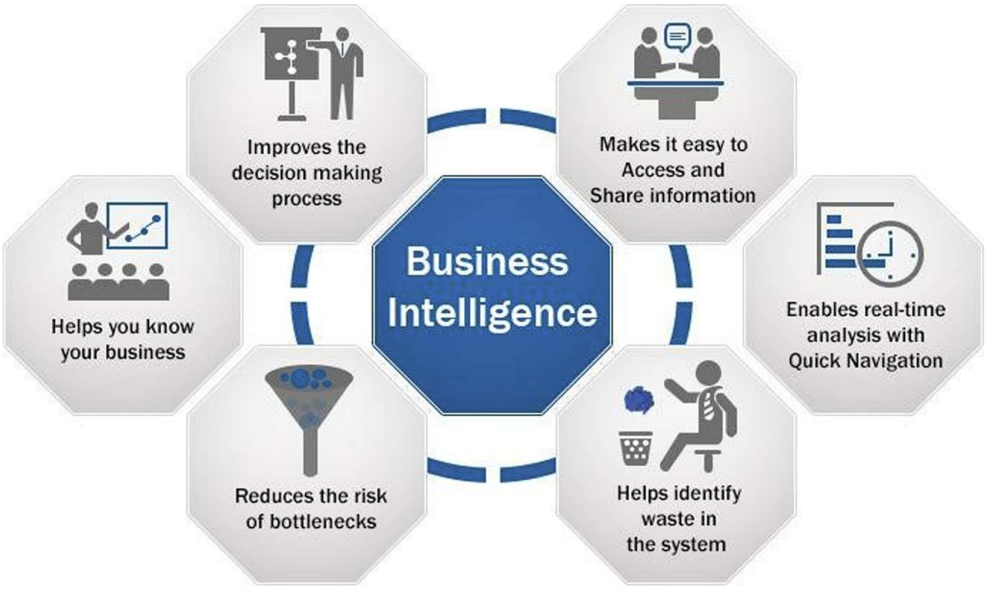
Strategic Value of BI

Creating Value with BI

What Business Intellegience helps with



Value creation is not easy

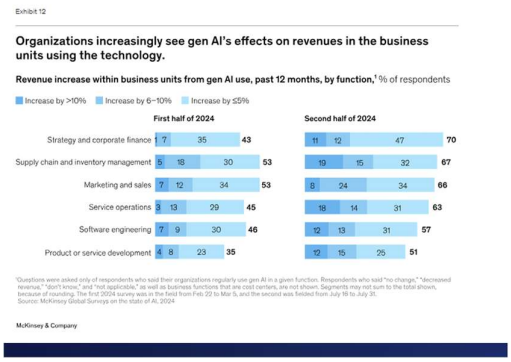


Exhibit 12

Organizations increasingly see gen AI's effects on revenues in the business units using the technology.

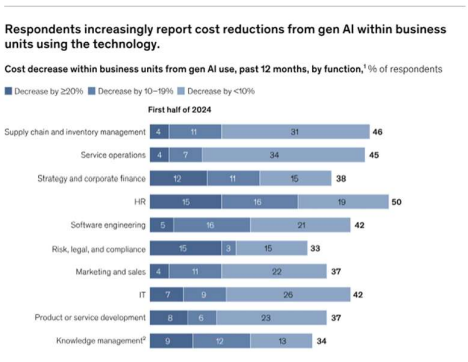
Revenue increase within business units from gen AI use, past 12 months, by function,[1] % of respondents

Increase by >10% | Increase by 6–10% | Increase by ≤5%

	First half of 2024				Second half of 2024			
Strategy and corporate finance	7	35	43		12	47	70	
Supply chain and inventory management	5	18	30	53	19	15	32	67
Marketing and sales	7	12	34	53	8	24	34	66
Service operations	3	13	29	45	18	14	31	63
Software engineering	7	9	30	46	12	13	31	57
Product or service development	4	8	23	35	12	15	25	51

[1]Questions were asked only of respondents who said their organizations regularly use gen AI in a given function. Respondents who said "no change," "decreased revenue," "don't know," and "not applicable," as well as business functions that are cost centers, are not shown. Segments may not sum to the total shown, because of rounding. The first 2024 survey was in the field from Feb. 22 to Mar 5, and the second was fielded from July 16 to July 31.
Source: McKinsey Global Surveys on the state of AI, 2024

McKinsey & Company

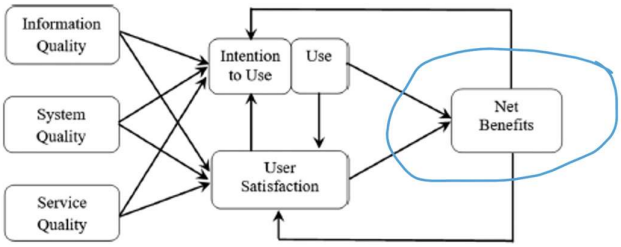

Respondents increasingly report cost reductions from gen AI within business units using the technology.

Cost decrease within business units from gen AI use, past 12 months, by function,[1] % of respondents

Decrease by ≥20% | Decrease by 10–19% | Decrease by <10%

	First half of 2024			
Supply chain and inventory management	4	11	31	46
Service operations	4	7	34	45
Strategy and corporate finance	12	11	15	38
HR	15	16	19	50
Software engineering	5	16	21	42
Risk, legal, and compliance	15	3	15	33
Marketing and sales	4	11	22	37
IT	7	9	26	42
Product or service development	8	6	23	37
Knowledge management[2]	9	12	13	34

The ISS Model



Source: DeLone and McLean (2003)

- The ISS Model shows that BI creates value only when:
  - Data, system, and service quality are high
  - Users trust the BI system (satisfaction)
  - Users actually use the BI system
  - Those actions lead to measurable Net Benefits
  - Net Benefits reinforce satisfaction and future use
- Value creation is not about the BI system itself,
  but about outcomes produced by using it.

System success and BI KPI Impact

Dimension	Success Driver	BI KPI Impact
System Quality — If the BI system is slow or confusing → users won't use it.	Fast, reliable, user-friendly BI tools	Adoption Rate ↑
Information Quality — Good decisions require trustworthy data.	Accurate, timely, relevant data	Decision Accuracy ↑
Service Quality — Users need help adopting BI, especially non-technical ones.	Strong BI support & training	User Engagement ↑
Use / Intention to Use — "Use" is the ISS model's direct path to benefits.	Actual and intended BI usage	BI Adoption ↑
User Satisfaction — Trust is critical — if users don trust the numbers, BI fails	Positive user feedback	Trust in BI ↑
Net Benefits — This is where value creation happens.	Organizational improvements	Profit, ROI, Efficiency ↑

Value Connections

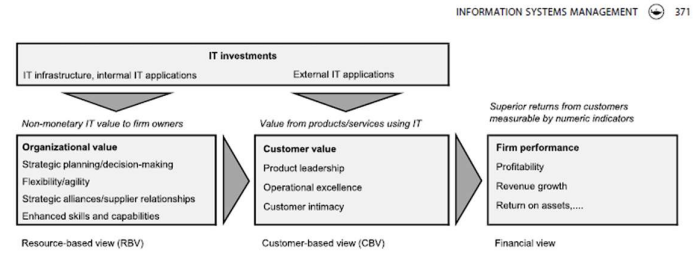
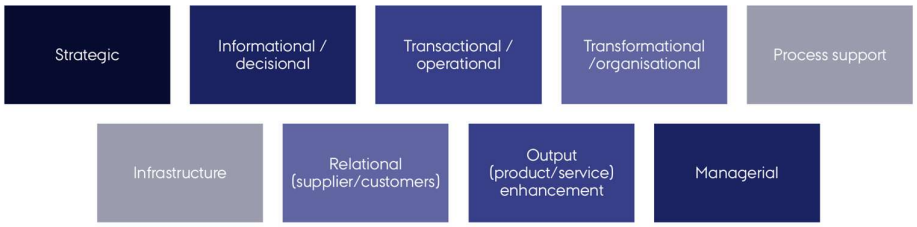


Figure 1. IT-Value Model: Organizational Value as Precondition for Customer Value and Firm Performance (Source: Authors)

- The IT-Value Model shows that BI creates value indirectly:
  IT investments create organizational capabilities (RBV), which enable customer value (CBV), which finally improves financial performance.
  Therefore, BI is a necessary but not sufficient condition for business value — capabilities and customer impact must mediate the effect.

