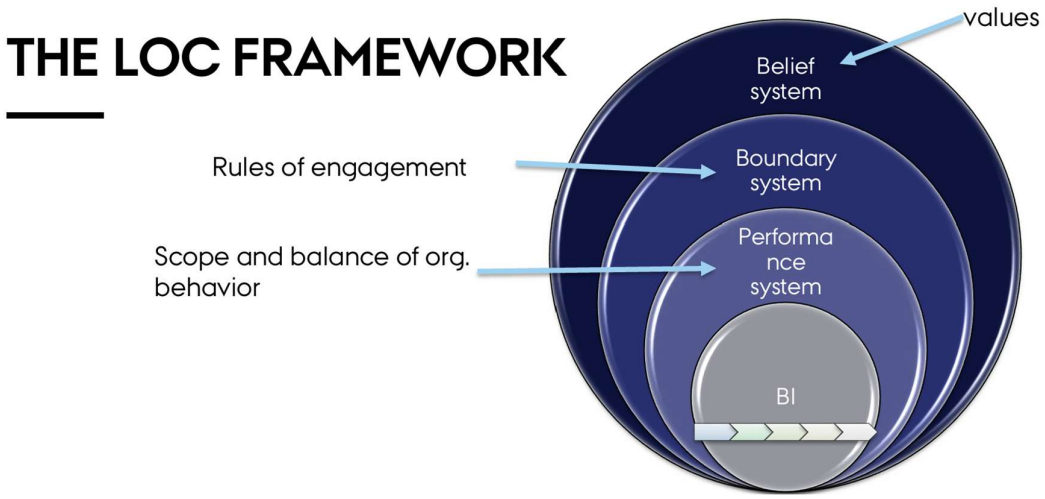
Management Control System for BI

Levers of control (LOC) framework

The Levers of Control Framework (by Robert Simons, Harvard) explains how managers balance freedom and control in an organization.

It has four systems, each with a different purpose:

1. Belief system – inspires and guides employees through values.
2. Boundary system – sets rules and limits for acceptable behavior.
3. Performance system (Diagnostic control system) – monitors KPIs and goals.
4. Interactive system – encourages learning, innovation, and adaptation.



Performance System (Diagnostic Control System)

Purpose:

- Measures and monitors whether goals are met.
- Ensures the organization stays on track.

Meaning:

The performance system defines what the organization pays attention to

→ KPIs, budgets, targets, dashboards, BI reports.

Role of BI:

- Dashboards
- KPIs
- Predictive forecasting

  BI strengthens this layer by giving accurate, timely, measurable insights.

Boundary System

Purpose:

- Defines the rules of engagement.
- Prevents employees from taking unacceptable risks.
- Sets limits, rules, codes of conduct, compliance requirements.

Meaning:

This system is about what employees must not do.

Role of BI:

- Fraud detection
- Access control

- Compliance monitoring
- Risk dashboards

Belief System

Purpose:

- Communicates values, mission, and purpose.
- Inspires employees and encourages strategic behavior.

Meaning:

This is the most strategic and cultural layer. It shapes what employees should strive for.

Role of BI:

BI aligns with belief systems by making strategy *visible*:

- Strategy maps
- Balanced scorecard visualizations
- Mission-linked KPIs

How These Layers Connect to BI

BI sits at the center because it provides the data that all three systems depend on.

- Without BI, performance systems are slow and inaccurate.
- Without BI, boundary systems cannot monitor risks effectively.
- Without BI, belief systems cannot translate strategy into measurable indicators.

So the LOC framework shows how BI supports organizational control on multiple levels.

THE LOC FRAMEWORK

- Assertain:
  - Strategic uncertain and risks influence implementation of MSC
- Assumes:
  - MSC:
    - will result in organizational learning
    - will consume managerial attention

Strategic uncertainty and risks influence how MCS is implemented

("Ascertain" section)

Meaning:

The design of a management control system (MCS) depends on how uncertain the environment is.

- If the company faces high uncertainty, fast-changing markets, or innovations → managers need more interactive controls and learning.
- If uncertainty is low, stable markets → more diagnostic controls and routine performance measures are enough.

In short:

The level of strategic uncertainty determines how the MCS should be used.

Examples:

- Tech startup → high uncertainty → interactive dashboards, experimentation, strategic discussions.
- Manufacturing company → lower uncertainty → KPI dashboards and routine monitoring.

Assumptions in the LOC framework

("Assumes: MSC will…")

Here "MSC" means Management Control Systems.

The LOC framework assumes two things will always happen when a company uses MCS:

MCS leads to organizational learning

Learning happens because:

- Managers monitor performance
- They analyze BI dashboards
- They detect deviations
- They discuss causes
- They adjust strategy

This is especially true when interactive controls are used.

Examples of learning triggered by BI:

- Understanding why a product underperforms
- Finding new customer segments
- Identifying operational bottlenecks

So MCS is not just for control — it creates knowledge.

MCS consumes managerial attention

This is important and often overlooked.

Managers' attention is *limited*.

Whenever they focus on:

- KPIs
- BI dashboards
- Reports
- Performance meetings
- Issues and deviations

…that attention is used up.

The LOC framework says you must design MCS so managers' attention is allocated to the right issues — especially under uncertainty.

Examples:

- Too many KPIs = attention overload
- Wrong KPIs = attention on wrong areas
- Good BI dashboards = attention focused where it matters

Expected Outcome of MCS

THE OUTCOME OF MCS (EXPECTED)

Improves performance within existing strategies.
Managers ask: "Did we meet the KPI?" "Why not?"
But they do not question the strategy itself.

MCSs	Organizational learning (benefit)	Consumption of attention (cost)
Belief system	Creates general organizational learning + → Employees learn what the company stands for, what values guide decisions.	Efficient (+) Once communicated, values don't require much active attention.
Boundary system	Employees learn what behaviors are NOT allowed (risk limits, codes of conduct). +	Efficient (+) Rules are stable and don't require constant monitoring.
Diagnostic control	Single loop (+)	Efficient (+) Dashboards and KPIs automate much of the monitoring.
Interactive control	Double loop (+)	Large consumption (-)

Not only improves performance but can challenge and change strategy itself.
Managers ask:
"Are we pursuing the right opportunities?"
"Should strategy change?"

Requires frequent meetings, discussions, deep analysis.

Belief and boundary systems create basic learning at low attention cost. Diagnostic controls create single-loop learning and are efficient. Interactive controls create double-loop learning but require high managerial attention. Therefore, managers must balance attention and learning when designing MCS.

