



## Reinventing Pharmaceutical Development & Manufacturing Sciences

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Real Time Information - Currency of the New Decade

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# Agenda



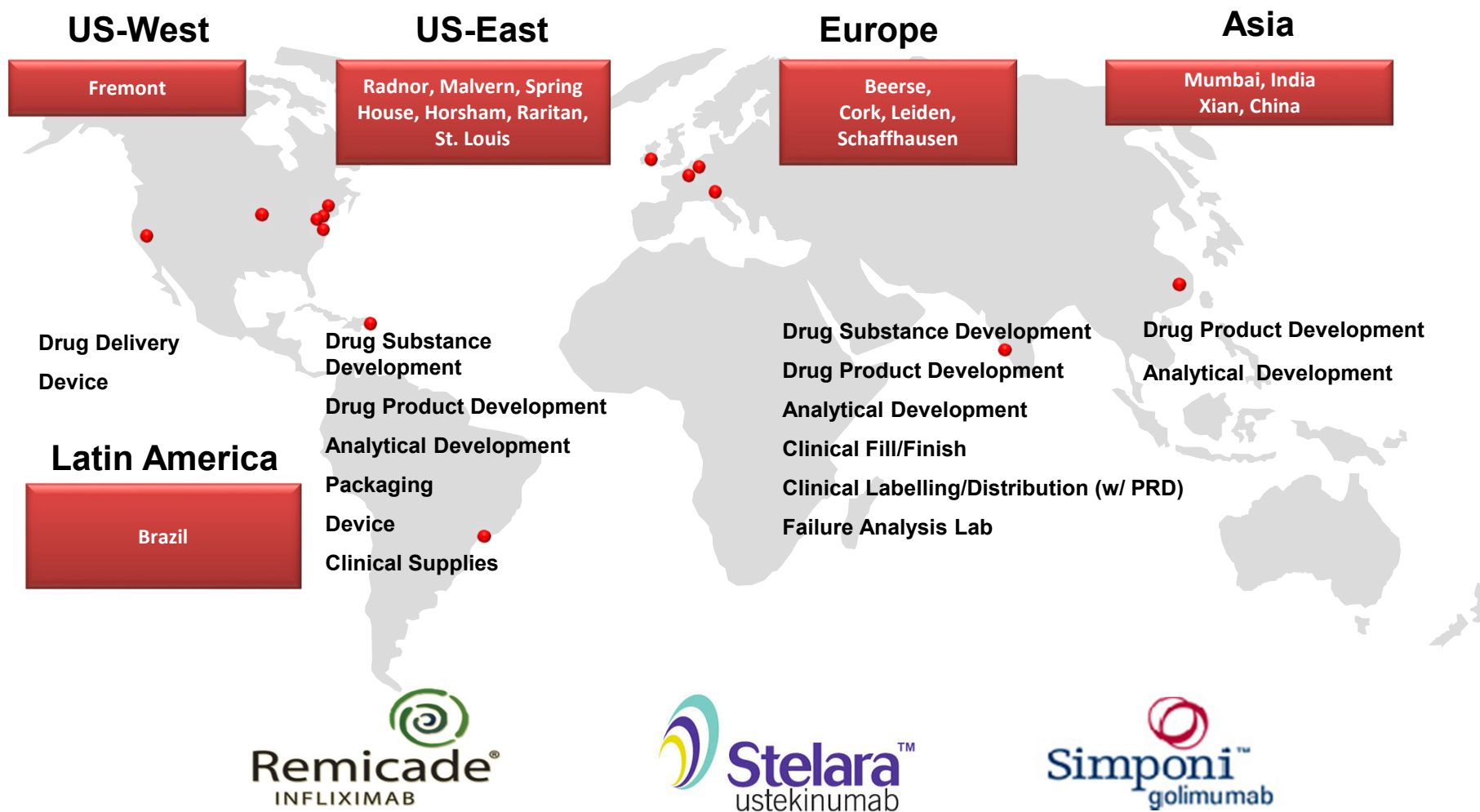
- Brief overview of PD&MS
- Burning Platform for Change
- Lab-to-Patient Concept

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# Pharmaceutical Development & Manufacturing Sciences



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- Brief overview of PD&MS
- **Burning Platform for Change**
- Lab-to-Patient Concept

# Increasing Diversity and Complexity

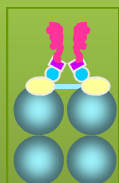


*in the pipeline*

**mAbs**

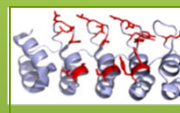


**Mimetibodies™**



**Novel Protein Scaffolds**

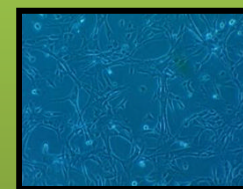
**DARPin™  
Molecular  
Partners**



**Centyrins™  
Centyrex**



**Stem Cells**



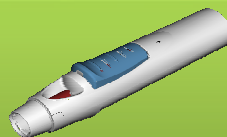
*Increasing Challenge*

*and the delivery method*

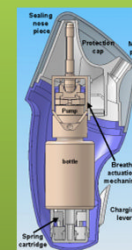
**Vials**  
liquid/  
Lyophilized  
powder



**Autoinjector**

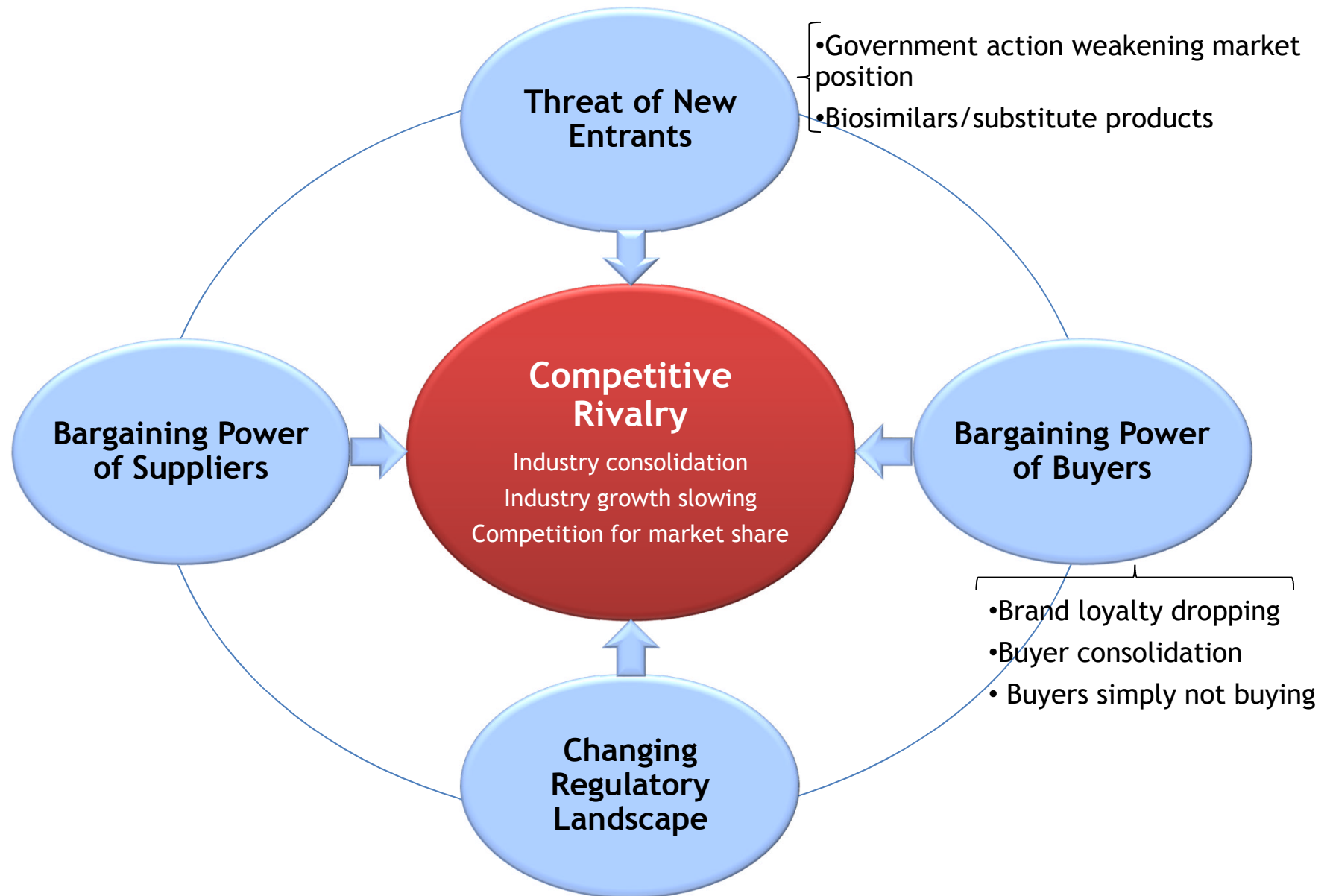


**Novel Drug Delivery  
Devices**



Confidential

# Business Realities Drive Need for Efficiencies



# A Day in the Life of Pharma

## The Double Whammy!!



- FDA Sends Complete Response and Warning Letter
- Complete Response - need more information to approve, need to better understand link between process changes and clinical outcomes
- Warning Letter - need to fix deficiencies documented during an inspection of manufacturing facility “These issues relate to aspects of microbiological monitoring and controls, production equipment maintenance and certain process controls”
- Company believes it can resolve all remaining issues within three to six months.
- Bottom-line - a lot of time, a lot of resources, a lot of lost revenue



# The Burning Platform



## Product A:

- Specifications
  - based on batches that have acceptable safety (including immunogenicity) and efficacy in pivotal clinical studies.
  - Need to capture "full batch experience" in the clinic !
    - Multiple lots across the shelf life.
    - Multiple lots demonstrating manufacturing variability
  - Better develop/defend our statistical strategy (tolerance intervals)

## Product B:

- Stability/Shelf Life
  - Protein Aggregates Formed During Shelf Life
  - Translucent particle levels in the clinic are basis for product specifications.
  - How do We Beat the clock - Be More Predictive !