Types of Benefits

The BI value adding potential



- Strategic
  - BI supports long-term, high-level decisions:
    - market analysis
    - competitor insights
    - entering new markets
    - mergers & acquisitions
    - product portfolio strategy
      - Example:
        A BI dashboard identifies fast-growing markets → informs expansion strategy.
- Informational / Decisional
  - BI provides better information for day-to-day decisions:
    - more accurate decisions
    - faster decisions
    - data-driven decision culture
      - Example:
        Sales managers use BI to forecast demand more accurately.
- Transactional / Operational
  - BI improves daily operations:
    - reducing bottlenecks
    - improving workflow
    - faster processing
    - optimized inventory
      - Example:
        A warehouse uses BI to optimize pick/pack routes.
- Transformational / Organisational
  - BI enables big organizational changes:
    - new business models
    - redesign of processes
    - automation
    - cross-department alignment
      - Example:
        A retailer transforms from gut-feeling merchandising to data-driven pricing.
- Process Support
  - BI supports existing processes by:
    - monitoring KPIs
    - identifying waste

        - improving efficiency
            - Example:
              Finance uses BI dashboards to track monthly closing performance.
- Infrastructure
    - BI contributes to:
        - better data infrastructure
        - standardized data
        - data governance
        - integration of systems
            - Example:
              A unified data warehouse replaces 20 spreadsheets across departments.
    - This supports all other benefit types.
- Relational (Supplier / Customer)
    - BI improves relationships:
        - better supplier negotiations
        - customer insights
        - improved service levels
        - reduced churn
    - Example:
      BI identifies high-value customers → marketing personalizes offers.
        - This links to the CBV (customer-based view) in the IT-value model.
- Output (Product/Service) Enhancement
    - BI improves what the company sells:
        - better product features
        - improved service quality
        - personalization
        - innovation
            - Example:
              Streaming services (Netflix) use BI to recommend content → better user experience.
- Managerial
    - BI enhances:
        - management control
        - monitoring
        - reporting
        - planning
        - forecasting
            - Example:
              Managers use BI to monitor KPIs in real-time.
    - This aligns strongly with the ISS model outcomes (decision support + satisfaction)

Authors	IT-value group	IT-value activity	IT-value category: Customer value PL	OE	Organizational value CI	SP/DM	FX/A	SA/SR	ESC	Other
Mirani and Lederer (1998)	Strategic benefits	Enhance competitiveness or create strategic advantage								x
		Enable the organization to catch up with competitors								x
		Align well with stated organizational goals				x				
		Help establish useful linkages with other organizations						x		
		Enable the organization to respond more quickly to changes					x			
		Improve customer relations			x					
		Provide new products or services to customers	x							
		Provide better products or services to customers	x							
	Informational benefits	Enable faster retrieval or delivery of information or reports				x				
		Enable easier access to information				x				
		Improve management information for strategic planning				x				
		Improve the accuracy or reliability of information				x				
		Improve information for operational control				x				
		Present information in a more concise manner or better format				x				
		Increase the flexibility of information requests					x			
	Transactional benefits	Save money by reducing travel costs		x						
		Save money by reducing communication costs		x						
		Save money by reducing system modification or enhancement costs		x						
		Allow other applications to be developed faster	x							
		Allow previously infeasible applications to be implemented	x							
		Provide the ability to perform maintenance faster		x						
		Save money by avoiding the need to increase the work force		x						
		Speed up transactions or shorten product cycles	x							
		Increase return on financial assets								x
Gregor et al. (2006)	Transformational benefits (in addition to the benefits from Mirani & Lederer, 1998)	Enhance employee productivity or business efficiency		x						
		An improved skill level for employees							x	
		Developing new business plans				x				
		Expanding organizational capabilities							x	
		Improving business models				x				
		Improving organizational structure/processes		x						

(Continued)

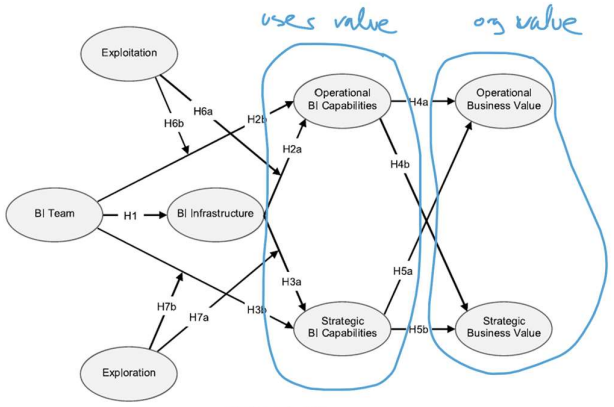


Fig. 1. Research model.

Fink et al 2017

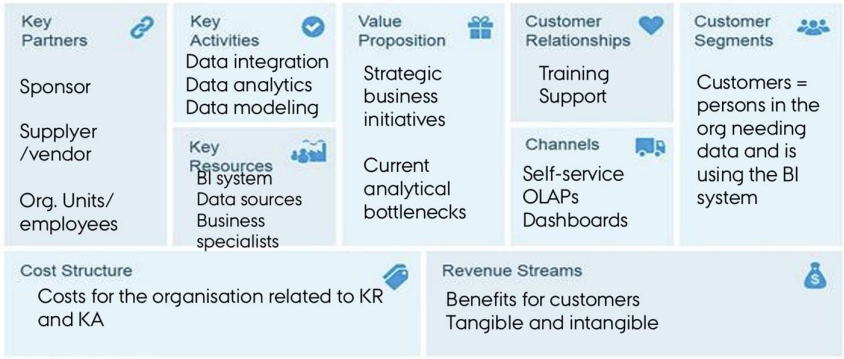
- BI Inputs
  - BI Team quality
  - BI Infrastructure
  - Exploitation (using existing BI)
  - Exploration (developing new BI uses)
  - These are the capability enablers.
- BI Capabilities (Use Value)
  - Operational BI Capabilities
    → fast reporting, accurate KPIs, process monitoring
    (maps to informational + transactional benefits)
  - Strategic BI Capabilities
    → forecasting, analytics, scenario planning
    (maps to strategic + transformational benefits)
  - This stage = “use value” (how BI is used).
- BI Outcomes (Business Value)
  - Operational Business Value
    = efficiency, cost savings, productivity
    → matches “transactional benefits”
  - Strategic Business Value
    = competitive advantage, agility, new opportunities
    → matches “strategic” and “transformational benefits”
  - This stage = organizational value.
- THE CORE MESSAGE:
  - BI team + infrastructure → BI capabilities
  - BI capabilities → BI business value (operational + strategic)
  - Capabilities are the mechanism.
    They mediate the relationship between BI and business value.

The Bi Business Model

Answers these questions

- What business benefits of the organization? Value proposition — Examples: better decisions, faster processes, strategic insights, reduced costs, improved customer experience
- Who will use the information? Customers — Not external customers → BI "customers" are internal roles needing managers, analysts, sales, finance, operations, executives
- How are they going to use the system? Channel/relation — How BI is delivered to users: dashboards, OLAP cubes, self-service BI, automated reports, alerts. And how BI supports them: training, helpdesk, support
- What are the anticipated user benefits of the BI system? Revenues — What benefits will users gain? In BI, "revenue" = value created: decision quality, efficiency, time savings, new opportunities, reduced errors. These are intangible "returns" from BI.
- Who are the internal BI stakeholders? Partners — Examples: BI sponsor (executive), IT/data engineers, data owners, business units, vendors (BI software providers)
- Which business processes are involved in and influenced by the BI project? Key Activities /resources — Activities: data integration, ETL, modeling, analytics, governance, training. Resources: BI system, data sources, BI specialists, analysts
- Who would sponsor the BI project? Partners
- What are the costs related to the BI project? Costs — Costs include: software licenses, hardware/cloud, data engineering, BI staff, training, maintenance

Business Model Elements



- Why This Model Matters (Link to Everything Above)
- The BI Business Model links to the earlier frameworks:

Earlier Model	How It Connects to BI-BM
ISS Model	Channels, Relationships → Use & Satisfaction → Net Benefits
IT Value Model	Value Proposition → Organizational Value → Firm Performance
BI Capabilities Model	Key Activities & Key Resources → BI Capabilities → Value
Types of BI Value	Value Proposition & Revenue Streams map to Strategic, Informational, Transactional, Transformational benefits

