

KADIR HAS UNIVERSITY RESEARCH SEMINAR

UNLOCKING THE POTENTIAL OF DIGITAL TRANSFORMATION WITH DIGITAL DUE DILIGENCE AND UNCERTAINTY MODELING

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OUTLINE

- Transformation to the better
- Salient elements of due diligence
- Getting derivatives to measure customer-centricity and operational risks
- Uncertainty modeling approach
- Concluding remarks and Q&A



STRATEGIC AGILITY VS ORGANIZATIONAL EFFICIENCY

“Today any company that isn’t rethinking its direction every few years and quickly making significant operational changes is putting itself at a risk” --- John P Kotter --- HBR Accelerate (2012)

- Strategic agility
 - Organizations as networks
 - Start-up culture
 - Effective to maneuver: Identify market opportunities and adjust according to them
- Organizational efficiency
 - Organizations as hierarchies
 - Establish companies that are managed efficiently

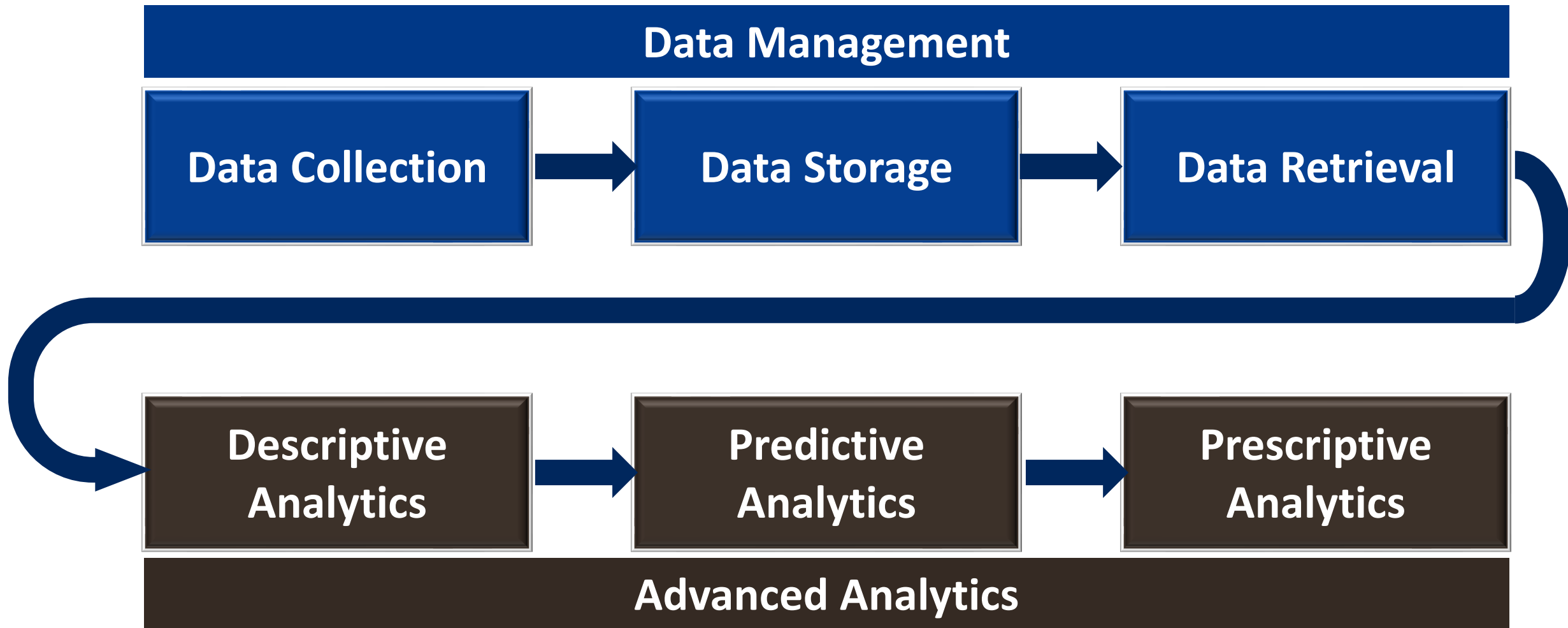


STRATEGIC AGILITY VS ORGANIZATIONAL EFFICIENCY

- How to reach an organizational structure that is efficient and agile simultaneously?
- Solution: Dual operating system
 - Primary efficient (hierarchical) model: Ensuring that operations are run reliably and efficiently
 - Additional agile (network-like) model: Assessing business opportunities and reacting to market opportunities and risks with greater agility