**PACT**

Process, Analytical , Clinical/Commercial, TODAY !



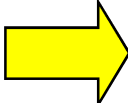
**Lab to Patient**

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**Meet these challenges by executing fundamental changes to existing development and manufacturing approaches**

***Integration***  **Integrate scientific, manufacturing, clinical & commercial objectives**

***Manufacturing Sciences***  **Development and technology transfer of the best process with full intrinsic process/product knowledge**

***Execution***  **Effective processes and systems to execute, capture, analyze & utilize process & clinical knowledge throughout lifecycle**

**How to achieve these ?**

# Rebuilding the Foundations of our Industry



# Agenda



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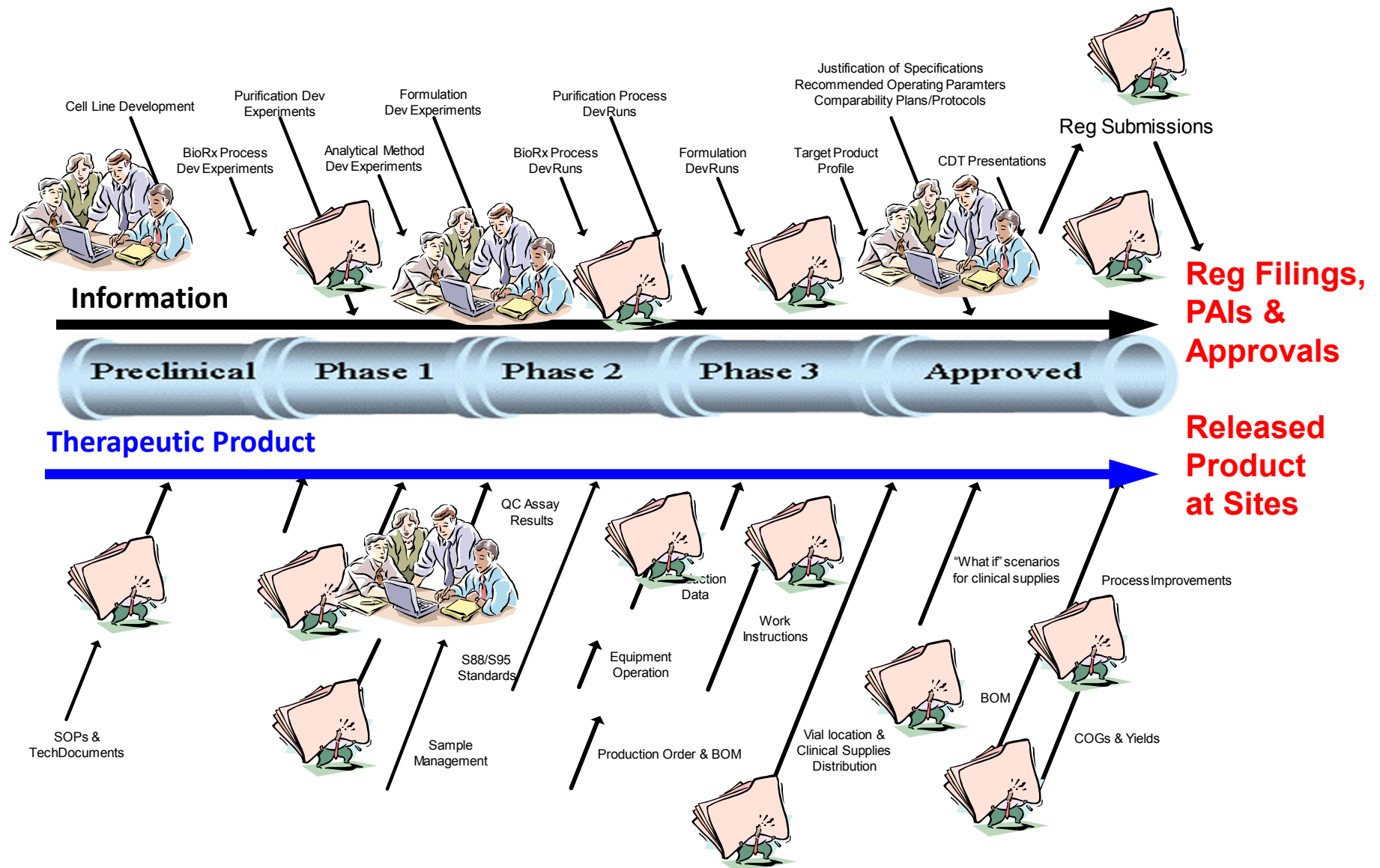


# Vision for New Execution Model:

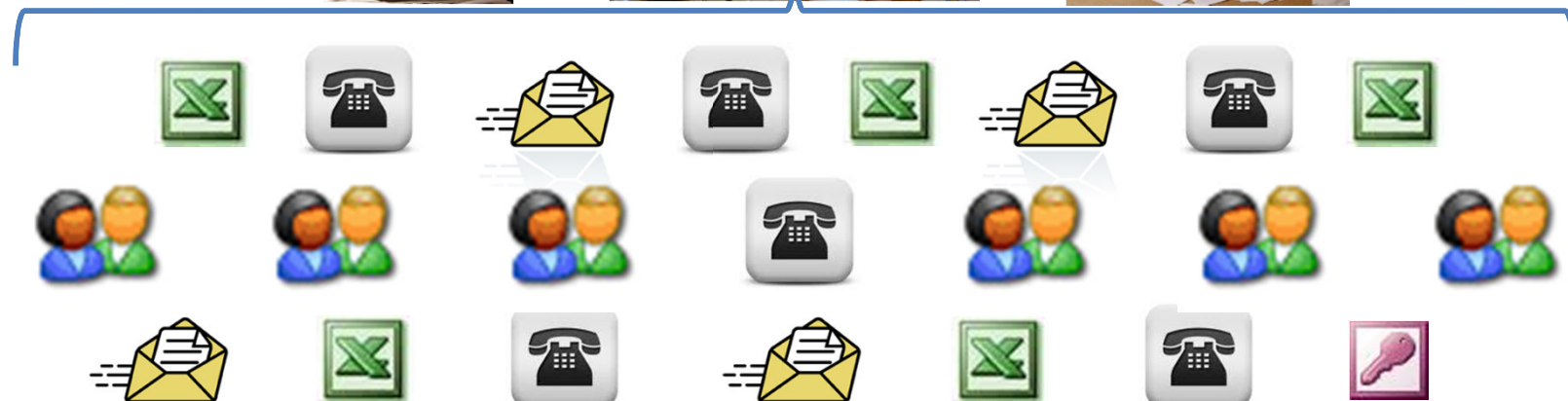


- **Lab to Patient will drive development through commercialization with efficiency, consistency, and quality; giving our employees a stronger sense of ownership while continuing to deliver value to our customers.**
- **Success will require radical change to our processes and the way people work together, that will be supported by technology. To accomplish this, we will:**
  - transform visibility to information & knowledge;
  - empowering employees to make timely and effective decisions at the right level;
  - modernize human and technical resources and support;
  - harmonize all practices and procedures through common recipes and platforms.
  - Partner with others to create end to end platform standards