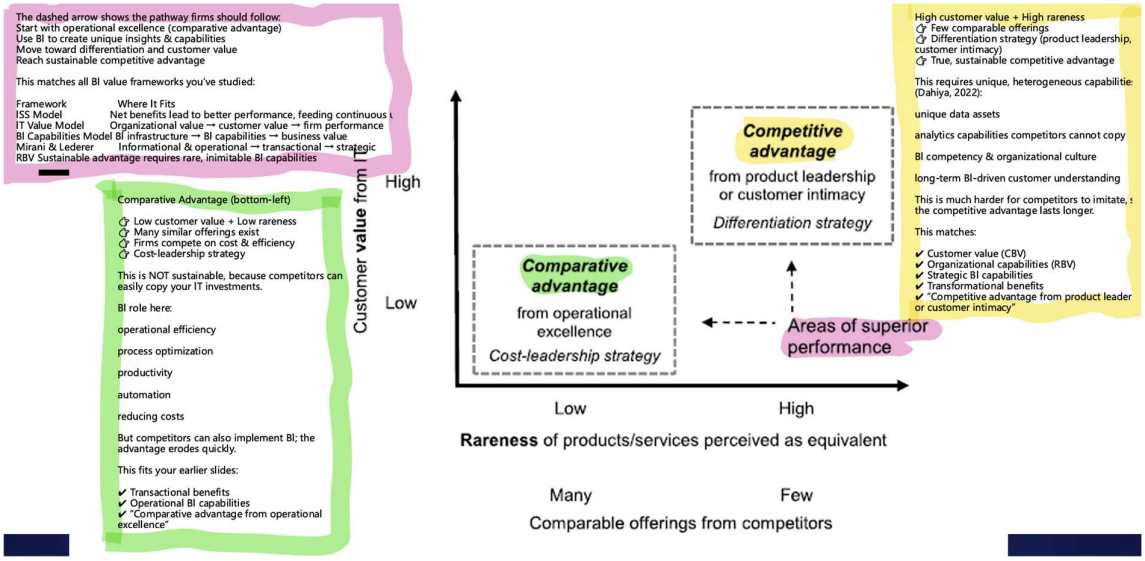
This is why the BI-BM is important:

👉 **It integrates all BI value thinking into one practical planning tool.**

- The BI Business Model (BI-BM) adapts the Business Model Canvas to describe how BI initiatives create value. It answers who uses BI, how they use it, what benefits they get, which activities and resources are required, who the key partners are, and what costs are involved. The BI-BM links BI's technical aspects (data integration, analytics, modeling) with business outcomes (strategic insights, operational improvements, better decisions). It bridges BI capabilities with BI value and aligns BI with organizational strategy.

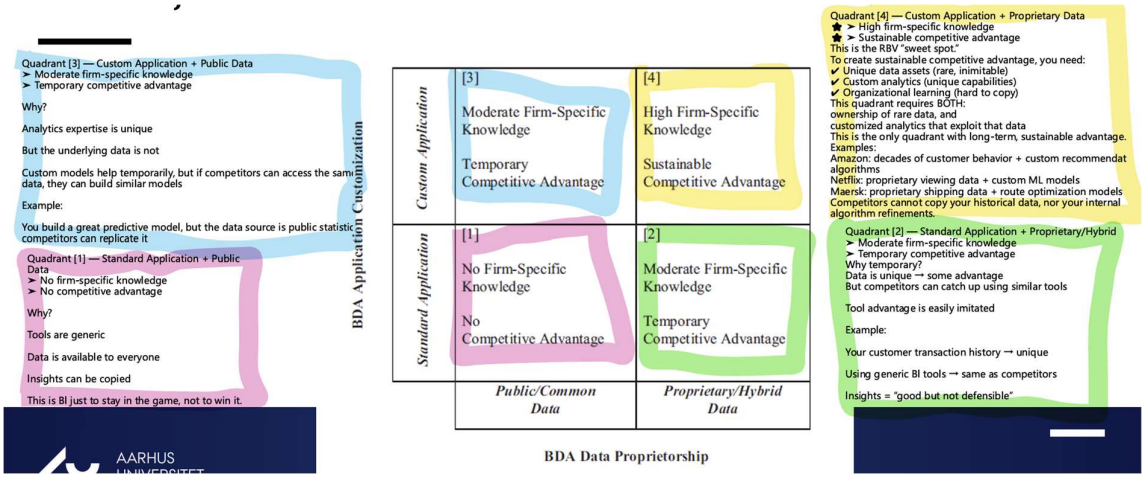
BI and Competitive Advantage

- Competitive advantage occurs when a firm creates more customer value than its competitors (Gellweiler & Krishnamurthi, 2022). However, as competitors adopt similar BI tools and value-adding services, the advantage erodes and competition shifts to cost efficiency. Therefore, BI technology alone cannot sustain long-term competitive advantage. According to Dahiya (2022), sustainable advantage requires unique, heterogeneous resources and capabilities—such as proprietary data, analytical skills, and BI-enabled organizational routines—that competitors cannot easily imitate.



- BI Competitiveness
    - Effective use of Big Data Analytics applications can help companies decipher hidden patterns in data that previously were unimaginable insights provided to business.
    - The underlying dimensions that determine the knowledge created:
        - The analytical application
        - Data ownership
    - Resource-based theory (RBV): knowledge constitutes a competitive advantage in the long run if it is unique and different from others while being the company's own

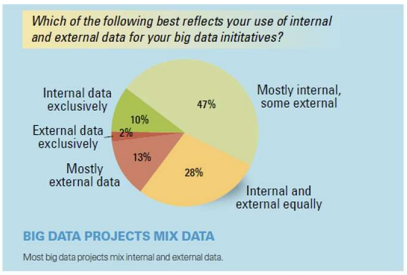
- Data Analytics and Competitiveness



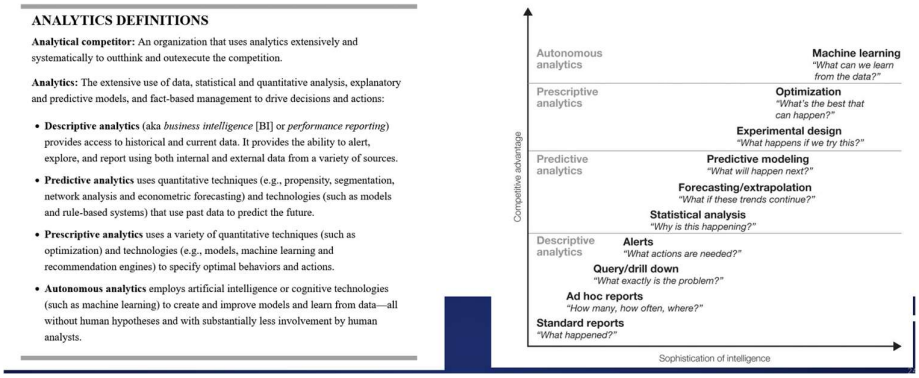
The BDA competitiveness matrix shows that competitive advantage depends on two factors: data proprietorship and the level of analytics customization. Standard analytics applied to public data creates no competitive advantage. Proprietary data or customized analytics each produce only temporary advantage because they can be imitated. Sustainable competitive advantage arises only when a firm combines proprietary or hybrid data with customized analytical applications, producing unique, inimitable knowledge. This aligns with the Resource-Based View, which states that long-term competitive advantage requires rare, valuable, and inimitable resources and capabilities.