DIGITAL TRANSFORMATION PATH





ANALYTICAL APPROACH TO BUSINESS PROBLEMS

Descriptive Analytics

- *What happened?*
- *Why did it happen?*

Predictive Analytics

- *What will happen?*

Prescriptive Analytics

- *How can it be improved?*

Technical difficulty





TENSION BETWEEN DIGITAL TRANSFORMATION AND DUAL OPERATING SYSTEM

- New business opportunities bring their own operational risks and management practices
- How can organizations simply adjust digital systems?
 - Probably not a problem for digitally unsophisticated firms
 - Established firms with high digital maturity may have some problems



THREE PILLARS OF DIGITAL TRANSFORMATION

Simplicity

- Sketching out the most salient factors
- Simple enough to characterize the information, capital and operational flows in an organization

Customer-centricity

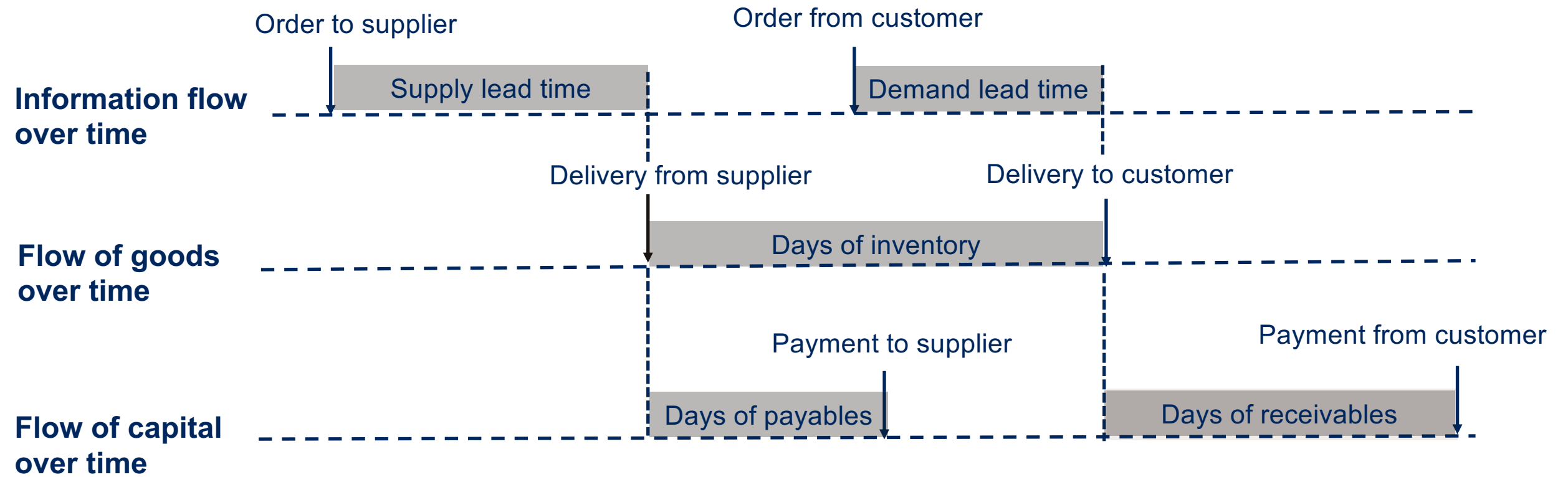
- Value proposition for customers
- Derivation of key indicators from the most salient factors

Explicitness

- Operational and financial risks
- Explicitly linked to the most salient factors



ESTABLISHING SIMPLICITY





CUSTOMER CENTRICITY

How long does it take to create value for customers?

- Operating lead time = Supply lead time + Days of inventory

How long does it take to generate revenues from customers?

- Operating cycle = Days of inventory + Days of receivables



EXPLICITNESS

How exposed is an organization to supply risk?

- Risk indicator: Supply lead time

How exposed is an organization to process risk?

- Risk indicator: Days of inventory

How exposed is an organization to demand uncertainty?

- Risk indicator: Decision lead time = Operating lead time - Demand lead time

How exposed is an organization to cash flow uncertainty?

- Risk indicator: Cash-conversion cycle = Operating cycle – Days of payables



TO WHAT EXTENT DO ORGANIZATIONS NEED DIGITAL TRANSFORMATION?