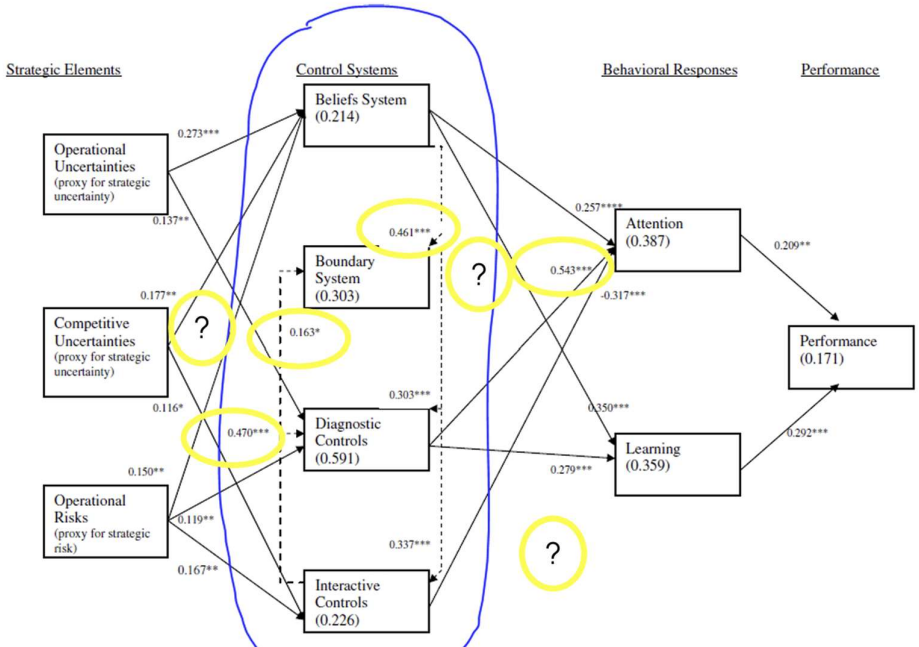


Fig. 2. Graphical depiction of significant results. This table presents the significant path coefficients of the final model shown in Table 6 (Alternative 4). The squared multiple correlations for the endogeous variables are shown in parentheses. The covariances among the endogenous variables are positive and significant (but not shown above).

Let's Connect the Yellow-Circled Paths to the THEORY Table

Competitive Uncertainty → Diagnostic Control (0.470*)**

Why this fits the theory table:

Diagnostic controls are "efficient" → can be used heavily under uncertainty because they don't consume too much attention.

So uncertainty pushes managers to use diagnostic controls (expected).

Boundary System → Diagnostic Control (0.461*)**

How this fits the table:

Boundary systems are also "efficient", so they work well *together* with diagnostic controls.

This path shows:

- Boundary rules support routine KPI monitoring.

This is consistent with the theory.

Diagnostic Controls → Attention (0.543*)**

THIS is an important circle.

Expected (from table):

Diagnostic controls = "efficient" → should not consume much attention.

Actual (from model):

Path = 0.543 → *high* attention consumption.

This is a direct contradiction between theory and empirical results.

Interpretation:

Even though diagnostic controls are theoretically "efficient", real managers still spend a lot of time looking at KPIs and dashboards.

Diagnostic Controls → Learning (0.350*)**

Expected:

Single-loop learning (yes)

Actual:

There *is* significant learning.

Matches theory.

Interactive Controls → Learning (0.279*)**

Expected:

Interactive controls → double-loop learning

Actual:

Yes, learning is significantly driven by interactive controls.

Matches theory.

Interactive Controls → Attention (not significant)

You circled this because there is no strong positive path.

Expected:

Interactive controls should consume *large* attention (negative cost).

Actual result:

The model *does NOT show a strong positive attention path*.

This contradicts the theory table.

This could mean:

- Managers are not using interactive controls as often as theory predicts
  Or they are using them in a more automated BI-supported way
- It's one of the biggest discrepancies.

Learning → Performance (0.292*)**

Matches theory.

Learning → higher performance.

Summary — Matching Theory to Data

Theory matches:

- Diagnostic → learning
- Interactive → learning
- Learning → performance
- Uncertainty → more use of diagnostic & interactive
- Boundary → diagnostic

Theory does not match reality here:

- Diagnostic controls *do* consume a lot of attention
- Interactive controls do *not* significantly consume attention (unexpected in Simons' theory)

How to Say This in an Exam (Perfect Answer)

The expected MCS outcomes suggest that belief, boundary, and diagnostic controls should consume little managerial attention, while interactive control should be attention-intensive and drive double-loop learning. The empirical model supports the learning predictions (diagnostic → single loop, interactive → double loop), but contradicts the attention-cost assumptions: diagnostic controls significantly increase attention consumption, while interactive controls do not. This implies that in practice, KPI monitoring demands substantial attention, while interactive controls may be used more sparingly or supported by BI tools that reduce their attention cost.

Actual Outcome of MCS

THE OUTCOME OF MCS

MCSs	Organizational learning (benefit)	Consumption of attention (cost)
Belief system	+	Efficient (+)
Boundary system	+	Efficient (+)
Diagnostic control	Single loop (+)	Efficient (+)
Interactive control	Double loop (+)	Large consumption (-)

Belief System

The belief system is the control mechanism that communicates the organization's core values, purpose, and strategic vision. Its goal is to inspire and motivate employees and create a shared understanding of "what matters" in the organization.

Below is the polished explanation of each point:

Belief System as Knowledge Leadership

The belief system defines the knowledge attitudes and behaviors that management wants employees to adopt.

It creates a psychological environment that can either *enable* or *restrict*:

- evidence sourcing
- knowledge seeking
- data usage
- learning behaviors

Employees tend to mirror the knowledge culture that management expresses.

Belief System in a Business Intelligence (BI) Context

In BI-driven organizations, the belief system plays a crucial role in shaping data-driven culture.

Encourages learning from diverse data sources

Employees feel motivated to explore and use internal and external data, not just rely on intuition.

Provides incentives for data/evidence use

Managers reward employees and teams for:

- using BI tools
- bringing evidence into decision processes
- applying analytics and insights

This shifts the culture toward data-driven decision making.

Allocates resources to knowledge production

The belief system influences how much resources are put into:

- BI platforms
- data governance
- analytics training
- knowledge management systems

Meaning: if leadership values knowledge, BI gets funded.

Cultivates knowledge sharing instead of silos

A strong belief system promotes collaboration and discourages information hoarding — essential for BI success.

Examples:

- shared dashboards
- cross-functional data projects
- open knowledge repositories

Makes knowledge a KPI

Knowledge becomes a strategic performance goal:

- data quality scores
- knowledge-sharing metrics
- analytics adoption rates
- insight generation KPIs

This turns "knowledge behavior" into something measurable and trackable.

Core Idea: Knowledge Leadership Defines Knowledge Behavior

Leadership signals what “good behavior” looks like.