# Process Development Enterprise example



# Current State



Homosapien Based Data Integration

Laboratory



Plant



Enterprise

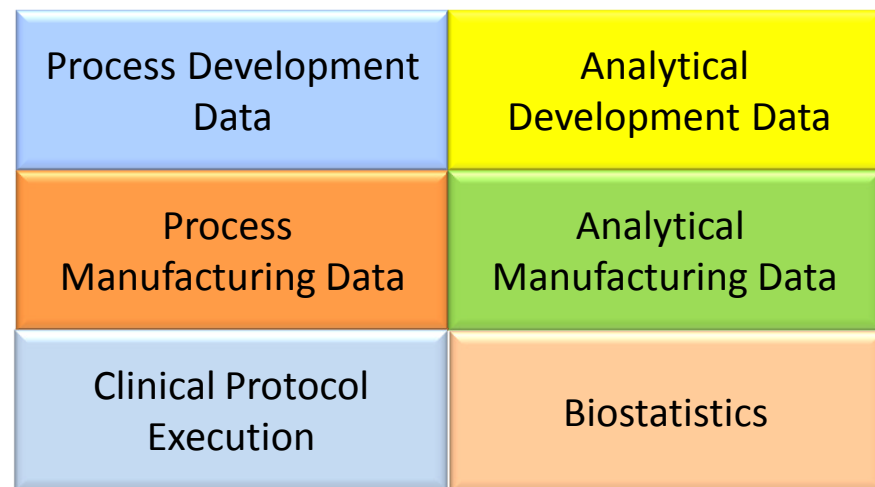
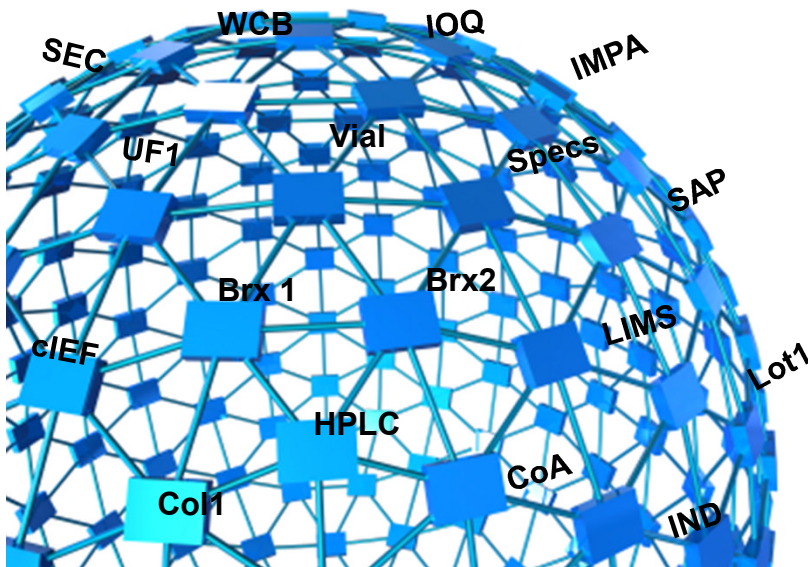
- In order to dramatically improve time to market for new products we recognise a need to take a standard approach to product development.
- A common recipe based approach:
  - ensures that scientists and engineers “speak the same language” and promotes consistency.
  - presents a significant opportunity to realise efficiencies across our systems landscape as medicines moves through their approval lifecycle.



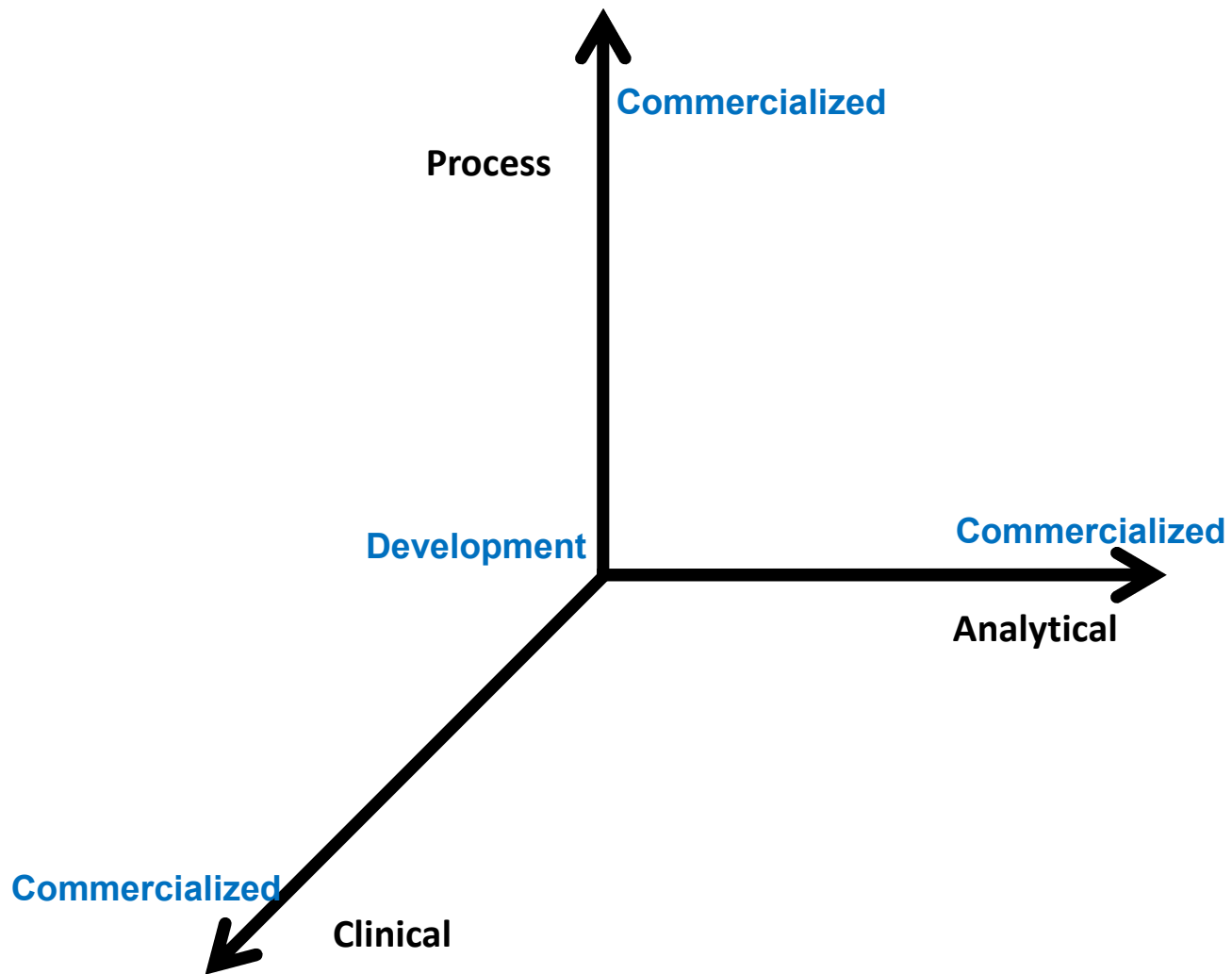
# Mission for R&D



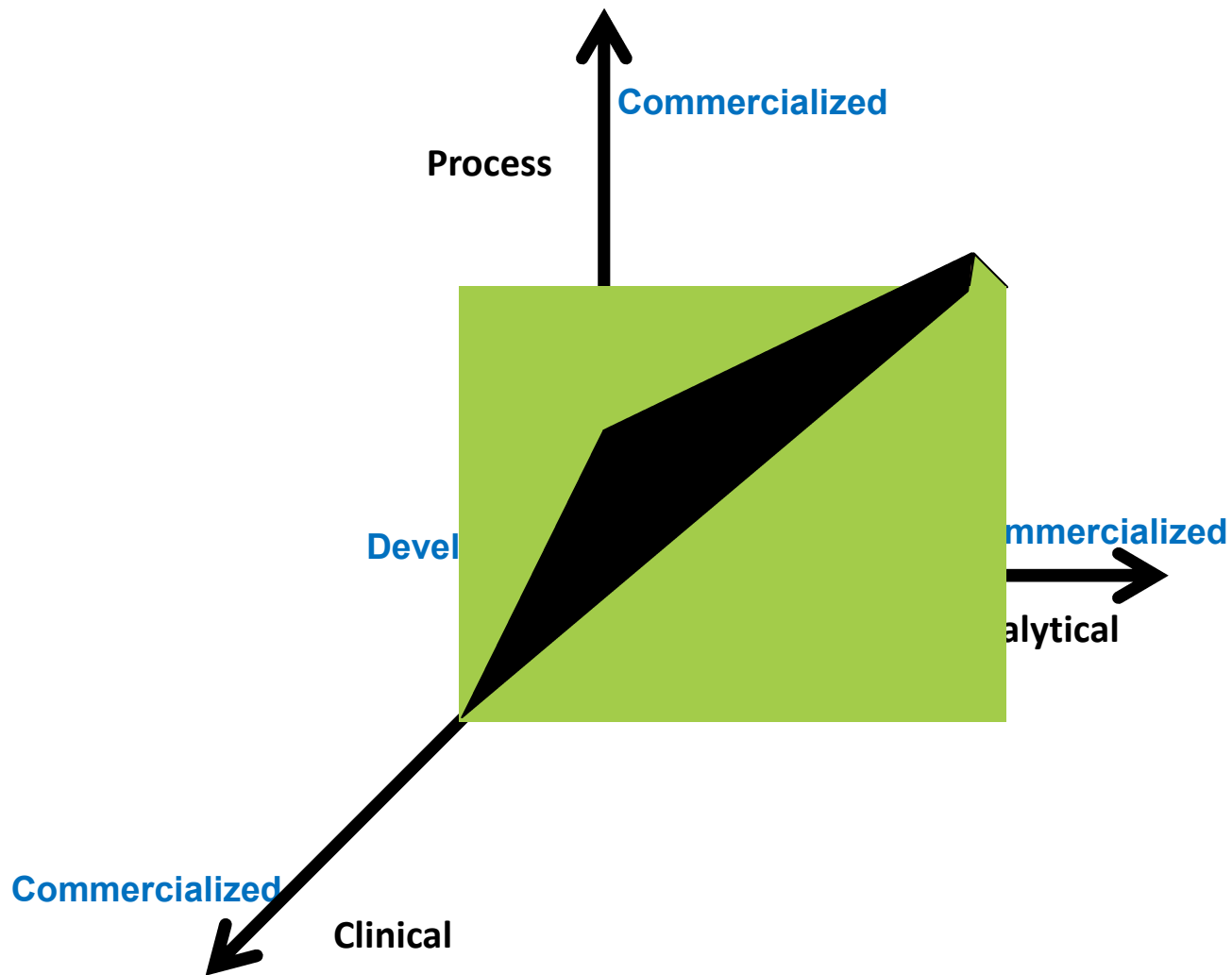
- Use technology and a recipe based approach to both simplify & better visualize product development, commercialization and regulatory efforts.