Data Management

Advanced analytics

Benefits of digital transformation

- Efficiency gain
- Customer satisfaction and market expansion
- Risk reduction

Costs of digital transformation

- IT investments
- Need for skilled employees
- Maintenance costs



ADVANCED ANALYTICS TARGETING HIGH-RISK AREAS

Modeling supply risk

- Agriculture industry

Modeling process risk

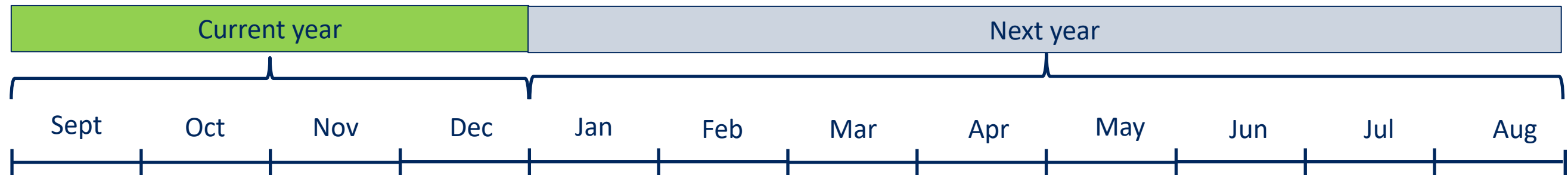
- Chemical and process industries

Modeling demand risk

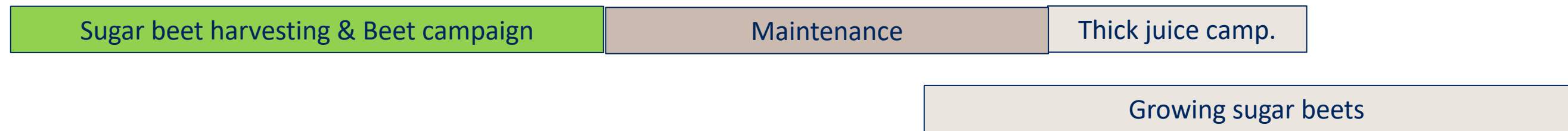
- Retail industry



SUPPLY RISK IN SUGAR PRODUCTION



Crop development and production





SUPPLY RISK IN SUGAR PRODUCTION

- Farmers are incentivized to grow sugar beets, but not forced
 - #1 Uncertainty: Total harvest area
- Amount of sugar beets per hectare is affected by climate factors during the growth period
 - #2 Uncertainty: Sugar beet amount per hectare
- Sugar content per one kg of sugar beets is affected by climate factors during the harvesting period
 - #3 “Uncertainty: Percentage sugar content per one kg of sugar beets
- Sugar supply is uncertain: Combination of three uncertain elements



PROCESS RISK

- Serial production with three machines
- Failure rates are uncertain for each machine.
 - First machine is less reliable than the other two
- Total amount of production is uncertain: Combination of three uncertain elements that come from each machine