When leaders talk about and reward:

- evidence
- analytics
- data-driven insights
- knowledge collaboration

Employees begin to internalize these values and act accordingly.

This is why the belief system is essential in BI:

It is the *cultural foundation* for data-driven transformation.

Active Leadership

ACTIVE LEADERSHIP AND LOC IMPLEMENTATION

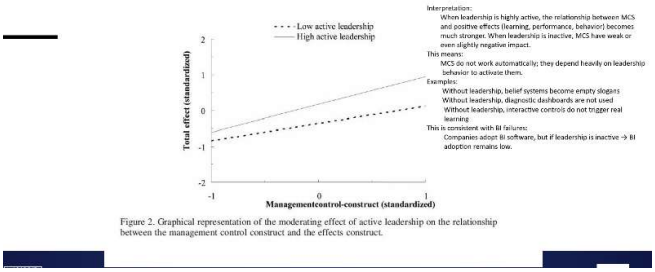


Figure 2. Graphical representation of the moderating effect of active leadership on the relationship between the management control construct and the effects construct.

Transformational Leadership (High active)

- This is the most effective for implementing LOC and BI.
  - Traits:
    - Charisma
    - Vision + inspiration
    - Intellectual stimulation (asks questions, encourages ideas)
    - Individualized consideration (coaching, mentoring)
    - Encourages autonomy and learning
    - Democratic decision-making
  - Effect on LOC:
    - Strengthens belief systems (values become real)
    - Encourages interactive controls (strategic learning)
    - Drives knowledge sharing
    - Boosts learning → performance relationship
  - In BI:
    - Encourages exploration of data
    - Creates enthusiasm for BI tools
    - Builds a culture of evidence-based decision-making
    - Result:
      BI + MCS have *high* impact.

TRANSFORMATIONAL LEADERSHIP AND LOC

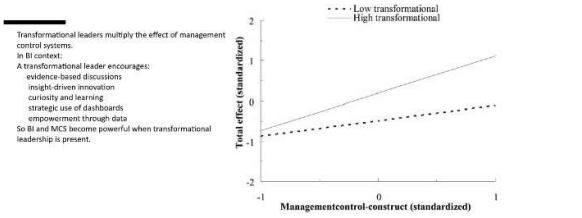


Figure 3. Graphical representation of the moderating effect of transformational leadership on the relationship between the planning and control construct and the effects construct.

Transactional Leadership (Moderate active)

- Focus on tasks, targets, monitoring
- Maintains structure
- More autocratic
- Works well with diagnostic controls (KPIs, dashboards)
- Good for efficiency, routine stability

- Transactional leadership:
  - Supports boundary systems
  - Supports diagnostic control
  - But does not create deep learning
  - And does not activate belief/interactive systems well
- In BI:
  - Good for KPI reporting
  - Poor for advanced analytics, strategic BI use

ACTIVE LEADERSHIP AS KNOWLEDGE LEADERSHIP

Active leadership means building a culture where knowledge and data are valued, shared, and used in decisions.

In a BI context, this is called knowledge leadership.

Knowledge leadership = leadership that creates a culture of evidence-based, data-driven decision-making through collaboration and information sharing.

It is not only about using BI tools — it is about shaping behaviors and attitudes around knowledge.

The 3 Approaches to Knowledge Leadership

These are three leadership styles that influence how knowledge and BI are used in the organization.

Directive Approach

What it means:

Leaders push employees to use data by making it a requirement.

Characteristics:

- Data use is enforced
- KPIs must be documented
- Employees must show evidence of how data was used in decisions
- High use of metrics, dashboards, reporting obligations

Effect on BI:

- Strong emphasis on accountability
- Ensures BI is *used*, but not necessarily understood
- Can improve compliance, but may limit creativity

In short:

"Use BI because you *must*."

Walk-the-Cost Approach

What it means:

Leaders focus on the financial side of BI and external vendors.

Characteristics:

- Emphasis on BI cost control
- Focus on outsourcing arrangements
- High pressure on BI provider performance
- Strong expectations for quality of external BI work
- Leaders judge BI mainly through *cost–benefit* logic

Effect on BI:

- BI investments evaluated carefully

- High quality required from external BI solutions
- But can create pressure that restricts internal BI learning

In short:

"BI must be high quality and cost-efficient."

Walk-the-Talk Approach (most effective for BI)

What it means:

Leaders personally model the behaviors they want.

Characteristics:

- Leaders use BI themselves
- Leaders coach and teach employees
- Resources are allocated to BI training, data access, and knowledge production
- Evidence is included in *all* strategic and operational decisions
- Leadership behavior demonstrates the value of data
- Encourages learning, curiosity, and sharing

Effect on BI:

- Builds strong data culture
- Encourages collaboration and knowledge sharing
- Makes BI meaningful and embedded in everyday work
- Leads to highest BI adoption and highest LOC impact

In short:

"Use BI because I show you how, and I support you."

Leadership styles and MCS

Belief system	Transactional	Transformative
Directive		
Walk-the-cost		
Walk-the-talk		

Management Demonstration of the Belief System

This refers to how leaders show, act out, and reinforce the belief system in daily practice.

✓ Strong belief systems require:

- leaders demonstrating values
- leaders supporting knowledge behavior
- leaders encouraging evidence-based decisions
- leaders not just saying but *showing* what matters

This connects directly to the three knowledge leadership approaches:

Passive → Weak Belief System

Active → Strong Belief System

Weak Belief Systems (Very Important Concept)

Two things weaken the belief system:

The Uniqueness Paradox (Counterproductive)

Definition:

Leaders believe the organization is too "unique" to benefit from scientific evidence, industry best practices, or empirical knowledge.

So leadership rejects:

- external data
- academic research
- benchmarking
- scientific evidence

They may only accept:

- internal anecdotes
- internal BI data (maybe)

✓ Why it is dangerous:

- blocks learning
- kills openness to evidence
- creates arrogance
- stops BI adoption
- prevents strategic knowledge development

This leads to a weak belief system because leaders essentially say:
"Evidence doesn't apply to us."

Laissez-faire Leadership (Passive Weak Belief System)

Definition:
Leaders assume employees will "just know" what knowledge is appropriate to use.

Characteristics:

- No guidance
- No reinforcement
- No cultural direction
- No incentives
- No knowledge leadership
- Leadership may exist only locally, or not at all

✓ Why it is harmful:

- no shared definition of "good knowledge"
- inconsistent data usage
- BI tools become optional
- knowledge silos emerge
- lack of learning culture

This is the absence of leadership, which destroys belief system effectiveness.