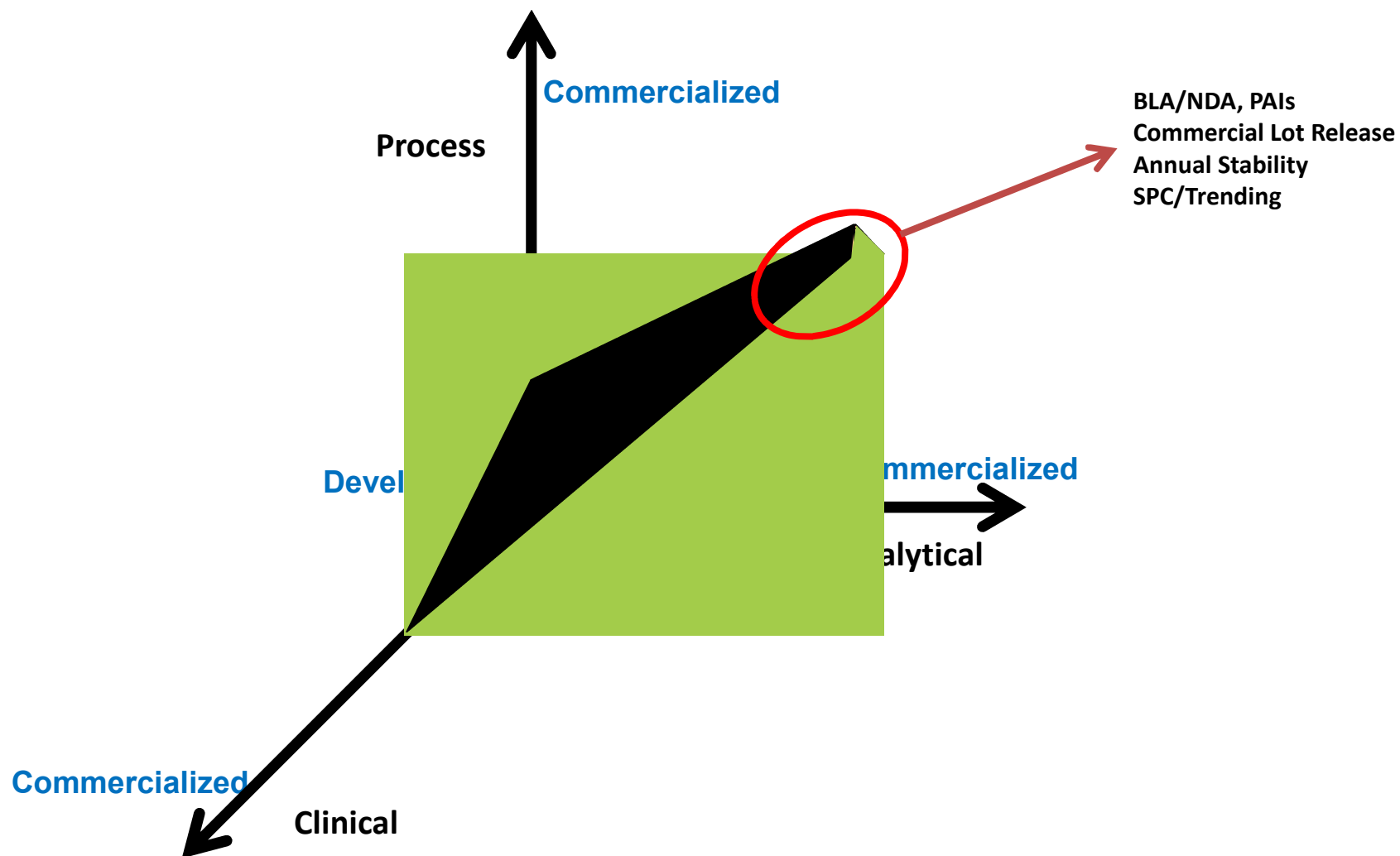
# Data Management Challenge



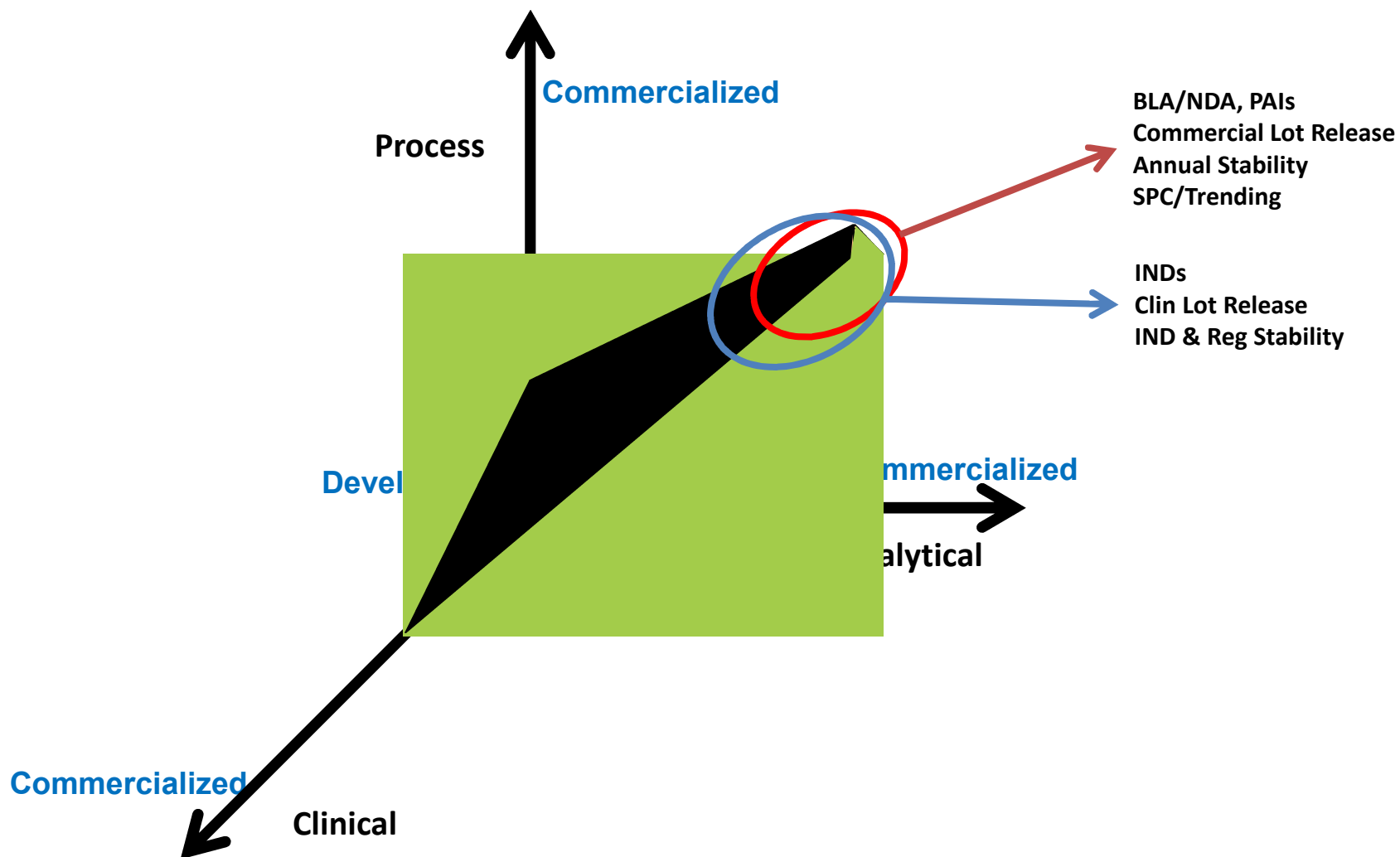
# Data Management Challenge



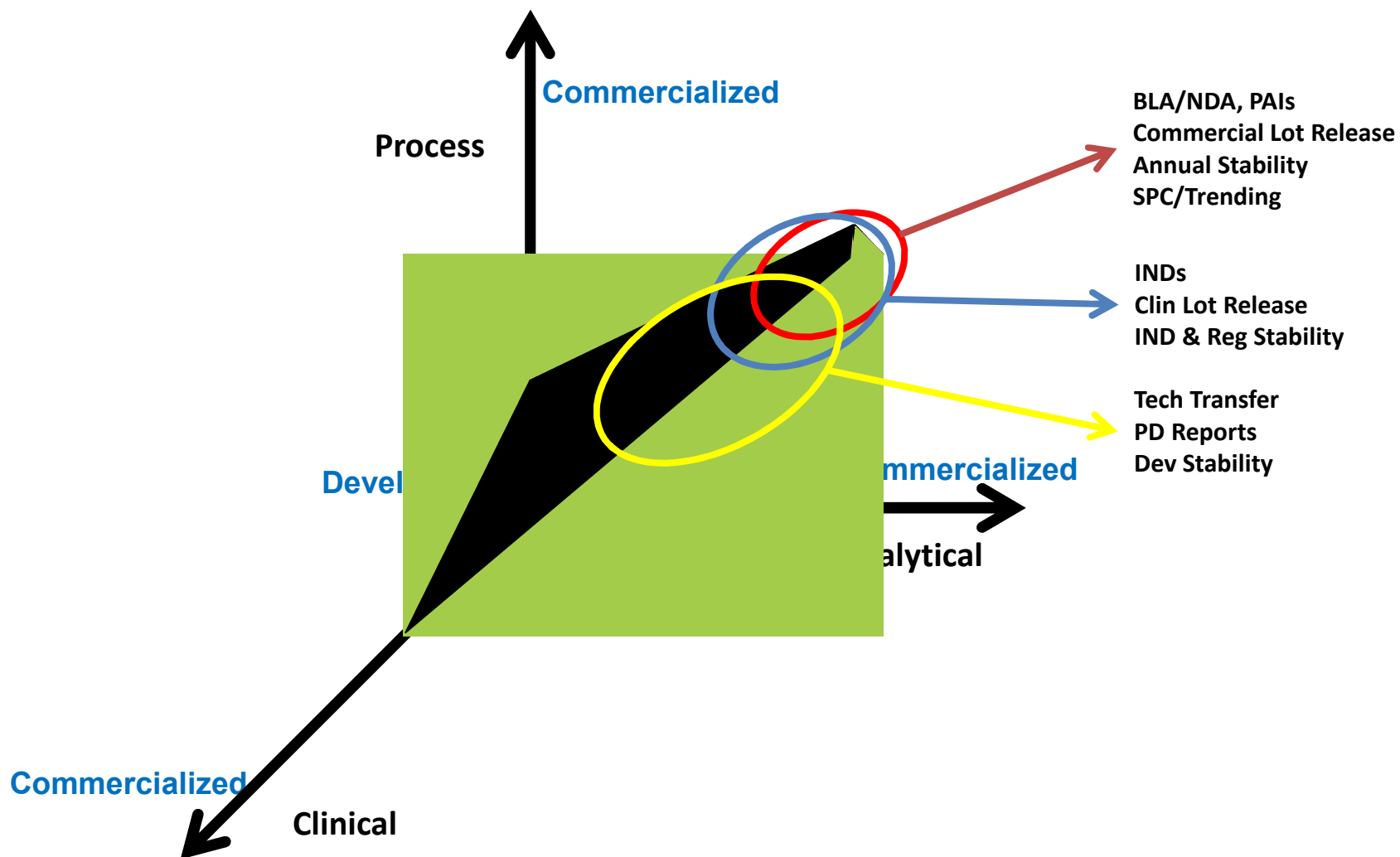
# Data Management Challenge



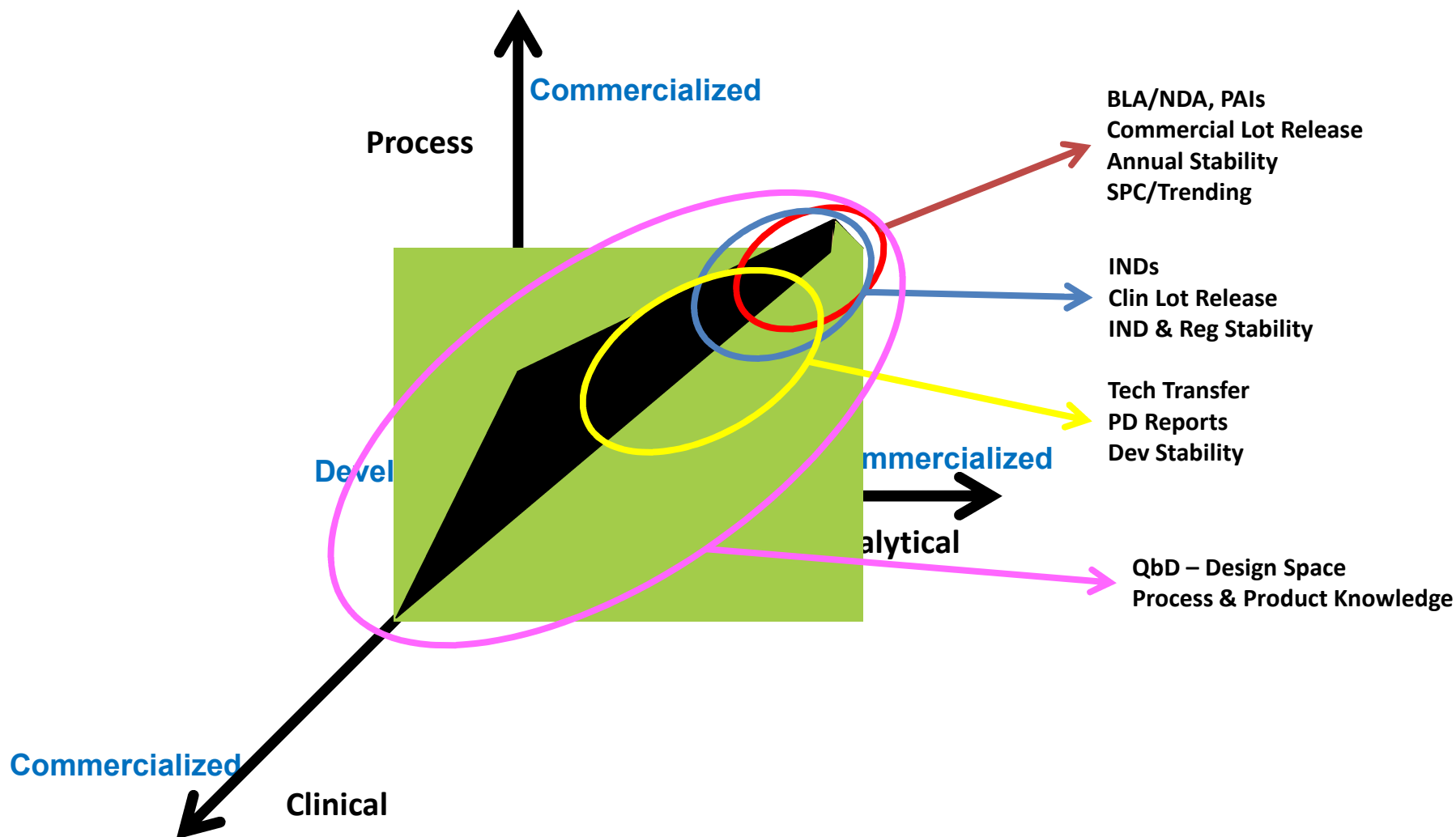
# Data Management Challenge



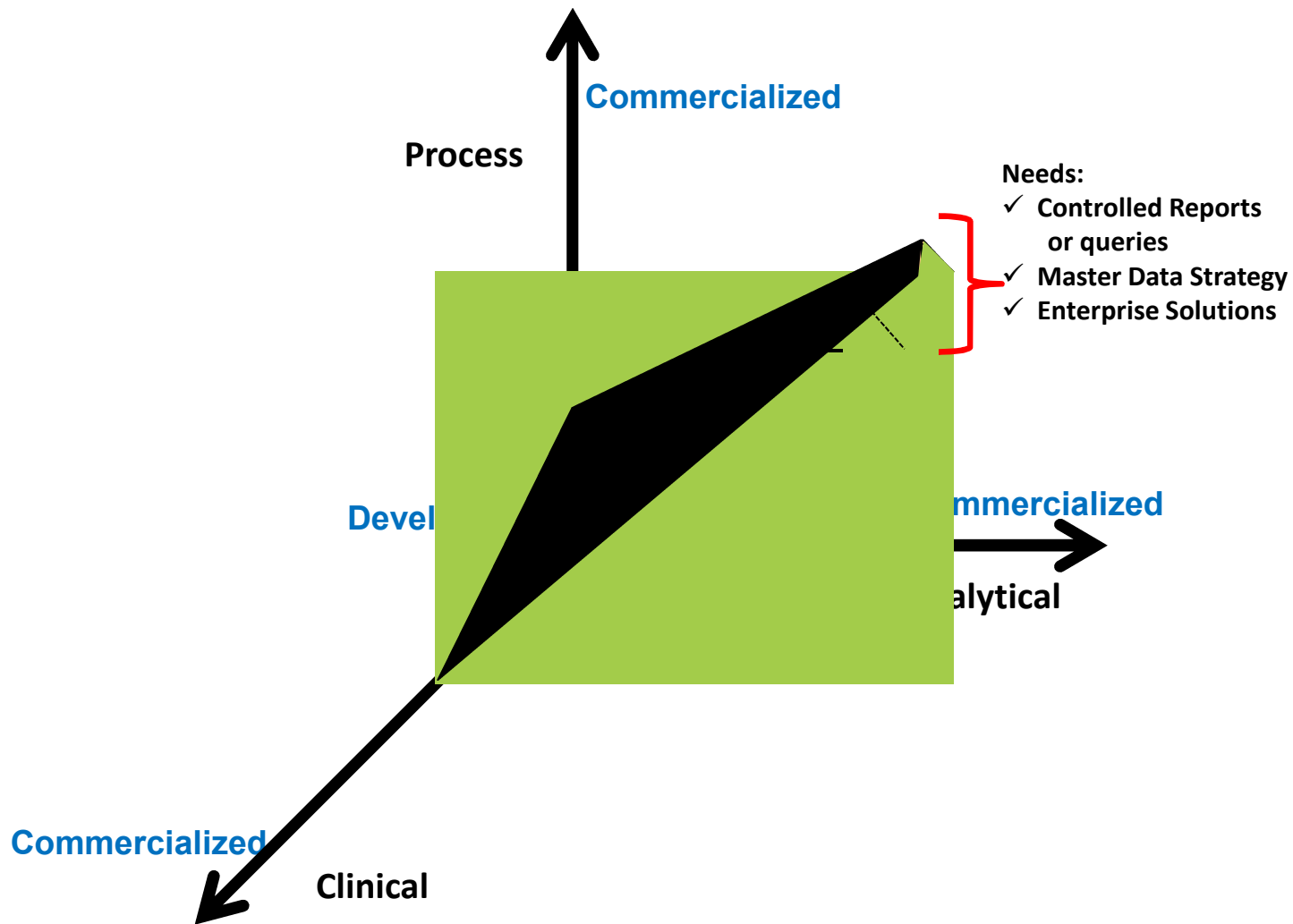
# Data Management Challenge



# Data Management Challenge

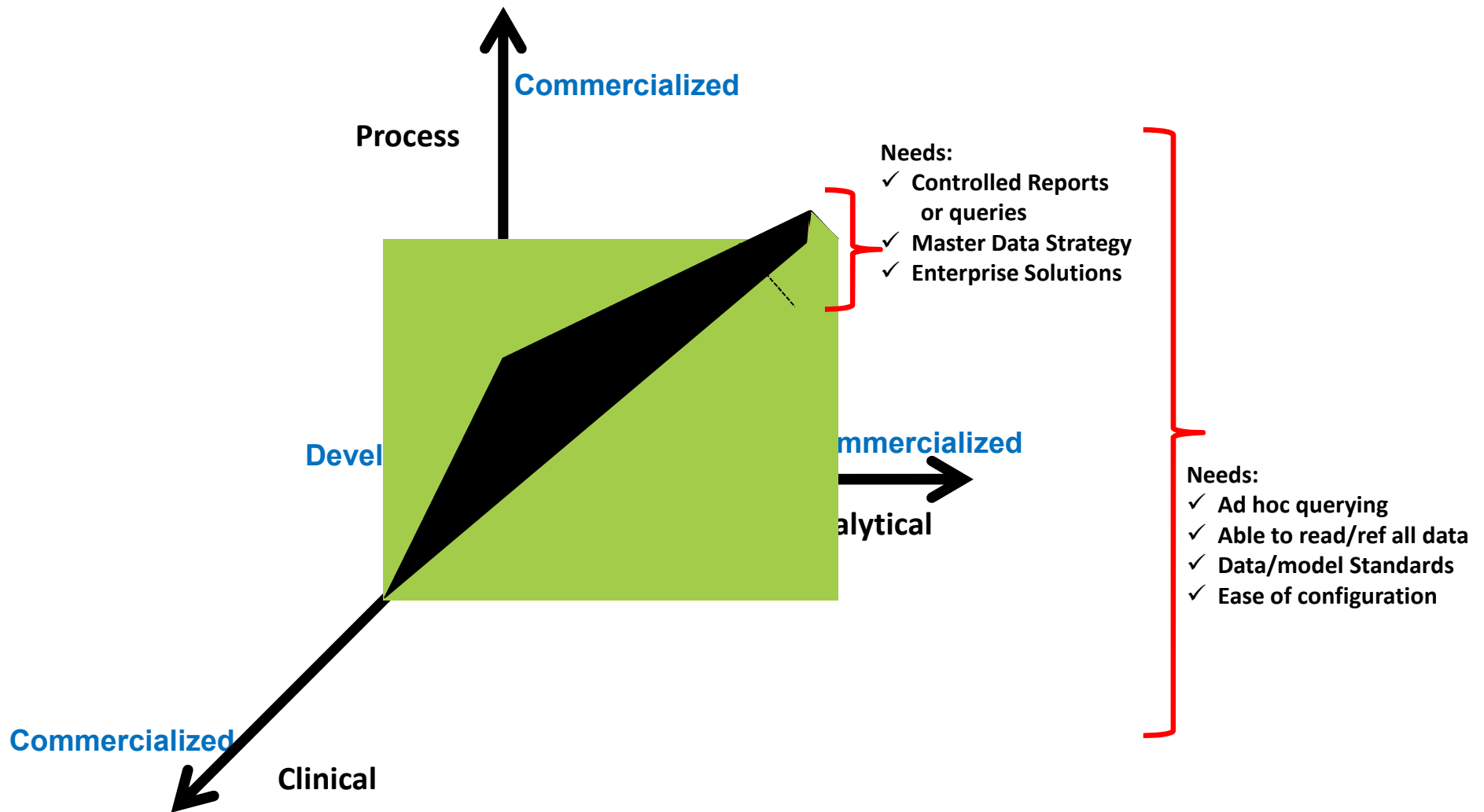


