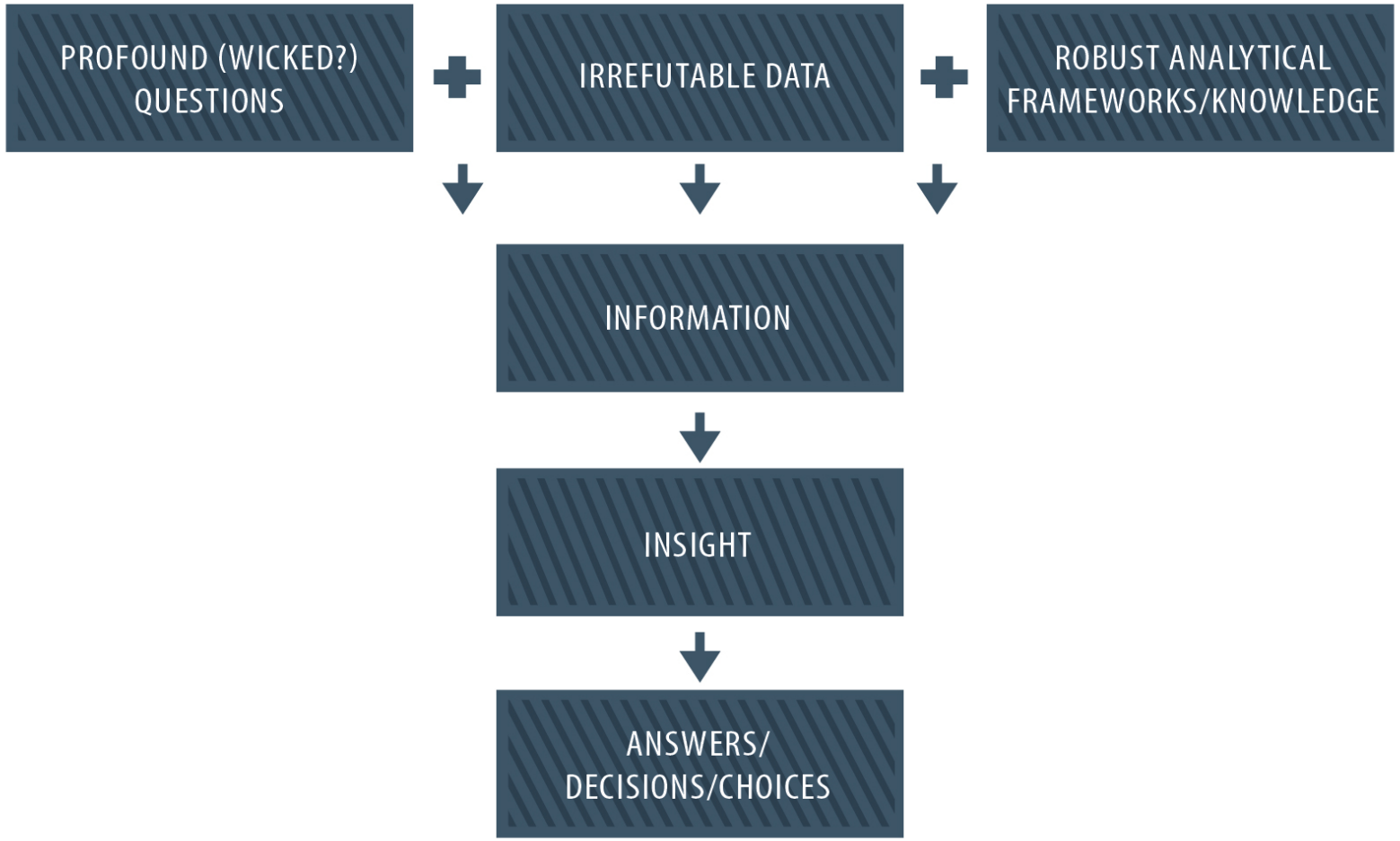
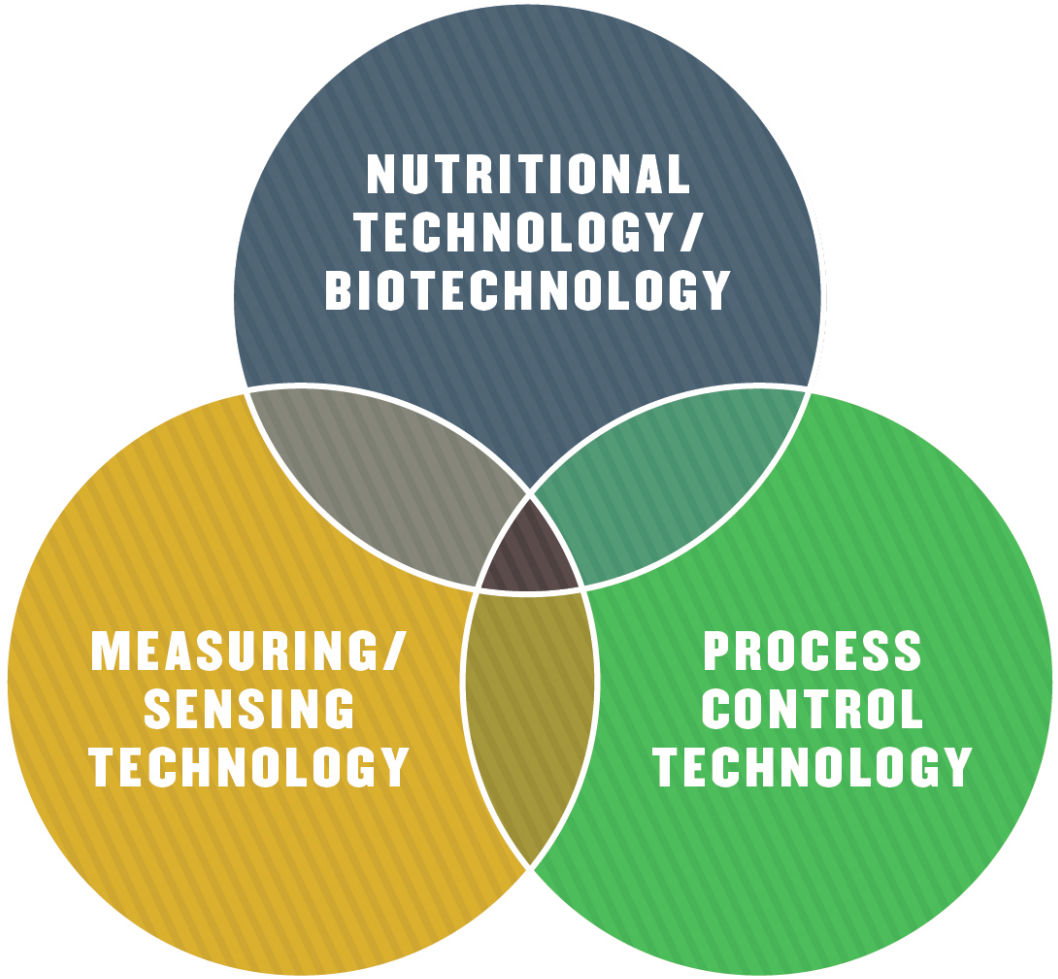
The Decision Framework