How Strong vs Weak Belief Systems Affect BI

Strong belief system = BI success

- Leaders value evidence
- Knowledge becomes a KPI
- Data sharing becomes normal
- Employees are motivated to use BI
- BI becomes part of everyday decisions

Weak belief system = BI failure

- No shared values around evidence
- Employees ignore BI
- Leadership rejects data
- BI systems become "empty dashboards"
- No learning, no performance gains

EXERCISE

Table 1: Senior management's use of evidence for decision-making

Type of evidence	Finance	HR	Intelligence	Production	Sales	CEO
Research	2	1	4	3	1	1
Stakeholder	1	3	4	2	5	2
Existing	5	3	4	5	3	2
Judgement	3	5	4	4	5	5

*Scale: 1 = not applying; 2 = Occasional applying; 3 = Frequently applying; 4 = Regularly applying; 5 = Always applying

Question 5 (15%)

One approach for management to influence organizational behavior towards evidence-based decision-making is through management control systems. Based on table 1, you are asked to assess the likely demonstration of the belief system by the CEO. In addition, you are to reflect on whether the rest of the management team can be expected to adapt a similar or a different approach to the belief system than the CEO. Please elaborate and present arguments for your answer.

Assessment of the CEO's Demonstration of the Belief System

The belief system is intended to communicate organizational values and promote evidence-based decision-making. It motivates employees to seek, share, and use knowledge and data. A strong belief system places high value on the three types of evidence (research, stakeholder, existing organizational evidence) and uses judgment only as a complement.

Based on Table 1, the CEO demonstrates a weak belief system.

1. Heavy reliance on judgment (score 5)

   The CEO "always" uses judgment while rarely using other forms of evidence. This indicates intuition-driven decision-making rather than evidence-based practice. This corresponds to a weak or counterproductive belief system, where decisions rely mainly on personal impressions rather than validated knowledge.

2. Very low use of research evidence (score 1)

   The CEO does not apply external research or scientific evidence. This strongly reflects the Uniqueness Paradox:

   "Our organization is too unique for external evidence to be relevant."

   This mindset rejects empirical knowledge and prevents organizational learning, because the leader signals that external research has no value. This undermines BI, benchmarking, and best-practice learning.

3. Low use of stakeholder evidence (score 2)

   Only occasional use of stakeholder input (customers, suppliers, partners) indicates limited interest in external perspectives. Again, this weakens the belief system by discouraging collaborative knowledge flows.

4. Low use of existing evidence (score 2)

   The CEO only occasionally uses internal data, analytics, or intelligence. This contradicts the essence of BI and discourages managers from using dashboards, KPIs, and data in decision processes. A strong belief system would elevate existing evidence into a central decision criterion.

Conclusion: the CEO demonstrates a weak and intuition-dominated belief system, resulting in a poor knowledge culture and limited support for evidence-based decision-making.

Majority Pattern in the Management Team

To determine whether the management team will follow the CEO's weak belief-system behavior, we analyze the "majority use" of evidence across departments.

Majority use of Research

- Finance: 2
- HR: 1
- Intelligence: 4
- Production: 3
- Sales: 1
- CEO: 1

Majority = low research use (1–2 range).

Only Intelligence scores high.

→ The majority of departments do NOT rely on research.

Majority use of Stakeholder Evidence

- Finance: 1
- HR: 3
- Intelligence: 4
- Production: 2
- Sales: 5
- CEO: 2

Majority = moderate stakeholder use, driven mainly by Sales and Intelligence.

Majority use of Existing Organizational Evidence

- Finance: 5
- HR: 3
- Intelligence: 4
- Production: 5
- Sales: 3
- CEO: 2

Majority = strong existing evidence use (3–5).

This majority pattern contradicts the CEO's low use of internal data.

Majority use of Judgment

- Finance: 3
- HR: 5
- Intelligence: 4
- Production: 4
- Sales: 5
- CEO: 5

Majority = very high use of judgment, but not as extreme as the CEO.

HR and Sales align most closely with the CEO.

Will the Management Team Follow the CEO's Belief System?

Departments similar to CEO (likely to follow CEO's weak belief system)

- HR: low research (1), high judgment (5), moderate existing evidence (3)
- Sales: low research (1), high judgment (5)

These departments resemble the CEO most closely and will likely adopt the same weak belief system where intuition overrides evidence.

Departments different from the CEO (unlikely to adopt CEO's belief system)

These departments show stronger evidence use and will resist the CEO's weak belief approach:

Finance

- High existing evidence (5)
- Uses judgment moderately

→ Favors data-driven logic → different from CEO

Intelligence (BI)

- High research (4)
- High stakeholder (4)
- High existing evidence (4)
- High judgment (4)
  → Represents the strongest belief system in the organization
  → Will certainly NOT follow the CEO

Production

- Research moderate (3)
- Existing evidence very high (5)
- Judgment moderate (4)
  → Evidence-oriented → unlikely to follow CEO

Argument Based on Majority Behavior

When assessing the entire management team as a majority group:

- Majority uses existing evidence strongly (3–5) → contradicts CEO
- Majority uses research weakly (1–2) → aligns with CEO somewhat
- Majority uses judgment heavily → partially aligns with CEO
- Majority uses stakeholder evidence moderately → above CEO's score

✓ Overall majority pattern:

The majority is hybrid, not fully intuitive like the CEO.

Therefore:

The majority of the management team is NOT likely to fully adopt the CEO's weak belief system.

They may follow the CEO in rejecting research, but they differ significantly in:

- heavier use of existing evidence
- greater inclusion of stakeholder knowledge
- more balanced judgment

Thus, they exhibit a more moderate belief system compared to the CEO, not the extreme intuition-based one.

Final Exam-Ready Conclusion (Long, Comprehensive, High-Level)

In conclusion, the evidence patterns clearly indicate that the CEO demonstrates a weak and highly limited belief system. By relying almost exclusively on judgment (score 5) and applying research, stakeholder, and existing evidence only occasionally (scores 1–2), the CEO signals that validated knowledge and empirical insights are not valued in decision-making. This reflects the "uniqueness paradox," where leadership believes the organization is too unique for external research or best practices to apply. Such a stance directly undermines evidence-based management and is counterproductive for cultivating a culture that values knowledge, data, or BI-supported learning.

When evaluating whether the wider management team is likely to adopt the same belief-system approach, the data suggests that this is unlikely. Although the majority of managers also score low on research evidence (similar to the CEO), their overall evidence usage differs substantially. Most departments display significantly higher use of existing internal evidence (Finance = 5, Production = 5, Intelligence = 4), more frequent use of stakeholder insights, and a more balanced reliance on judgment. The strong evidence orientation of Finance, Production, and especially the Intelligence department contrasts sharply with the CEO's intuition-driven approach. Only HR and Sales mirror the CEO's pattern of low research use and very high judgment reliance, making them the departments most likely to adapt to the CEO's belief system.