# Data Management Challenge





# Data Management Challenge



## And now we turn to the standards

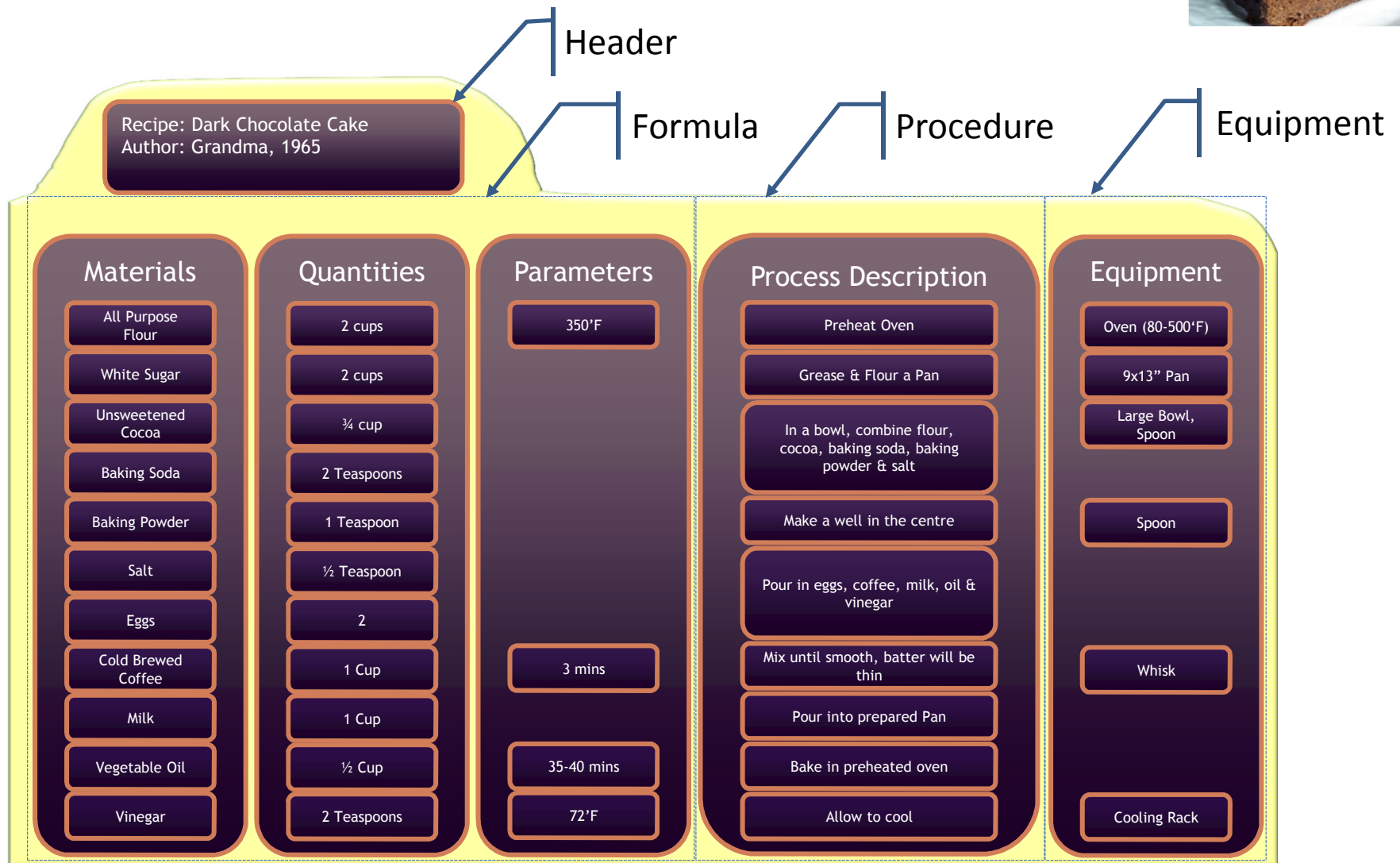


- To meet these challenges, we need guidance
- All this data, and still these three deliverables:
  - Tech Transfer to Commercial Partner
  - Drug Product to the Clinic
  - Regulatory Dossier
- Choose the right software at the right level
- Apply standards to new areas as needed

- Requirements:
  - a harmonised data model across systems
  - systems capability to configure re-usable libraries of standard unit operations.
  - exchange recipe structures between our eLN and MES/RES systems based on standards underwritten by the recipe based approach (e.g. B2MML).
  - contextualisation of our data regardless of the system it was generated in.
- Inherent Quality by Design!