- Types of Data

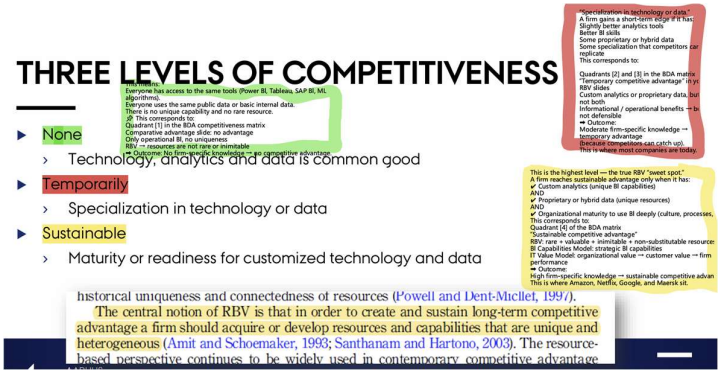
  - Internal
  - External
  - Familiar (exploitation)
  - New (exploration)
  - Public
  - Organizational specific



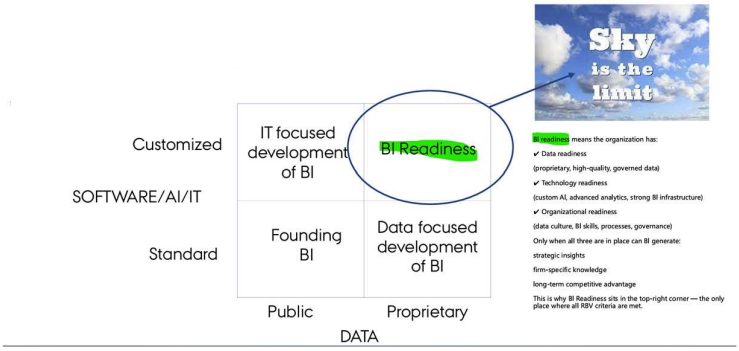
- Levels of analytics sophistication



- Three Levels of Competitiveness

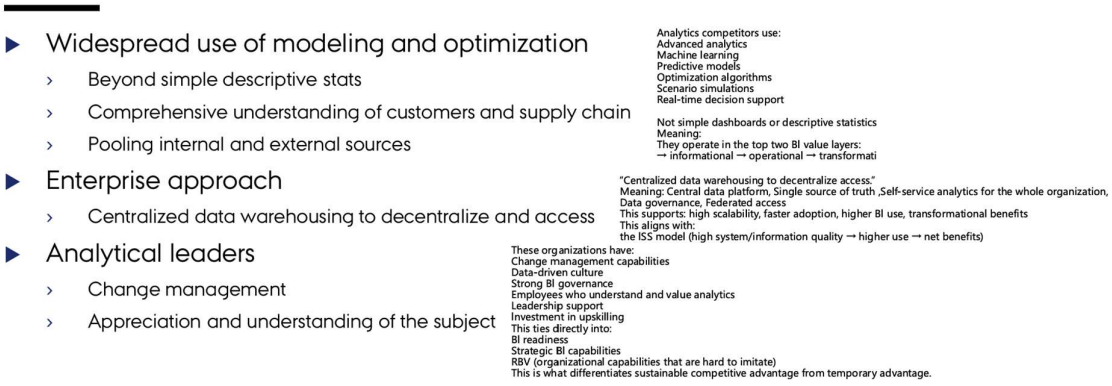


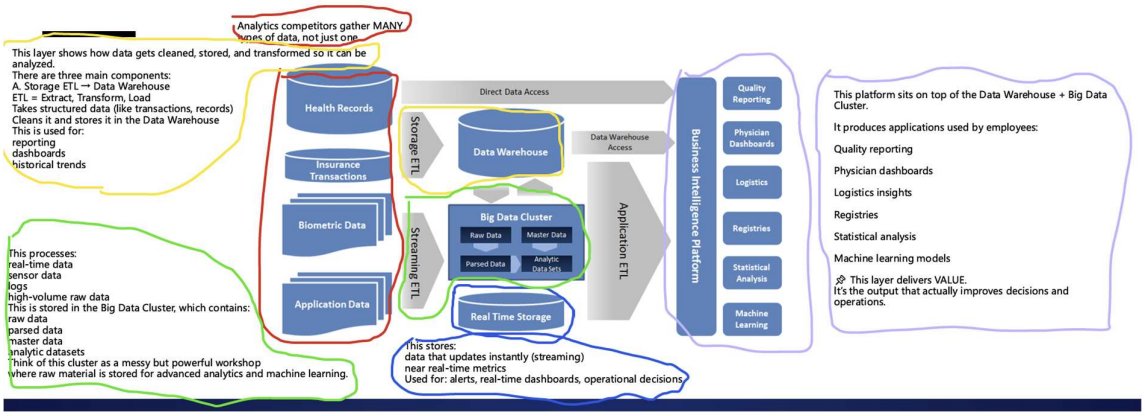
- Competitive Advantage



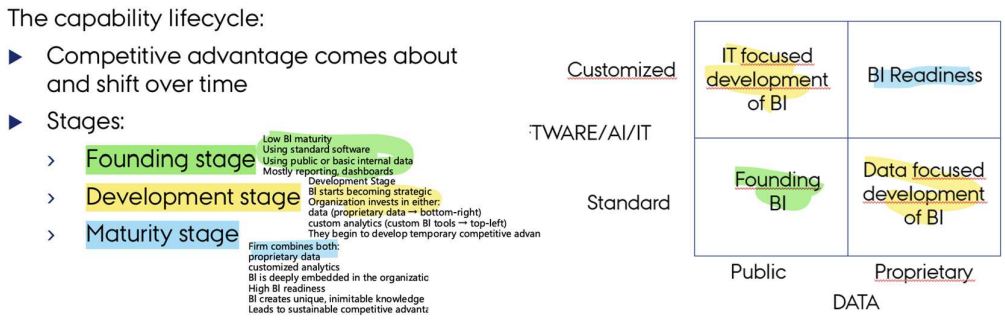
The BI readiness matrix shows that competitive advantage depends on both data proprietorship and the level of analytics customization. Standard BI on public data creates no competitive advantage, while either proprietary data or customized analytics alone create only temporary advantage. Sustainable competitive advantage is achieved only when an organization combines proprietary or hybrid data with customized BI/AI applications and organizational maturity. This produces unique, inimitable knowledge consistent with the Resource-Based View, and represents true BI readiness — the point at which the firm can fully exploit BI for long-term strategic value.

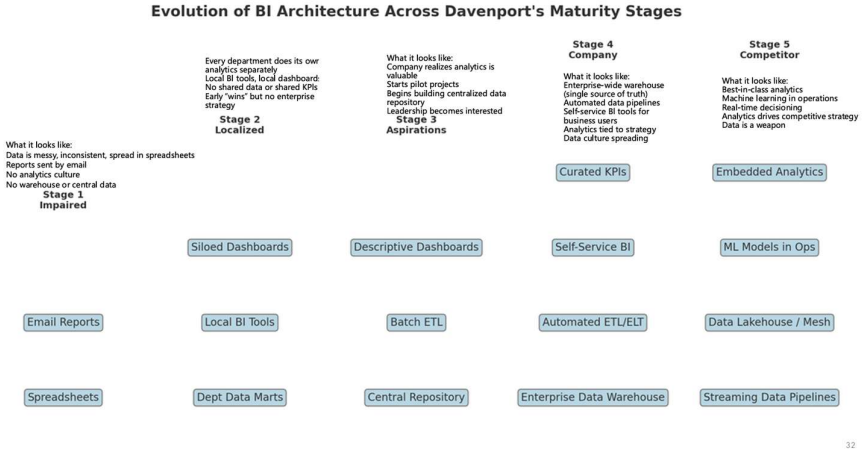
- Anatomy of Analytics Competitors





- How Competitiveness develops
  - Companies move through **three capability stages** — Founding → Development → Maturity —
    and each stage corresponds to a different position in the **BI competitiveness matrix**





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FROM STAGE 1 → STAGE 2

Analytically Impaired → Localized Analytics

- **Data:** Clean up obvious errors, make data usable within functions (start with finance, sales, or operations).
- **Enterprise:** Allow local initiatives; support "islands of analytics" that show early value.
- **Leadership:** Build awareness at functional level — create curiosity about data.
- **Targets:** Set basic, function-specific targets (even if not strategic).
- **Analysts:** Hire or assign first functional analysts; tolerate pockets of expertise.

FROM STAGE 2 → STAGE 3

Localized Analytics → Analytical Aspirations

Data: Begin to consolidate functional data into a central repository; standardize formats.

Enterprise: Launch an enterprise-wide data strategy (roadmap, governance framework).

Leadership: Leaders recognize analytics' importance — start sponsoring pilot projects.

Targets: Align analytics to a small but more strategic set of performance targets.

Analysts: Encourage collaboration between isolated analysts; create informal networks.

FROM STAGE 3 → STAGE 4

Analytical Aspirations → Analytical Company

Data: Build an integrated, accurate data warehouse (single source of truth).

Enterprise: Formalize central or networked structures (Analytics CoE, data platform team).

Leadership: Provide consistent leadership support — link analytics to business strategy.

Targets: Focus analytics on a few key domains (e.g., customer churn, supply chain).

Analysts: Invest in highly capable analysts and embed them in cross-functional teams.

FROM STAGE 4 → STAGE 5

Data: Relentlessly expand data sources (internal + external) and metrics; invest in advanced analytics/ML.

Enterprise: Centrally manage all key data, technology, and analyst resources; scale globally.