This creates a situation where the management group as a whole is not aligned with the CEO. The majority demonstrates a more moderate, mixed, or even strong belief system, while the CEO represents an extreme, intuition-heavy orientation. As a result, the organization will not converge toward the CEO's weak belief system. Instead, a fragmented belief system is likely to emerge—

where different departments follow different evidence norms. This fragmentation weakens the organization's capacity to create shared values around knowledge, undermines the consistency of management control systems, and reduces the potential impact of BI and evidence-based decision-making. In such an environment, MCS, especially belief and interactive systems, will struggle to create learning effects because leadership does not consistently promote knowledge-seeking behavior.

Overall, the CEO does not provide the knowledge leadership required to build a strong belief system, and the majority of the management team will not follow the CEO's example. The organization faces misalignment in evidence practices, which poses a major barrier to developing a coherent evidence-based culture and reduces the overall effectiveness of BI, organizational learning, and strategic control. This misalignment must be addressed if the organization wants to achieve the intended benefits of MCS and transition toward true evidence-based decision-making.

GENERAL EXAM APPROACH

(A 6-step method you can use in all related questions)

Step 1 — Identify the leader's evidence-use pattern

Check high/low use of:

- Research
- Stakeholder evidence
- Existing/internal evidence
- Judgment

→ This tells you if the belief system is strong, moderate, or weak.

Step 2 — Classify the belief system (strong, moderate, weak, or counterproductive)

Use these rules:

- **Strong belief system:**
  high use of research + existing evidence + stakeholder evidence, balanced judgment
- **Moderate belief system:**
  moderate use of the three evidence types, moderate judgment
- **Weak belief system:**
  low use of research + stakeholder + existing evidence, high judgment
- **Counterproductive (Uniqueness Paradox):**
  very low research + high judgment + belief that external evidence is irrelevant

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Step 3 — Examine majority patterns in the management team

Count how many departments fall into:

- high research
- high existing evidence
- high stakeholder evidence
- high judgment

→ The majority pattern tells you whether the team is:

- aligned with the CEO, or
- different from the CEO, or
- fragmented/mixed

Step 4 — Compare CEO vs. majority

Three possible outcomes:

1. Both CEO and majority share the same belief system

2. CEO is weak, majority is stronger
3. CEO is strong, majority is weaker

Step 5 — Predict alignment/disalignment
Use evidence theory + knowledge leadership:

- Weak → discourages evidence use
- Directive → enforces KPIs
- Walk-the-talk → encourages BI
- Transformational → builds strong evidence culture

Step 6 — Explain implications for BI, learning, and organizational control
Depending on alignment/misalignment:

- unified strong belief system → high BI adoption and learning
- fragmented belief system → inconsistent decision-making
- weak belief system → BI failure, knowledge silos

⭐ **READY-TO-USE ANSWERS FOR DIFFERENT COMMON OUTCOMES**
Below are **exam templates** for every typical conclusion scenario.

⭐ **OUTCOME A: CEO has a "weak" belief system, majority has a "moderate/strong" belief system**
(This is what your exercise showed.)
The CEO demonstrates a weak belief system characterized by limited use of research, stakeholder knowledge, and existing evidence, combined with heavy reliance on judgement. This signals the uniqueness paradox and reduces the organization's capacity for evidence-based decision-making.
The majority of the management team, however, shows a more balanced or evidence-oriented approach, particularly departments such as Finance, Intelligence, and Production. Because the majority relies more on internal data and stakeholder knowledge than the CEO, the organization is unlikely to converge toward the CEO's weak belief system.
Instead, the organization will experience a fragmented belief system, where some units follow evidence while others follow intuition. This misalignment reduces the effectiveness of BI, weakens learning, and limits the impact of management control systems.

⭐ **OUTCOME B: CEO has a strong belief system, majority has a weaker belief system**
The CEO demonstrates a strong belief system by actively using research, stakeholder evidence, and existing data in decisions. This represents knowledge leadership and supports an evidence-based culture.
However, the majority of the management team relies more heavily on judgement and uses research and data less frequently. Because belief systems require consistent leadership demonstration across all levels, this gap is problematic.
The CEO's strong belief system will not translate into organizational behavior unless the rest of the management team is aligned. As a result, the organization may experience resistance to BI adoption, inconsistent evidence practices, and limited organizational learning.

⭐ **OUTCOME C: Both CEO and majority have weak belief systems**
The CEO and the majority of the management team both show low use of research and internal evidence, while relying heavily on judgement. This indicates a shared weak belief system dominated by intuition and the uniqueness paradox.
With such alignment, the belief system demonstrated across leadership layers does not promote evidence-based decision-making, knowledge sharing, or BI adoption.

This uniform weakness will lead to poor learning outcomes, minimal BI impact, weak diagnostic control, and a low-performance culture.
The organization will struggle to integrate data-driven decision-making and will face long-term strategic blind spots.

⭐ **OUTCOME D: Both CEO and majority have strong belief systems**

Both the CEO and the majority of the management team demonstrate strong belief systems, reflected by high usage of research, stakeholder evidence, and existing organizational data, balanced with reasonable judgement.
This alignment represents a mature and coherent evidence-based culture. It promotes BI adoption, knowledge sharing, diagnostic and interactive control use, and organizational learning.
With consistent leadership messaging and evidence norms, management control systems operate effectively, strengthening strategic learning, improving performance, and reducing uncertainty.
This scenario represents optimal conditions for successful BI-driven management.

⭐ **OUTCOME E: CEO is mixed, majority is mixed (fragmented environment)**

Both the CEO and the management team show inconsistent evidence practices. Some departments rely on evidence, others rely on judgement, and the CEO demonstrates mixed behavior.
This produces a fragmented or hybrid belief system. There is no clear cultural direction around what constitutes “good evidence,” resulting in inconsistent BI use, uneven learning, and difficulty establishing shared strategic values.
Such fragmentation reduces the effectiveness of management control systems and prevents the organization from developing a strong knowledge culture. This leads to knowledge silos, varied interpretation of KPIs, and misaligned decision processes.

⭐ **OUTCOME F: CEO has moderate belief system, majority is polarized (some strong, some weak)**

The CEO demonstrates a moderate belief system, using evidence occasionally but not consistently. The management team, however, is polarized, with some departments showing strong evidence use and others relying heavily on judgement.
This is a high-risk scenario because neither strong nor weak belief systems dominate. Without clear leadership signaling, departments develop their own evidence norms and BI adoption becomes fragmented.
The lack of coherence in belief-system demonstration weakens the integration of MCS, complicates BI governance, and produces inconsistent learning and performance outcomes.