## System independent recipe model

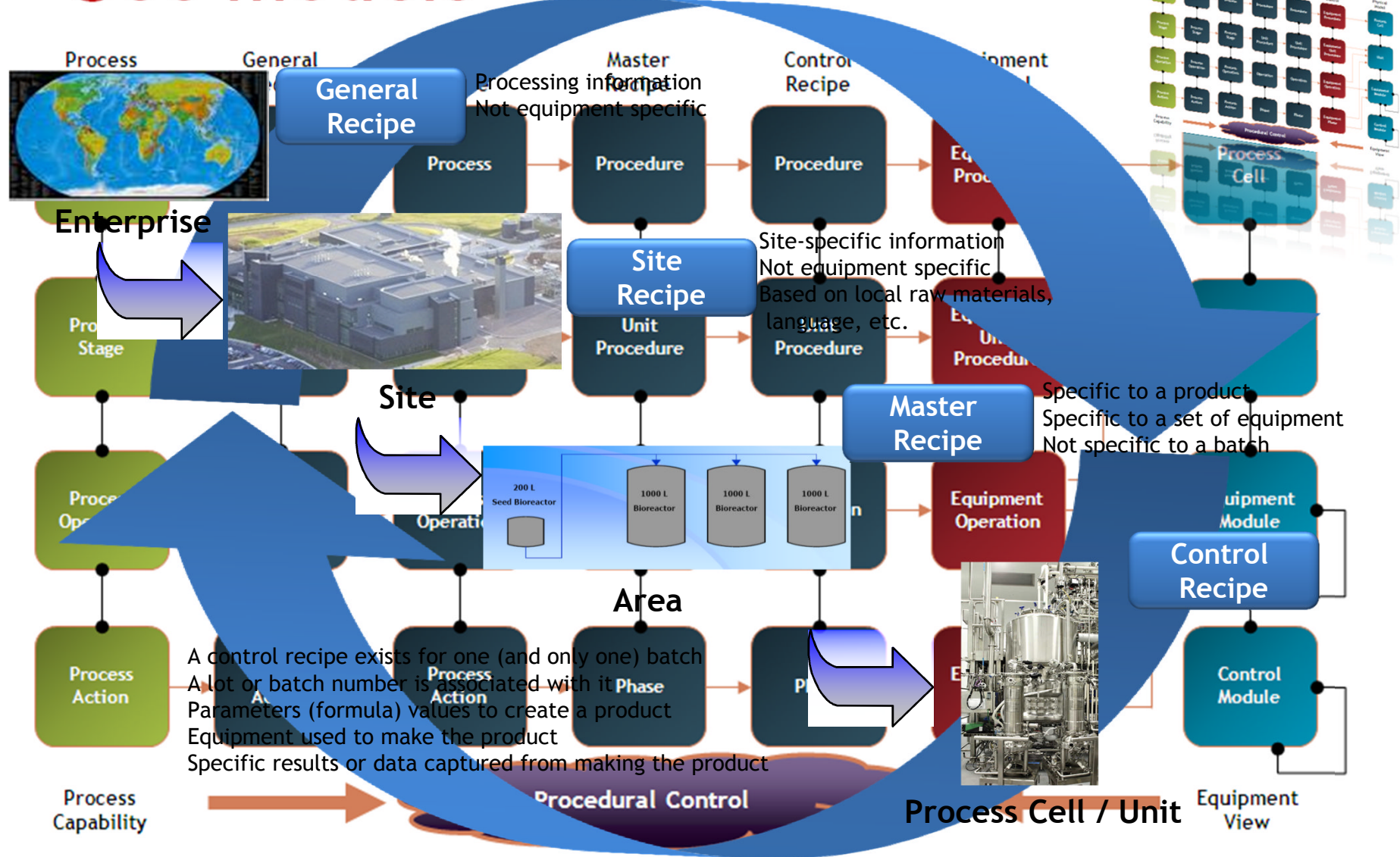
# Cake Recipe the S88 Way!



# 4 Types of Recipes

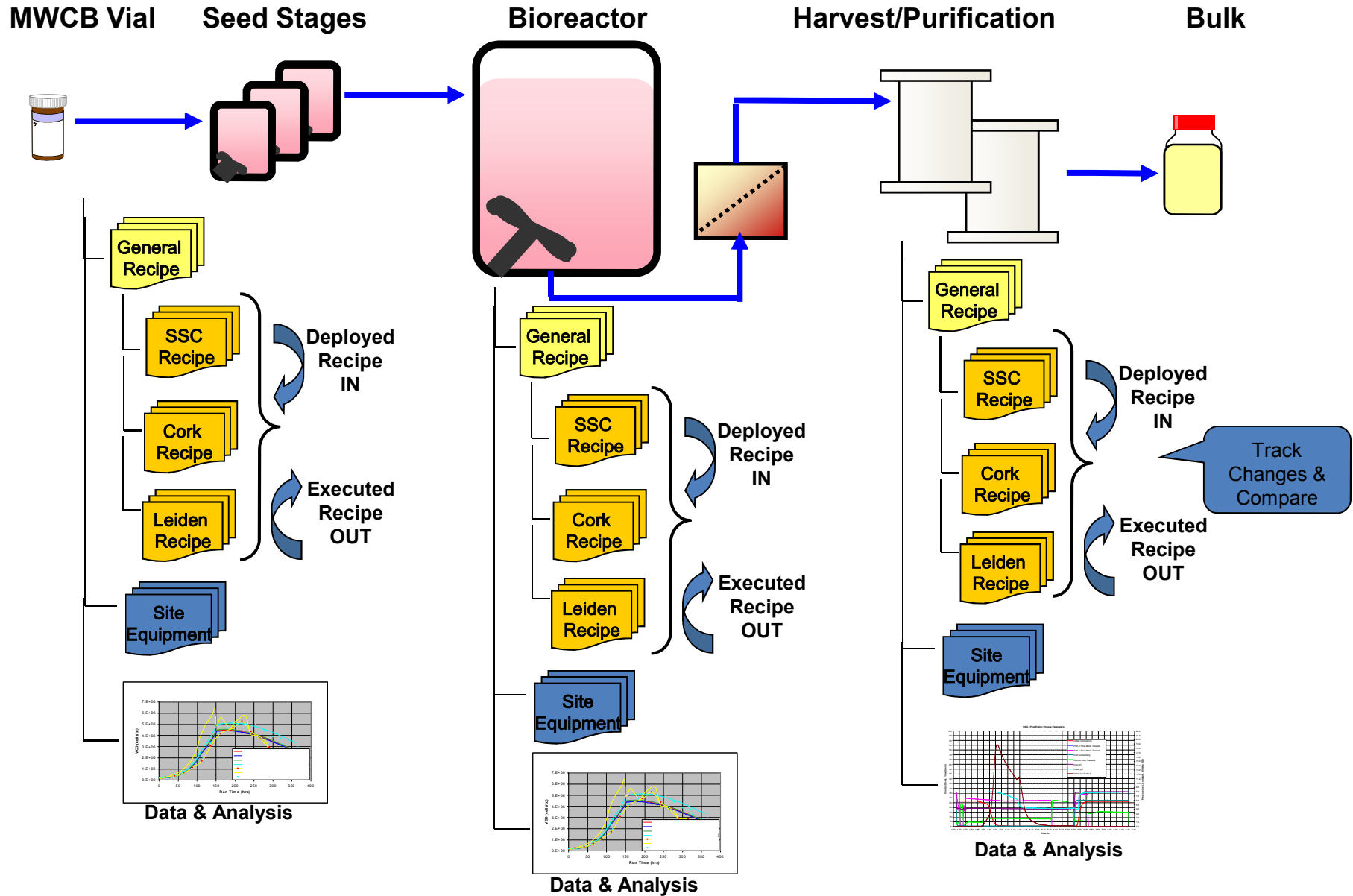


## S88 Models “Process-Fit-to-Plant”



# Managing the Recipe

## *Automatic Development History*



# Recipe Based Development

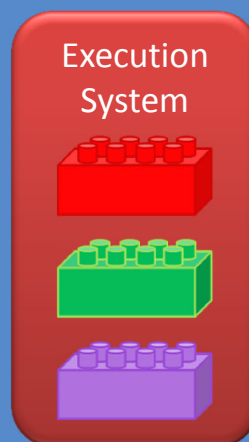


## Recent/Today



Mainly paper based

## Short-term

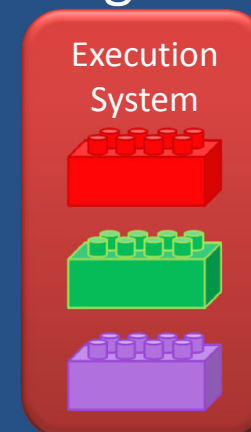


Building blocks of unit operations cross product portfolio.

“Walk-up” execution  
Release by exception



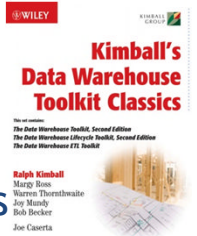
## Long-term



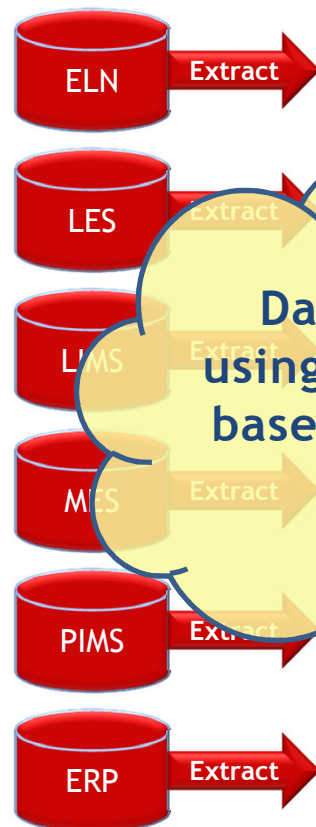
Eliminate the need for validation (cross product platform) ergo validation becomes an oxymoron!!