Leadership: Strong passion and commitment from senior leadership — analytics seen as a competitive weapon.

Targets: Align analytics directly with the firm's distinctive capabilities and strategic goals.

Analysts: Develop world-class analytics talent; create pathways for "analytical amateurs" (business users) via self-service tools and data literacy programs

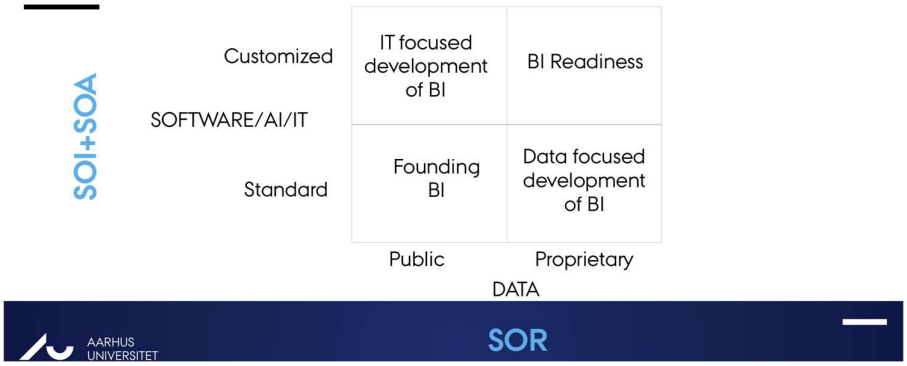
Analytical Company → Analytical Competitor

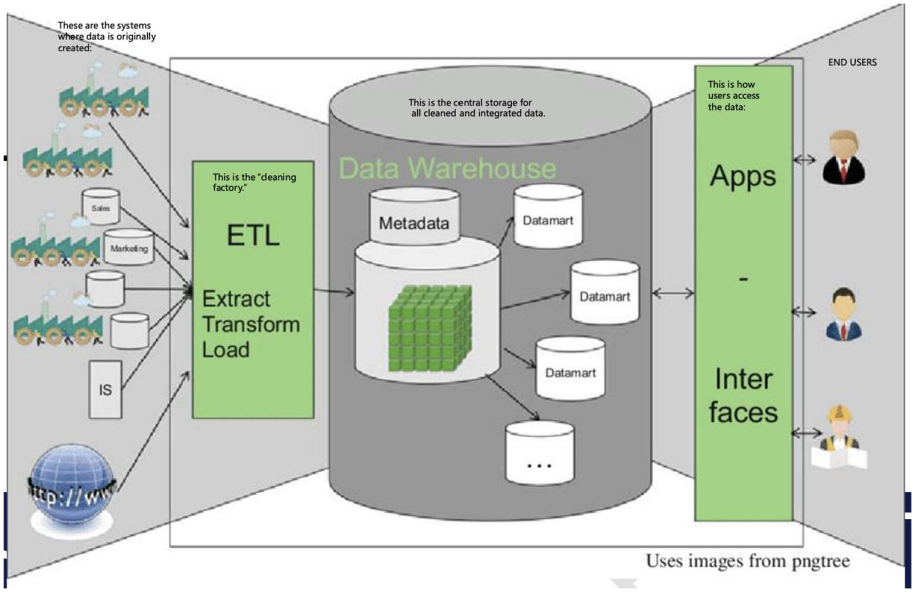
- Analytical Competition
  - Analytical competition means a company competes — and wins — by using superior analytics better than anyone else in the market.
  - Key Idea: Analytics as a Competitive Weapon
  - To maintain a competitive edge, an analytical competitor must continuously improve:
    - New measures
      - Create new KPIs
      - More precise performance metrics
      - Leading indicators instead of lagging ones
      - ➡️ Enables better monitoring and prediction.
    - New algorithms
      - Machine learning models
      - Optimization algorithms
      - Recommendation systems
      - Forecasting improvements

- ➡️ Improves accuracy, efficiency, and automation.

- New data sources
  - External data
  - Sensors/IoT
  - Market and customer data
  - Real-time streams
  - ➡️ Adds new insights competitors may not have.
- New data manipulation techniques
  - Feature engineering
  - Real-time processing
  - Cloud-scale analytics
  - Data lakehouse / mesh architecture
  - ➡️ Makes analytics faster, cheaper, and more powerful.
- New decision-making approaches
  - Data-driven decisions replace gut feeling
  - Automated decisioning (AI/ML)
  - Decision intelligence platforms
  - Scenario simulations
  - ➡️ Reduces uncertainty and human bias.
- Ultimate Goal: Eliminate Guesswork
  - Analytical competitors strive to make decision-making:
    ✓ predictable
    ✓ optimized
    ✓ automated
    ✓ based on evidence, not intuition
  - They redesign processes and business models so that guessing is no longer needed.
  - Example:
  - Amazon optimizes pricing, logistics, inventory, and recommendations without guessing — everything is modeled.
- Why This Is Hard
  - Because competitors can copy technology, but they cannot easily copy a continuously improving analytical culture.
  - That's why sustained advantage requires constant develop

COMPETITIVE ADVANTAGE





Use Case: SME Knowledge USE

SME KNOWLEDGE PROFILES

Table 3
Results of Cluster Analyses—Strategic Types of External Knowledge Sourcing[a]

Cluster Variables	Mean Values (Based on a 7-Likert Scale)						F Test ($df = 4$)
Intensity of External Knowledge Sourcing	Total Sample	Minimal Searcher	Supply-chain Searcher	Technology-oriented Searcher	Application-oriented Searcher	Full-scope Searcher	
Direct Customers	4.69	2.30	5.48	4.47	5.48	5.87	**313.43****
Indirect Customers	3.81	2.47	1.84	3.37	5.61	5.34	**388.78****
Suppliers	3.82	1.94	4.26	2.93	4.58	5.41	**223.98****
IPR Experts	2.46	1.37	1.43	2.74	1.53	5.21	**504.06****
Universities/Research Org.	3.06	1.52	1.75	5.06	1.76	5.36	**738.19****
Network Partners	3.87	2.25	2.92	4.45	4.19	5.50	**157.95****
Number of Firms	1,411	279	286	275	300	271	

[a]Methods: First Ward; Afterward K-Means with Ward Results as Starting Point. * = $p < 0.05$; ** = $p < 0.01$.

The F-test checks whether the differences between the clusters are statistically significant.
Think of it like this question:
“Are the differences between the groups real, or just random noise?”
The F-value tells you HOW LARGE the difference is, not whether it is significant.

📌 Simple rule

- Large F value = big differences between the groups
- Small F value = small/non-significant differences

In this table, the F values are very large, which means:

👉 The 5 SME knowledge groups are truly different from each other.

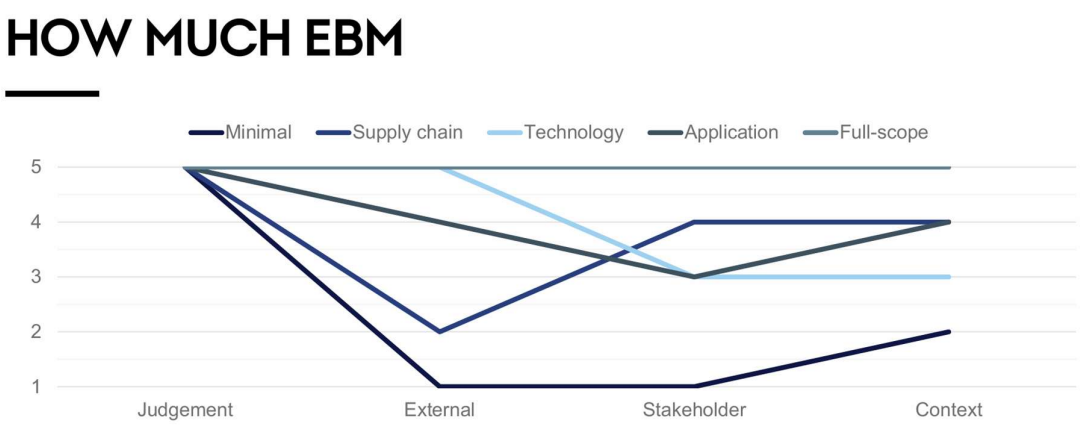
👉 The differences in their knowledge sourcing behaviors are not accidental.