⭐ **GENERAL SENTENCE YOU CAN ALWAYS USE IN ANY ANSWER**

In summary, the effectiveness of the belief system depends on the extent to which leadership consistently values and demonstrates evidence use. Alignment between the CEO and the management team strengthens organizational learning, BI adoption, and the impact of management control systems, whereas misalignment creates fragmentation, weakens the knowledge culture, and diminishes performance.

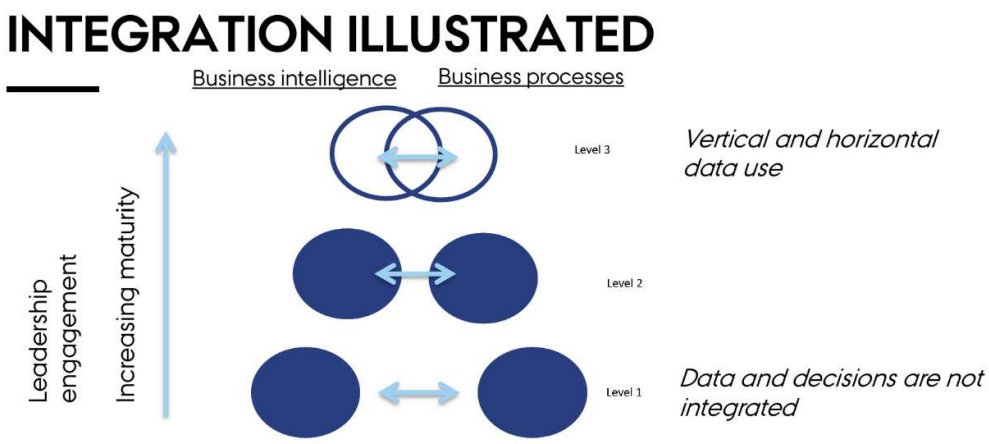
Boundary Systems

The boundary system defines the limits of acceptable behavior in the organization.
Unlike the belief system (which inspires), the boundary system restricts by specifying what employees must not do and what minimum required behaviors they must follow.
In the context of Business Intelligence (BI) and knowledge management (KM), the boundary control system ensures that evidence and knowledge are used properly, consistently, and ethically

- **Integration of Evidence Into Business Processes**
  - The boundary system establishes rules, procedures, and guidelines that ensure evidence is embedded in the organization's workflow.
    - Examples:
      - Mandatory use of BI dashboards in decision processes
      - Required documentation of data sources before signing off decisions
      - Standard templates for evidence-based reporting
    - This ensures BI is not optional but **structurally built into operations**.
- **Ensuring adequate skills to execute knowledge processes**
  - The boundary system ensures employees have:
    - sufficient analytical skills
    - adequate training
    - needed BI literacy
    - technical competencies
  - Because BI and evidence use cannot occur if people lack the skills, the boundary system sets the rules for **training, certification, and competence requirements**.
- **Arranging activities in time and integrating knowledge workflows**
  - The boundary system regulates **when** and **how** knowledge activities must occur.
    - Examples:
      - When evidence must be collected
      - When analysis must be completed
      - Sequencing of BI processes in project timelines
      - This ensures all knowledge work happens in an orderly, predictable manner.
- **Linking incentives to desired knowledge-management behaviors**
  - The boundary system sets **formal rewards and sanctions**.
    - It makes clear which behaviors are required, by linking:
      - bonuses
      - performance evaluations
      - promotions
        to evidence-based actions.
    - Examples:
      - Rewarding employees who document data use in decisions
      - Penalizing decisions made without evidence trails
      - This aligns behavior with KM and BI goals.
- **Guiding knowledge manipulation activities**
  - Boundary controls specify:
    - how employees are allowed to use data
    - what they may not alter or manipulate
    - rules for data privacy, accuracy, and documentation
  - This prevents:
    - data abuse

        - selective use of evidence
        - “political” manipulation of reports
        - and ensures knowledge is treated responsibly.
- **Establishing communication channels for knowledge flows**
    - Boundary systems require the creation of:
        - reporting structures
        - documentation channels
        - communication rules
        - knowledge repositories
    - This ensures that knowledge flows efficiently across the organization rather than being stuck in silos.
- **Creating programs that encourage learning**
    - Though boundary systems are restrictive, they also formalize minimum expectations for continuous learning.
        - Examples:
            - Mandatory BI training
            - Required participation in knowledge-sharing events
            - Continuing education requirements

Integration Illustrated



Level 1 — Low Maturity: Data and Decisions Are Not Integrated

(Representation: two circles far apart)

Characteristics:

- BI and business processes operate in isolation.
- Data is produced, but it is not used in operational decisions.
- BI is treated as an “IT tool,” not a decision tool.
- Reports exist, but managers do not consult them.
- Decision-making is judgment-based and siloed.

Vertical & horizontal data use:

❌ No vertical integration

❌ No horizontal integration

Leadership engagement:

Very low — leaders do not require evidence for decisions.

Theoretical link:

- Weak belief system

- Weak boundary system (no rules mandating data use)
- Mostly diagnostic controls ignored

This is typical of early BI adoption, where BI has little organizational impact.

Level 2 — Medium Maturity: Partial Integration

(Representation: two circles touching with arrows)

Characteristics:

- BI and business processes begin to communicate.
- Data is used in some decisions, but not consistently.
- Some departments use BI; others still rely on intuition.
- Evidence use improves but is not standardized.
- Organizational units exchange information horizontally (across teams) more than vertically.

Vertical & horizontal data use:

⬆ Horizontal integration (teams sharing data)

⬇ Vertical integration (leaders still not fully engaging with BI)

Leadership engagement:

Moderate — leaders expect some BI use but do not fully practice it themselves.

Theoretical link:

- Moderate belief system (mixed values about evidence)
- Boundary system begins to formalize data usage
- Diagnostic control dominates; interactive control limited

This reflects a hybrid culture, where BI is sometimes used and sometimes ignored.

Level 3 — High Maturity: Full BI–Process Integration

(Representation: overlapping circles; full integration)

Characteristics:

- BI is embedded directly into operational and strategic processes.
- Decisions are routinely made using data.
- BI becomes part of daily workflows (dashboards, alerts, automated insights).
- Cross-functional data flows are established.
- Learning and innovation emerge from continuous data use.