UNCERTAINTY MODELING VS DEMAND FORECASTING

Uncertainty modeling

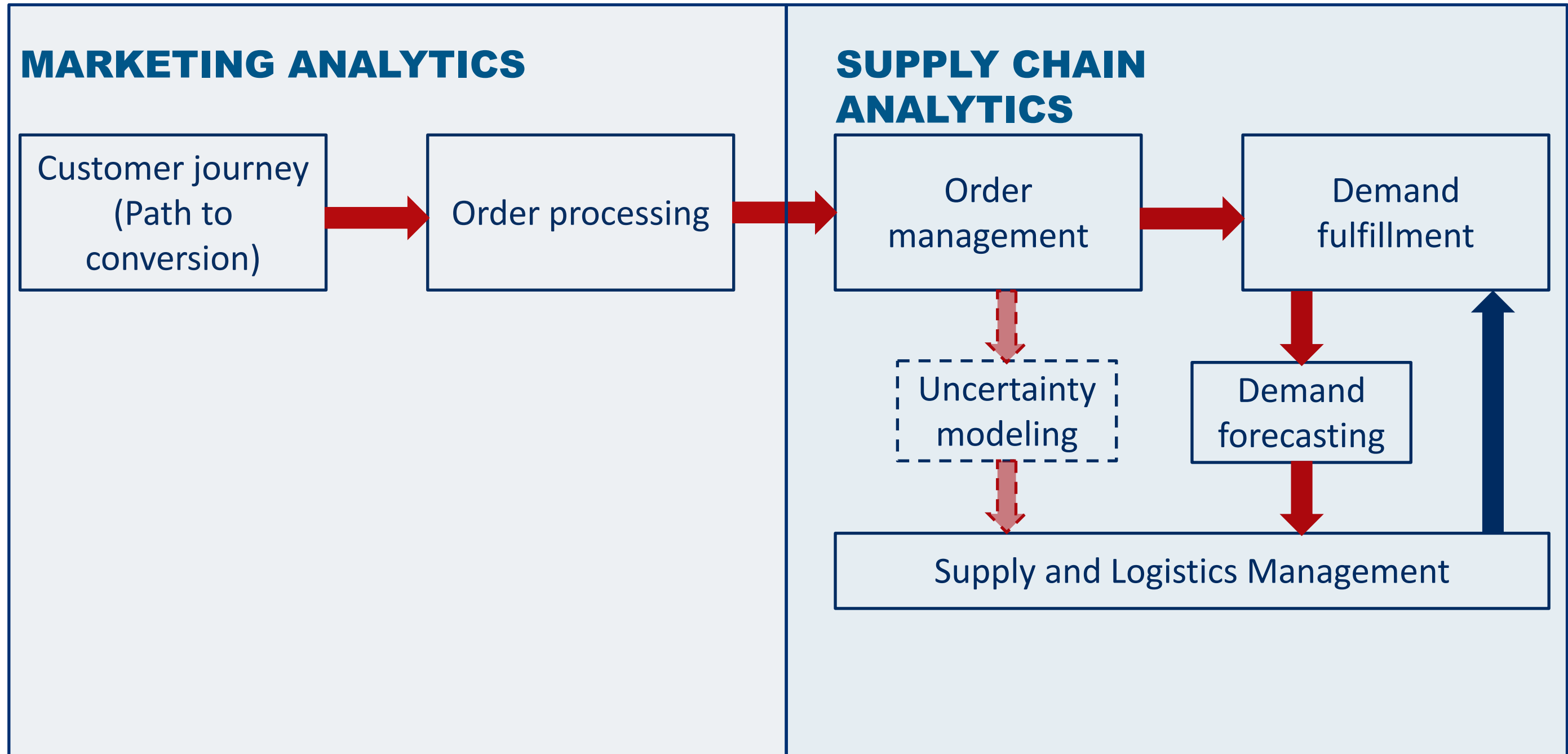
- Reducing the decision bias
- How are customer orders formed?
- Order management datasets are used

Demand forecasting

- Reducing the forecast bias
- What are the historical demand values and factors affecting the demand?
- Demand fulfillment datasets are used



UNCERTAINTY MODELING VS DEMAND FORECASTING





B2B SETTING (KORDSA INC)

- Kordsa receives bulky orders from its customers
- The number of distinct orders in a week is uncertain
- For each order, the quantity demanded is uncertain
- For each order, demand lead time is uncertain
- Uncertainty modeling represents demand as a combination of three uncertain parameters



B2C SETTING (ONLINE RETAILER)

- Website traffic
- Choice probabilities
- Uncertainty modeling represents demand as a combination of two uncertain parameters



FAST FOURIER TRANSFORM

- Additive demand (independent random variables)
 - Demand = $X + Y$
 - Characteristic function of demand is multiplication of the characteristic functions of X and Y
- Multiplicative demand (independent random variables)
 - Demand = $X * Y$
 - $\ln(\text{Demand}) = \ln(X) + \ln(Y)$
 - Characteristic function of log-demand is multiplication of the characteristic functions of $\ln(X)$ and $\ln(Y)$
- Prescriptive analytics with the fast Fourier transform
 - What should we be able to compute for optimization under uncertainty?
 - Cumulative demand
 - Partial integral



RELATED RESEARCH

- Biçer, I., Hagspiel, V. and De Treville, S., 2018. Valuing supply-chain responsiveness under demand jumps. *Journal of Operations Management*, 61, pp.46-67.
- Biçer, I. and Tarakci, M., 2021. Managing Capacity Utilization with Advance Orders. *Available at SSRN 3972463*.
- Biçer, I., Tarakci, M. and Kuzu, A., 2022. Using uncertainty modeling to predict demand. *Harvard Business Review*
- Biçer, I., forthcoming. Securing the upside of digital transformation before implementation: Keeping it simple, customer centric and explicit. *California Management Review*



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Thank you



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