Example

- Look at Direct Customers row:
  - F = 313.43
    - This is a very high number.
    - It means:
    - The 5 groups differ strongly in how much they use direct customers.
    - Another example
    - Universities / Research orgs
  - F = 738.19 (this is huge)
- Meaning:
  - The biggest differences between groups are in how they use universities.
  - And that matches the table:
  - Minimal Searcher: 1.52 (low)
  - Tech-oriented Searcher: 5.06 (high)
  - Full-scope Searcher: 5.36 (very high)
  - These are BIG differences → so F is big.

What do the stars mean (**) ?

- In your table:
  - * = statistically significant at $p < 0.05$
  - ** = statistically significant at $p < 0.01$
  - This means:
  - The differences between the groups are real, not random.
- The stars indicate statistical significance:
- $p < 0.01$ (two stars) → extremely strong evidence
- Means the result is almost certainly not random.
- All variables have two stars, so everything is highly significant



The chart compares five SME knowledge-sourcing profiles across four kinds of evidence used in decision-making:

1. Judgement (managerial experience, intuition)
2. External (research, benchmarking, expert knowledge)
3. Stakeholder (customer/employee perspectives)
4. Context (organizational data, internal processes)

Each line = how much each SME group uses these evidence types (1–5 scale).

Interpretation by Profiles

1. Full-scope Searchers (top performers)
    - Always around 5 across all evidence types
    - Means: They use EVERYTHING — judgement, research, stakeholder input, and context data
    - They are the most evidence-based companies
2. Application-oriented Searchers
    - Start high on judgement (5)
    - Use external evidence moderately (3)
    - Higher again on stakeholder and context (4)
    - Meaning:
        ✓ They rely on practical experience
        ✓ They still look at users and context
        ✓ They use some research but not heavily
3. Technology Searchers
    - Jump from judgement (5) to external (5)
    - Then drop on stakeholder and context (3)
    - Meaning:
        ✓ Strong on research, tech info, expert knowledge
        ✓ But less interest in stakeholders and internal data
        ✓ More R&D-driven than customer-driven
4. Supply-chain Searchers
    - Moderate judgement (5)
    - Low external (2)
    - Higher stakeholder (4)
    - High context (4)
    - Meaning:
        ✓ They use operational data
        ✓ Care about internal processes and customers
        ✓ Rarely use external research
5. Minimal Searchers
    - High judgement (5)
    - Very low on everything else (1–2)
    - Meaning:
        ❌ Not evidence-based
        ✓ Decisions rely almost fully on intuition
        ✓ Little research, little data, little stakeholder involvement

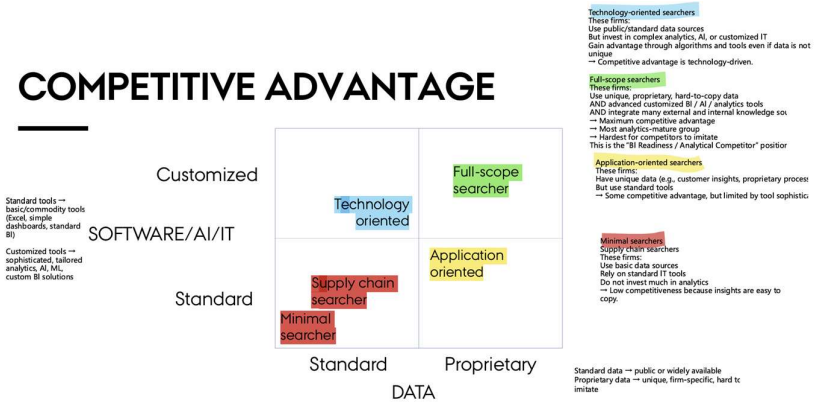


Table 4
Tobit Regressions on Income from Innovation and Innovation Success[a]

	Income from Innovation				Innovation Success			
	Model 1a		Model 1b		Model 2a		Model 2b	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Intercept	0.489**	0.044	0.397**	0.460	53.980**	4.460	34.460**	4.859
Sourcing Strategies (Dummies)								
Supply-chain Searcher	0.069	0.037	0.051	0.036	1.168	3.950	−1.468	3.811
Technology-oriented Searcher	0.061	0.037	0.019	0.038	−2.865	3.829	−6.074	3.779
Application-oriented Searcher	0.042	0.036	−0.003	0.036	12.320**	3.719	8.141*	3.653
Full-scope Searcher	0.143**	0.037	0.078*	0.039	9.973**	3.755	4.308	3.860
Internal Organizational Practices for Innovation								
Long-term Innovation Investment			−0.001	0.000			−0.046	0.043
Innovation Strategy Processes			0.136*	0.006			−0.380	0.558
Innovation Development Processes			0.002	0.008			1.866*	0.776
Innovation Project Control			0.002**	0.000			0.316**	0.038
Control Variables								
Age (ln)	−0.061**	0.013	−0.052**	0.013	0.399	1.365	0.800	1.310
Size (ln)	−0.023*	0.011	−0.094**	0.011	−0.263	1.072	−1.378	1.050
Expenditures for Innovation	0.375**	0.042	0.334**	0.041	−0.604	3.610	−3.431	3.509
Industry Dummies (Reported if Significant)								
Biotechnology	−0.120**	0.044	−0.115**	0.043				
Log-Likelihood	−872.200		−845.98		−4,564.210		−4,525.630	
Chi-Square (Wald)	231.02**		283.233**		34.40**		111.56**	
Pseudo R^2 applied	0.120		0.140		0.004		0.012	
N	1,341		1,341		1,068		1,068	

[a]One Tail T-test Applied. Reference Group of Sourcing Strategies: Minimal Searcher; Reference Group of Industry Dummies: Knowledge Intensive Services (KIS).
* = p < .05; ** = p < .01.

The study runs Tobit regressions to see how different SME knowledge sourcing strategies affect:

(A) Income from innovation

Models 1a and 1b

(B) Innovation success

Models 2a and 2b

Independent variables include:

- SME knowledge sourcing profiles (dummy variables)
- Internal innovation practices
- Controls like age, size, expenditures, etc.

The reference group is:

Minimal searchers

(So all coefficients represent improvement relative to minimal searchers.)

2. How to Read the Coefficients

A coefficient is:

- Positive → increases innovation income/success
- Negative → decreases
- Starred (* or **) → statistically significant
- The bigger the number → stronger effect

3. Key Results — What Actually Matters

Full-scope searchers (the highest knowledge profile)

Significant positive effect on income from innovation

Model 1a: 0.143 (p < .01)

Model 1b: 0.078 (p < .01)

Meaning:

SMEs that search broadly (customers, suppliers, universities, partners, tech, etc.) earn more income from innovation than minimal searchers.

Significant positive effect on innovation success

Model 2a: 9.973 (p < .01)

Meaning:

They are also much more successful at innovation outcomes.

Full-scope = best performer across all models.

Matches the cluster analysis: they lie in the “sustainable competitive advantage” quadrant.

Application-oriented searchers

Model 2a: 12.320 ($p < .01$)

Model 2b: 8.141 ($p < .05$)

Meaning:

These firms achieve strong innovation success, despite not always having proprietary data or highly customized tech.

Their strength is turning knowledge into applied solutions.

Technology-oriented searchers

Mixed results:

- No significant effect on innovation income
- Negative but not significant on innovation success

Meaning:

Technology alone does not guarantee innovation performance if not matched with the right data or application.

Supply-chain searchers

No significance anywhere.

Meaning:

Focusing mostly on suppliers does NOT create innovation performance.

4. Internal Organizational Practices Matter

These are powerful predictors:

✓ Innovation strategy processes

Model 1b: 0.136 ($p < .01$)

→ Having structured innovation strategies increases innovation income.

✓ Innovation project control

Models 1b and 2b are significant

→ Good project governance boosts both income and innovation outcomes.

✓ Innovation development processes

Model 2b: 1.866 ($p < .05$)

→ Strong development routines increase innovation success.

Interpretation:

Internal capabilities amplify the effect of external knowledge sourcing.

5. Big Picture Takeaway

Which SMEs innovate best?

➡️ Full-scope searchers

(broad sourcing + capability maturity + proprietary/unique knowledge)

Which SMEs innovate worst?

➡️ Minimal searchers

(low external knowledge, standard tools, no distinct advantage)

What really drives innovation?

✓ Broad, diverse knowledge sourcing

✓ Strong internal innovation processes

✓ Ability to integrate/exploit knowledge

ABSORPTIVE CAPACITY

Why Absorptive Capacity Matters for Competitive Advantag
A company gains sustained competitive advantage only if it can:
✓ Acquire external knowledge
✓ Understand it
✓ Integrate it
✓ Use it
This directly matches the BI competitiveness model you saw:
BI Readiness (top right of your matrix) = High absorptive capacity
Firms in this quadrant can learn fast and innovate faster than competitors.
This is why full-scope searchers score highest in the regression table — they strongest absorptive capacity.