Vertical & horizontal data use:

✓ Vertical: data flows from front line → middle managers → executives

✓ Horizontal: departments share common data platforms

Leadership engagement:

Very high — leaders demonstrate a strong belief system:

- They demand evidence
- They reward evidence use
- They use BI themselves
- They model knowledge behavior

Theoretical link:

- Strong belief system
- Strong boundary system (data-use rules embedded in workflows)
- Strong diagnostic & interactive control systems
- High organizational learning (single + double loop learning)

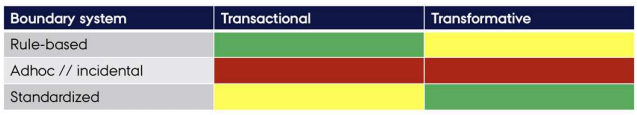
This is a data-driven organization, where BI is an integrated component of everyday management.

Case Boundry Systems: Crowdsourcing and Innovation Performance

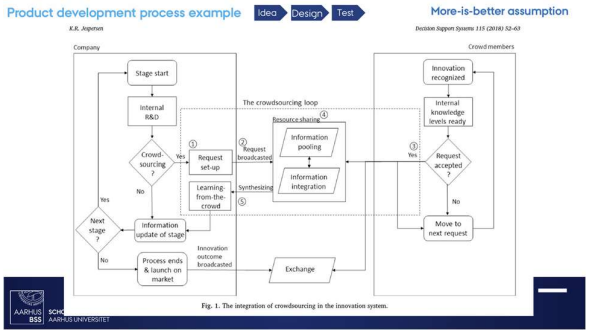
- What the Boundary System Does (Core Functions)
    - A Boundary System is not about inspiration (Belief System) nor performance measurement (Diagnostic System).
    - Instead, it focuses on ensuring that the right behaviors and processes are followed regarding the use of evidence and knowledge.
    - A Boundary System does:
        - Integrates evidence into operational processes
        - Ensures people have the skills to use BI tools and data
        - Defines rules and procedures for how knowledge must flow
        - Links incentives to knowledge-related behaviors
        - Sets up communication channels for knowledge sharing
        - Designs programs that encourage continuous learning
    - In essence:
        - It formalizes the "rules of engagement" for how an organization uses evidence.
- Three Maturity Levels of Boundary Systems
    - Incidental (Low Presence)
        - Evidence is used ad hoc, irregularly, inconsistently
        - No defined processes, no routines
        - Knowledge use relies on personal initiative
        - Implemented through weak belief systems at lower levels
        - Outcome: low BI maturity, fragmented evidence use
    - Rule-based (Medium Presence)
        - Evidence is embedded in SOPs, routines, rules
        - Integration protocols exist but are operational, not cultural
        - Job descriptions and roles ensure minimum competencies
        - Outcome: evidence is used regularly but mechanically
    - Standardized (High Presence)
        - Evidence-based thinking embedded in behavior
        - BI is integrated vertically (top-down) and horizontally (cross-functional)
        - A culture of evidence is visible everywhere in operations

          Outcome: high maturity, consistent BI usage, powerful learning loops
- Leadership Style and the Boundary System

  Rules of engagement



    - Why?
        - Transactional leadership
            - Works with rules, routines, KPIs
            - Keeps people compliant with formal BI processes
            - Good for rule-based systems
        - Transformative leadership
            - Inspires learning, exploration, experimentation
            - Encourages deeper BI usage and innovation
            - Perfect for standardized systems



- The figure illustrates **when and how a company integrates external knowledge (crowdsourcing)** into a structured innovation process.
  - **Key components**
    - **Internal R&D (traditional knowledge generation)**
      - **Decision: Should we crowdsource?**
        - If *yes*, a request is formulated, broadcast, and knowledge is pulled from the crowd.
        - If *no*, the process continues internally.
    - **Crowdsourcing Loop**
      - This loop contains five knowledge-integration steps:
        - **1. Request setup** → define the knowledge need
        - **2. Broadcast request** → crowd members receive it
        - **3. Evaluate responses** (request accepted?)
        - **4. Pooling & Integration** → combine many external inputs
        - **5. Synthesizing** → convert inputs into usable knowledge for innovation
    - **Outcome is fed back** into the company's information update stage.
    - **Purpose of this diagram**
      - It shows that **integration is not automatic**.
        It requires:
        - processes
        - routines
        - evaluation criteria
        - communication channels
        - decision rules
      - This is exactly what the **Boundary System** governs.
- **Linking the Diagram to the Boundary System**
  - The **Boundary System** determines *how* and *when* external knowledge is allowed to enter the organization—and how tightly integrated such knowledge becomes.
    - **Boundary system elements seen in the diagram**
      - **Standardized evaluation step**: "Request accepted?"
      - **Structured communication channels**: Request broadcast, information pooling
      - **Defined routines**: Request setup, synthesizing
      - **Skill requirements**: internal capability to evaluate and integrate crowd

- When to Integrate External Knowledge

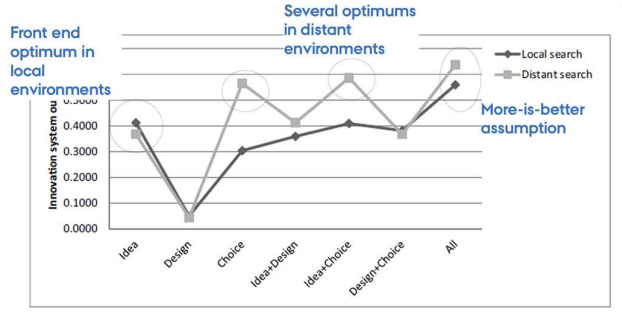


Fig. 2. Crowdsourcing timing and innovation system outcome.

  - Fig. 2 analyzes innovation outcomes when crowdsourcing is done at different stages:
    - **Idea**
    - **Design**
    - **Choice**
    - And combinations of these
  - It compares **local search** (close knowledge) vs **distant search** (remote knowledge).
  - **Key results from the graph**
    - **Local environments (local search)**
      - → **Best to crowdsource at the front end (Idea stage)**.
      - Early knowledge improves idea generation.
      - Later integration has diminishing returns.
      - Over-integrating doesn't add much value.
      - **Interpretation:**
        - Local environments benefit from **front-loaded integration** because knowledge is similar and less diverse.
    - **Distant environments (distant search)**
      - → **Multiple peaks at different stages** (Idea, Choice, Idea+Design, All).
      - Different external groups provide different types of knowledge at different times.
      - More integration points = higher innovation.
      - **Interpretation:**
        - Distant knowledge creates value across multiple phases because it adds diversity and novelty.
  - **The "More-is-Better" assumption**
    - → Especially for distant search, integrating across **all** stages yields the **highest performance**.
    - But this requires:
      - high coordination
      - strong routines
      - high boundary system maturity
- How Boundary Systems Determine Innovation Outcome
  - Low boundary system (Incidental / Ad hoc)
    - No rules, no routines
    - Crowdsourcing happens randomly
    - Integration is poor
    - Knowledge gets wasted
  - Works poorly in both local and distant environments.
  - Medium boundary system (Rule-based)
    - Defined procedures

        - SOPs for when crowdsourcing is allowed
        - Clear job responsibilities
    - Works well for local search (Idea stage); supports predictable integration.