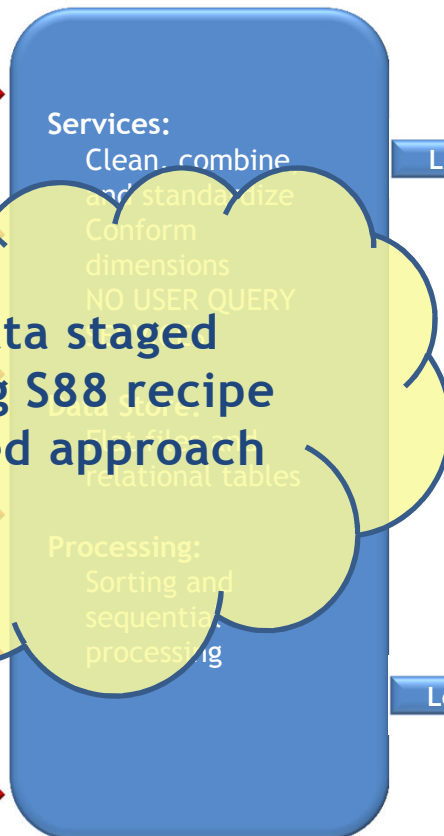
# Recipe based Data Warehouse



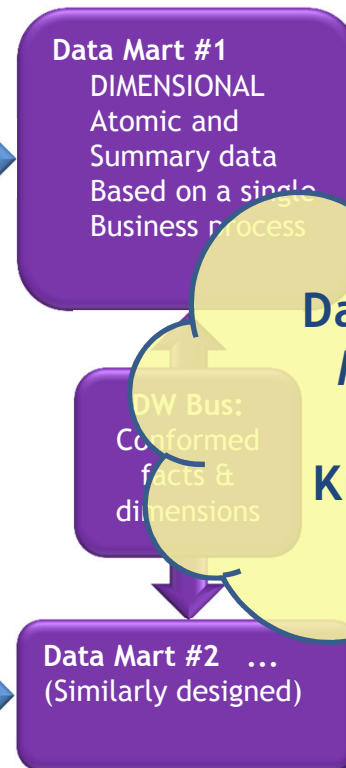
Operational  
Source  
Systems



Data  
Staging  
Area



Data  
Presentation

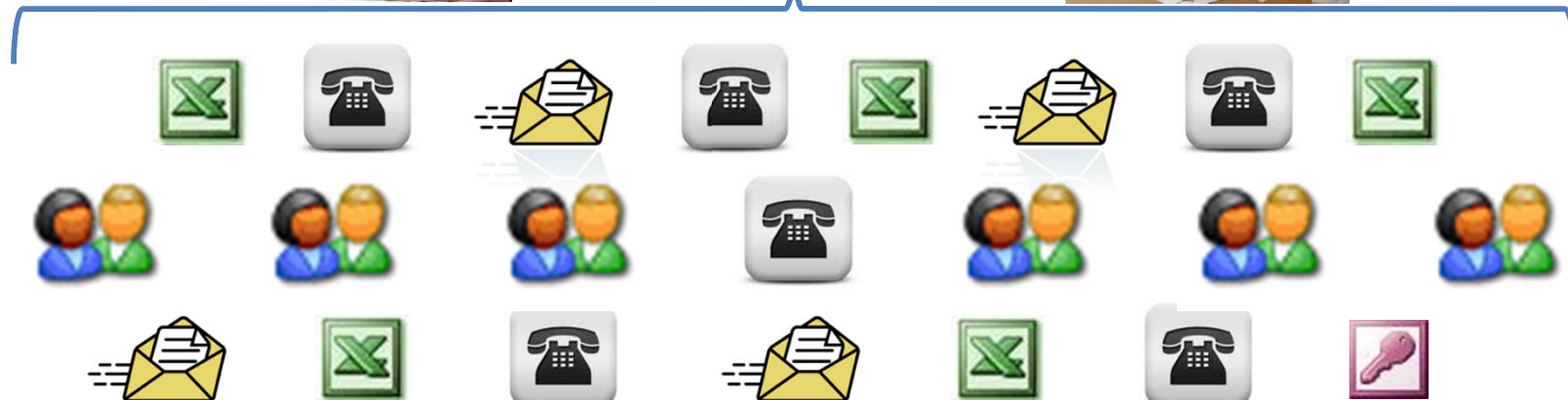


Data  
Access  
Tools





# Current State



Homosapien Based Data Integration

Laboratory

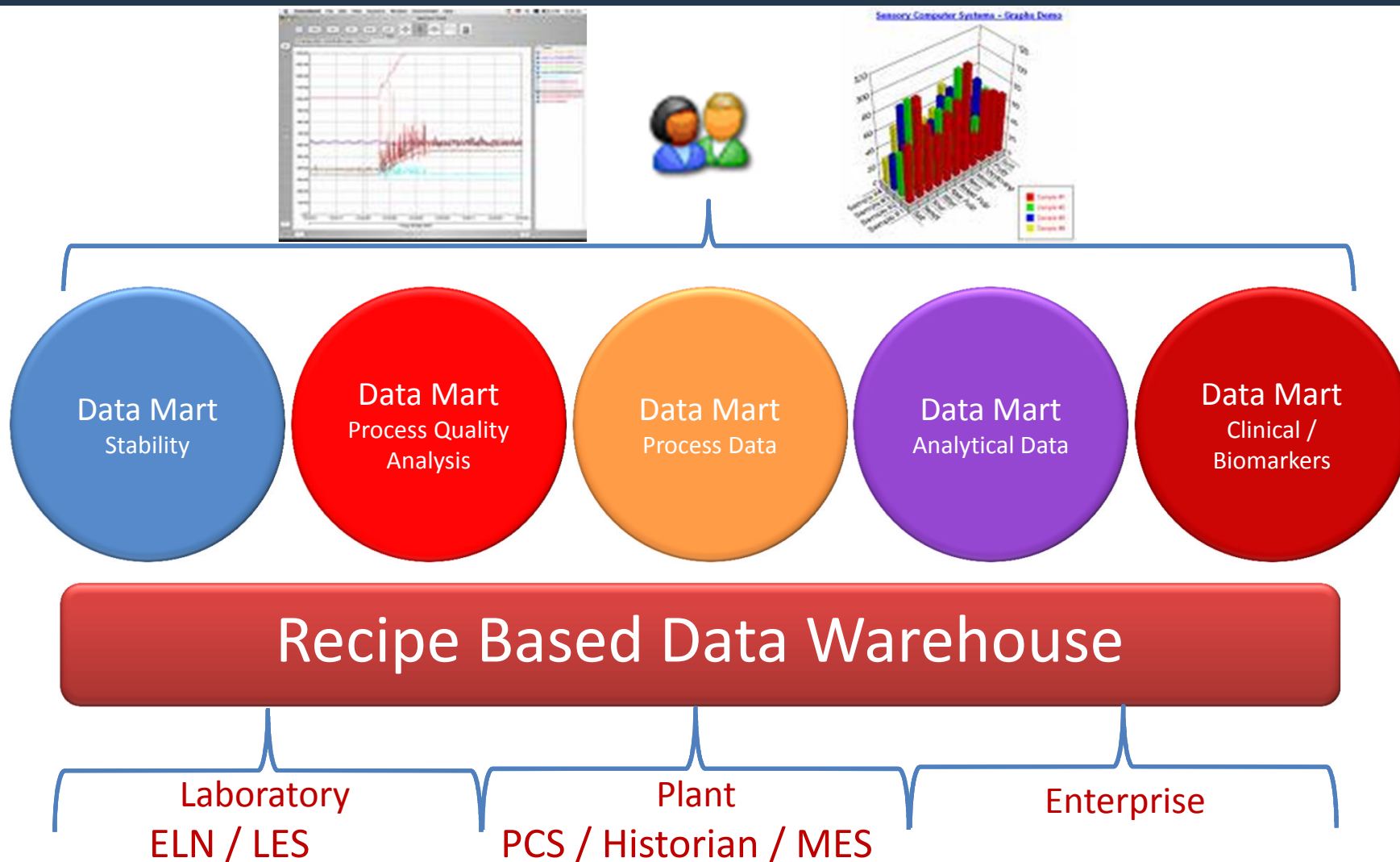


Plant



Enterprise

# Future State



OSI PI gives us process data and batch context

# Recipe based approach



- Expected Results:
  - Zero day release!
  - the capability to answer quickly, the questions to support our business needs (filings, tech transfers, investigations etc.).
  - Zero day for handing over a recipe from/to external contract labs/plants or between internal groups (lab, pilot plant, production)
  - Less demand on quality organizations due to the improved systems integration
  - More time for advanced multivariate understanding of the process and subsequent definition of design space
  - Data driven decisions and advanced modeling techniques enabled
  - Industry standard that reduces overall implementation time and moves us all to a higher level

# Acknowledgements



- Ryan Bass
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