How companies can develop their capabilities

- Acquisition:
  - Identifying data

What it is:
→ The ability to identify, recognize, and obtain valuable information.
Example:
A company monitoring customer trends, scanning competitors, collecting external data.

- Assimilation:
  - Analyze, process, interpret, and understand

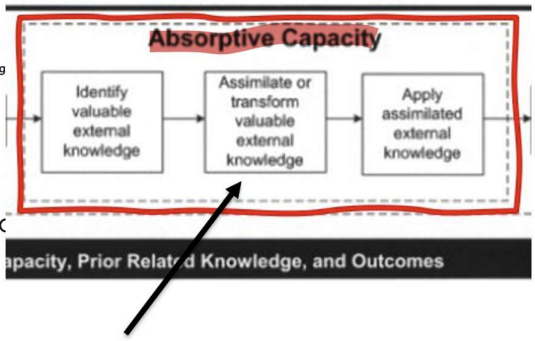
What it is:
→ Analyzing, interpreting, and understanding the new information.
Example:
Business analysts run BI dashboards and interpret what customer behavior means.

- Transformation:
  - Combining new and existing information into kn

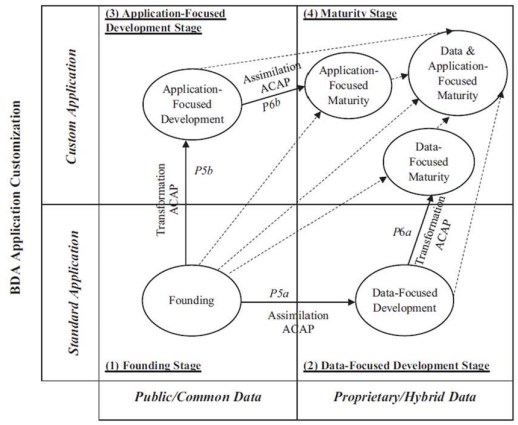
What it is:
→ Combining new knowledge with what the company already knows. → Creatin insights.
Example: Merging customer feedback + sales data → new pricing strategy
Connecting machine data +,maintenance records → predictive models

- Exploitation:
  - Apply

What it is:
→ Applying the new knowledge to improve products, services, or operations.
Example:
Launching a new service based on customer insights.
Optimizing supply chain using predictive analytics.



HOW COMPETITIVENESS DEVELOPS



Note: moving on a path require technological and human capital

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It explains how firms become more competitive through BI and data capabilities.
It shows 4 stages and 3 possible paths a firm can take as it develops:
Stage 1 — Founding
Using standard BI tools and public/common data
→ lowest maturity
→ lowest competitive advantage
Stage 2 — Data-focused development
Developing proprietary/hybrid data but still using standard tools
→ better competitive advantage
Stage 3 — Application-focused development
Customizing BI/analytics tools (AI, ML, advanced apps)
→ focused on analytics use cases
→ requires strong human skills
Stage 4 — Maturity
You can become either:

- Application-focused mature, or

- Data-focused mature, or
- Both → Data & Application-focused maturity
  This last category represents true analytical competitors.

How Absorptive Capacity (ACAP) fits in
ACAP has 4 parts:

1. Acquisition
2. Assimilation
3. Transformation
4. Exploitation

In the diagram:

- **P5a** = Assimilation ACAP (moving horizontally)
- **P5b** = Transformation ACAP (moving vertically)
- **P6a** = More complex transformation to reach maturity

Meaning:

➡️ To move right → you need better **data assimilation**

➡️ To move up → you need better **data + application transformation**

➡️ To reach the top-right → you need BOTH

This matches the note on the slide:
"Moving on a path requires technological and human capital."

🔁 **Interpreting the Paths**

The arrows show 3 possible development paths:

⭐ **Path 1: Straight Right (P5a) → Data-Focused Maturity**

This is a **data-first strategy**.
The firm invests in data ownership, data quality, proprietary datasets.

Examples:

- Banks
- Insurance companies
- Retailers with advanced customer data

ACAP component:

✓ Strong assimilation

✗ Limited transformation

Outcome:

Good analytics, but not fully integrated.

⭐ **Path 2: Straight Up (P5b) → Application-Focused Maturity**

This is an **application-first strategy**.
The firm develops custom BI/AI/ML tools before investing in unique data.

Examples:

- Tech startups
- AI/ML-focused digital firms

ACAP component:

✓ Strong transformation

✗ Limited proprietary datasets

Outcome:

Useful applications but limited by data quality.

⭐ **Path 3: Zig-Zag (P6a) → Full Data & Application-Focused Maturity**

This is the **BEST path**.

The firm acquires both:

✓ Proprietary/hybrid data

✓ Customized BI/AI applications

✓ Strong ACAP abilities (assimilation + transformation + exploitation)

This quadrant represents:

➡️ **Analytical competitors**

➡️ **Sustained competitive advantage**

Examples:

- Amazon
- Netflix
- Tesla
- Spotify

🔥 **What This Means for Competitiveness**

To climb to the top-right, a firm must invest in:

Technological capital

- Big data platforms
- Data lakes
- Custom AI/ML models
- BI tools

Human capital

- Data scientists
- Analysts
- Data engineers
- Domain experts

Absorptive capacity

This is the glue:

A firm must be able to **acquire, assimilate, transform, and exploit** knowledge.

Without ACAP → it gets stuck in Stage 1 or 2.

🎓 **How This Will Be Asked in an Exam**

You could be asked:

"Explain how firms move from founding to maturity in BI competitiveness."

Answer:

Through increased **data proprietorship**, **application customization**, AND **absorptive capacity**.

"What is required to reach the top-right quadrant?"

Answer:

Investment in:

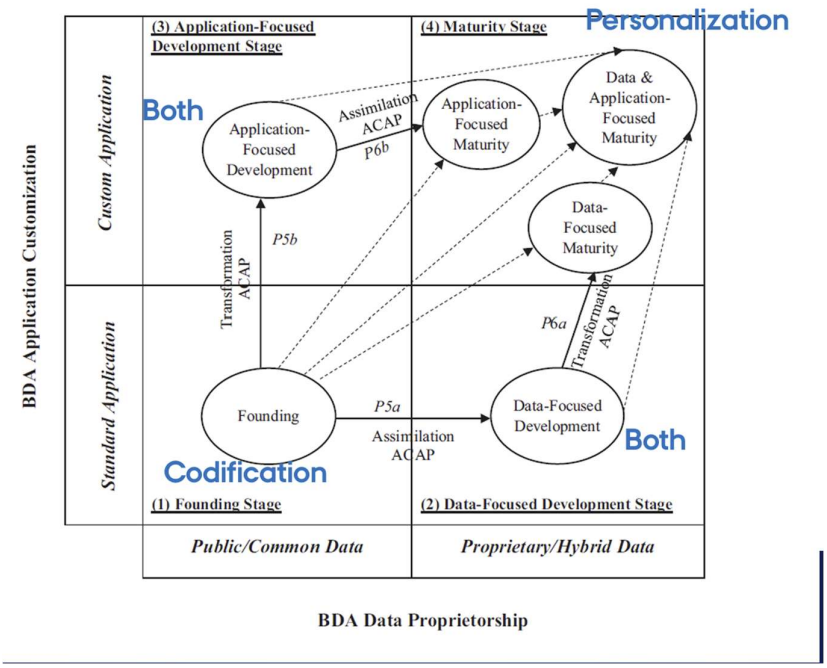
- proprietary data,
- customized analytics,
- human capital, and
- strong ACAP abilities (assimilation + transformation + exploitation).

"What is the role of absorptive capacity?"

Answer:
ACAP enables firms to *process* and *apply* both data and applications, allowing movement along the development paths.

KNOWLEDGE STRATEGIES

- Codification — Turn knowledge into something that can be written down, stored, indexed, and reused.
  - Capture and codify knowledge in explicit form and make these available for further reuse.
- Personalization: — Transfer knowledge through people rather than documents.
  - Mobilizing and transferring knowledge in tacit form.
  - Facilitated by networking between skilled individuals



Founding Stage → Codification
Why Codification?