The Technologies of Biological Manufacturing

1. Biotechnology/nutritional technology to enhance plant/animal growth
2. Measuring/sensing technology to real-time measure and monitor the growth processes and impacts of drivers/determinants on growth
3. Process control technology to manage/intervene in enhancing/ controlling the growth process.



BIOLOGICAL MANUFACTURING

The Key Questions

1. What are the fundamental drivers/determinants/constraints of plant/animal growth and what are the specific structure and parameters of the underlying growth model?
2. What are the alternative application/process control technologies that can be used to real-time manage/intervene to enhance/control the biological growth process?
3. What technologies are available to real-time measure/sense/monitor the growth process?

4. How regularly and real-time can the growth conditions and the drivers/determinants/constraints on growth be measured?
5. What are the accuracy/measurement errors in measuring outputs(yield, production) and inputs(seed, nutrition, location/spatial, etc) in biological growth processes?
6. What are the characteristics of the output distributions(i.e. normal, skewed, etc.)?

7. What are the errors/accuracy in “application” technology(seed and fertilizer placement, spray patterns and dosage, tank or batch composition and concentration, etc.)?
8. What data aggregation/sharing is needed to obtain essential insights at the appropriate level of granularity given the long cycle-time in biological manufacturing?
9. What information insights are useful/essential to supply chain partners(buyers and suppliers) to increase producer efficiency/ profitability and reduce their risks?

10. How might Bayesian/stochastic/systems dynamics with feedback numerical decision models be used to obtain insights for improved decisions?
11. How might options thinking concepts be used to frame the analysis and inform the decisions(i.e. focus on the tails of the output distributions and reduce the downside or reshape the distribution to have more upside)?