- Firms rely on **public/common data**
- Use **standard BI applications**
- Focus is on building basic BI infrastructure:
  - Data warehouses
  - Standard ETL
  - Reports
  - Descriptive dashboards
- Knowledge is written down, systematized, and reused → **explicit knowledge**

This is the **codification-heavy stage** because companies are standardizing processes.

👉 **Your "Codification" label here is correct.**

(2) Data-Focused Development Stage → Both

This stage introduces:

- Proprietary/hybrid data
- More complex data processes
- Custom ETL / early ML / deeper analytics

This requires **both knowledge strategies**:

✓ Codification

- Building scalable pipelines
- Documenting data structures
- Creating reusable analytics components

✓ Personalization

- Analysts and domain experts collaborate
- Tacit knowledge is needed for feature engineering, model interpretation, and custom data processing

👉 **Your label "Both" here is correct.**

This stage is a hybrid: **codify what you can, personalize when needed**.

---

(3) Application-Focused Development Stage → Both (but more personalization)

Here, companies begin customizing analytics applications:

- Tailored dashboards
- Custom workflows
- Specific decision-support tools

Why both?

✓ Codification

- Applications require structured logic, standardized data, documented KPIs
- The system captures explicit knowledge in rules

✓ Personalization

- Collaborative refinement with business users
- Tacit knowledge from domain experts shaped into application logic
- Analysts work closely with managers → human-intensive process

👉 **Your label "Both" is accurate**, though this stage leans **more toward personalization** than (2).

---

(4) Maturity Stage → Personalization

At the top-right, firms reach:

- **Data & application-focused maturity**
- Full-scale analytical competitiveness
- Complex, dynamic data use
- Cross-functional decision systems
- ML embedded in operations (MLOps)
- Organization-wide analytics culture

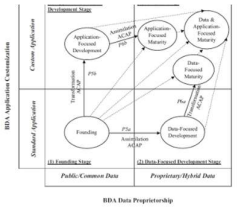
These firms rely heavily on **tacit knowledge**:

- Expertise of analysts
- Stakeholder understanding
- Iterative collaboration
- Strategic decision-making
- Data scientists + domain experts co-creating models

This is the **personalization-dominant** stage.

👉 **Your "Personalization" label is exactly right.**

POTHOLES



- Focusing excessively on one dimension of analytical capability (e.g., too much technology)
- Collecting data without any plans to use it
- Attempting to do everything at once
- Investing excessive resources on analytics that have minimal impact on the business
- Investing too much or too little in any analytical capability, compared with demand
- Choosing the wrong problem, not understanding the problem sufficiently, using the wrong analytical technique or the wrong analytical software
- Automating decision-based applications without carefully monitoring outcomes and external conditions to see whether assumptions need to be modified

CHALLENGES

- The large span of attention represents a risk of information-overload challenging the ability to align inbound knowledge flows with organizational processes.
- The knowledge inflows over-stretch the absorptive capacity of the organization

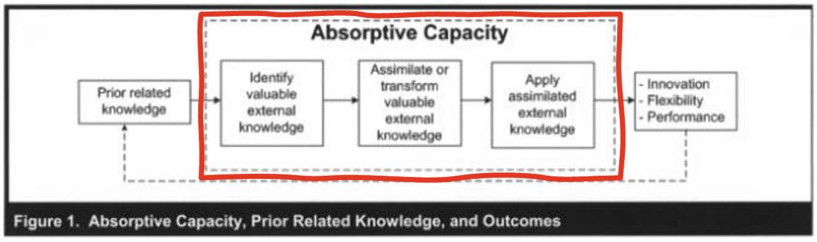


Figure 1. Absorptive Capacity, Prior Related Knowledge, and Outcomes

Why this matters for SMEs and BI/analytics

SMEs with limited:

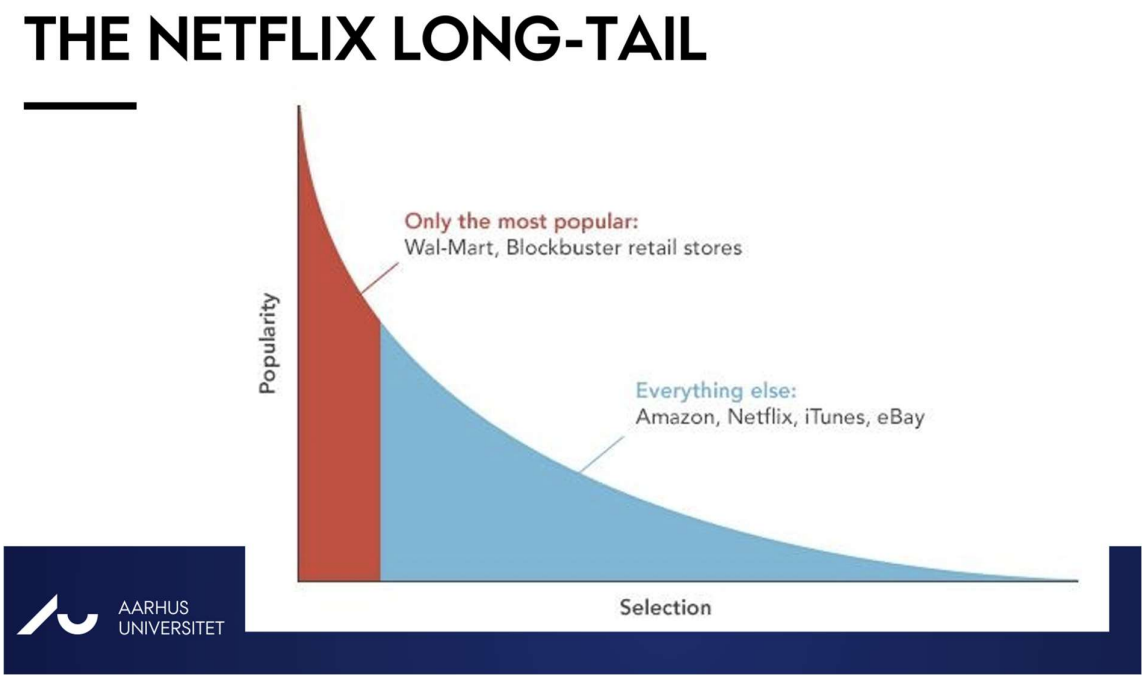
- Time
- Skills
- Data capabilities
- Analytical talent

...can easily reach a point where they **import more knowledge than they can actually use**.

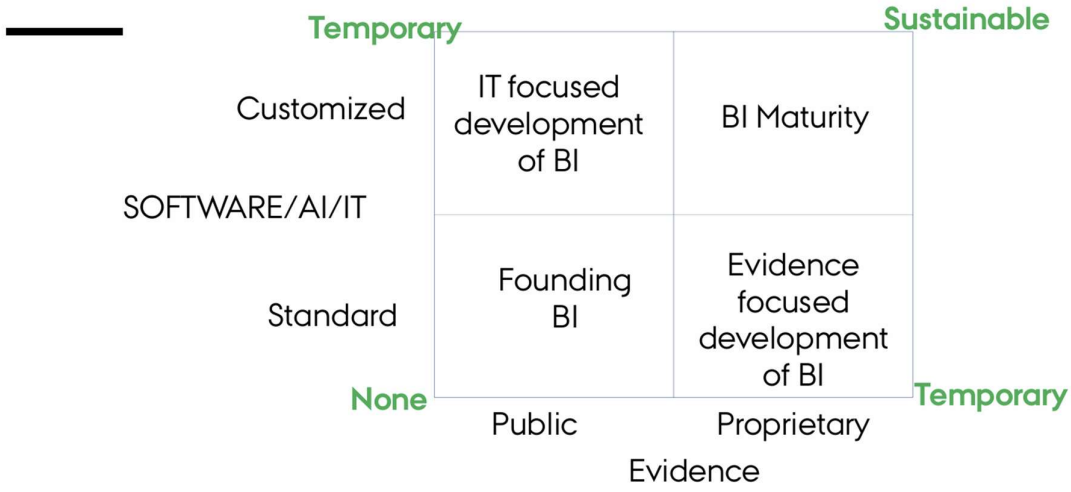
This leads to:

- Confusion
- Slow innovation

- Wasted data and tools
- Poor BI outcomes



The long-tail effect shows that digital platforms create value not just from popular items (the head), but from the massive number of niche items (the tail). Business intelligence makes this possible by recommending, ranking, and matching users with content across the entire tail.



Sustainable competitive advantage arises only when a company combines customized BI/AI systems with proprietary internal evidence. Standard tools or public data produce only temporary or no competitive advantage.