Performance Controls

- DIAGNOSTIC CONTROL SYSTEM
    - Purpose:
      To measure performance against predefined standards and trigger corrective action.
    - What it does
        - Sets pre-established standards for expected behavior or quality (KPIs, benchmarks).
        - Monitors performance after the fact (lag indicators).
        - Evidence is judged according to methodological rules of engagement
          → e.g., "acceptable evidence must be statistically valid, recent, documented, etc."
        - Ensures that employees follow procedures and meet targets.
        - Efficient: requires *little attention* once established.
    - In a BI context
        - Diagnostic control checks:
            - whether dashboards reflect the right metrics
            - whether data-driven decisions adhere to standard methodologies
            - whether BI reports meet quality standards (accuracy, completeness, validation)
    - Organizational learning
        - Single-loop learning
          → Corrects deviations without questioning underlying assumptions.
    - Example
        - "If customer satisfaction drops below 80%, BI team must run root-cause analysis using predefined templates."
- INTERACTIVE CONTROL SYSTEM
    - Purpose:
      To promote learning, exploration, conversation, and deeper understanding in uncertain or changing environments.
    - What it does
        - Defines *where* to search for new evidence
          → the evidence-sourcing scope (internal, external, distant, experimental…)
        - Creates mechanisms for evaluating source relevance
          → which knowledge matters, and why?
        - Encourages ongoing dialogue between employees and top management
        - Identifies strategic uncertainties where new evidence is most valuable
        - Helps avoid learning traps:
            - success trap: relying too much on old knowledge
            - failure trap: over-exploring without exploiting
            - local optimum trap: staying within familiar knowledge environments
    - In a BI context
        - Interactive control enables:
            - exploration of new data sources
            - experimentation with analytics and models
            - cross-functional discussions over insights
            - dynamic updating of BI dashboards depending on context

        - Organizational learning
            - Double-loop learning
              → Questions underlying assumptions, business models, or strategic direction.
        - Example
            - "Management meets weekly with the analytics team to explore anomalies in customer behavior and adjust BI models dynamically."

Performance Controls – The ISS Model

- Performance control systems measure whether BI and knowledge-management activities actually create value.
    - The ISS model offers **specific, measurable indicators** for performance control:
        - **Diagnostic control uses ISS to define:**
            - How BI success is measured
            - The KPIs for data quality
            - System usage requirements
            - Standards for service delivery
            - Expected decision improvements (net benefits)
        - Diagnostic control = **Are we meeting the standards?**
    - **Interactive control uses ISS to:**
        - Identify why users are dissatisfied
            - Explore new types of evidence or analytics
            - Reveal learning traps (e.g., poor data quality prevents learning)
            - Guide conversations between management and BI teams
            - Adapt BI to changing strategy or user needs
        - Interactive control = **How do we learn, adapt, and expand?**

Performance Control – information success Elements

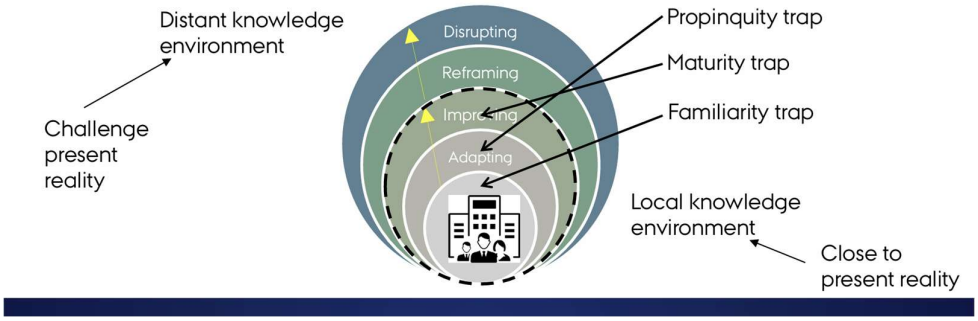
INFORMATION SYSTEM SUCCESS ELEMENTS

ISS Dimension	Definition (Theory)
1. System Quality	Refers to the **technical soundness** of the system — its performance, reliability, usability, flexibility, and response time. A high-quality system enables efficient and reliable access to information.
2. Information Quality	Describes the **accuracy, relevance, completeness, consistency, and timeliness** of the data and reports produced by the system. Users must trust and understand the data outputs.
3. Service Quality	Reflects the **support and services** provided to users — including training, technical assistance, responsiveness, and reliability of the BI or IT support team.
4. Use / Intention to Use	Measures the **degree and willingness** of users to interact with and depend on the system. It reflects adoption, engagement, and integration of BI tools into decision-making routines.
5. User Satisfaction	Represents users' **emotional and cognitive response** to the system — how well it meets their needs and expectations. It's often linked to perceived usefulness and ease of use.
6. Net Benefits (Individual &	Encompasses the **tangible and intangible gains** realized by individuals and the

- What is Information Quality (from ISS)?
    - Information quality is defined as the accuracy, relevance, completeness, consistency, and timeliness of the data and reports produced by the BI system.
      It determines whether managers can *trust* and *use* the information as evidence in decisions.
- How Information Quality Relates to Performance Control Systems
    - Performance control systems have two components:

        - Diagnostic Control System (standard-setting + monitoring)
            - Diagnostic control uses information quality as a performance standard. Managers set explicit expectations about the quality of BI outputs and monitor whether these standards are met.
            - Information Quality → Diagnostic Control Examples
                - Accuracy standard: Error rate < 2% in operational dashboards
                - Completeness: All relevant KPIs available by the reporting deadline
                - Timeliness: Dashboards refreshed daily
                - Consistency: Same number definitions across departments
                - Relevance: KPIs must directly support strategic goals
            - Diagnostic control ensures stable, efficient, predictable use of BI.
            - It supports single-loop learning: detect deviations → correct → return to standard.
        - Interactive Control System (learning + adaptability)
            - Interactive control uses information quality issues as a basis for discussion, learning, and strategic adaptation.
            - When information quality becomes a point of uncertainty, managers interact frequently with BI users and analysts to explore:
                - Why is the information not useful?
                - Which evidence is missing for decisions?
                - Should the data model, indicators, or sources be changed?
                - Are there new emerging data sources (external, crowdsourced, unstructured)?
                - Do users need training, new tools, or different visualizations?
            - Interactive control promotes double-loop learning:
              Not just fixing the data, but questioning *what* data should exist—and *why*.
- How Information Quality Drives BI Performance (Net Benefits)
    - High information quality leads to:
        - Better decision accuracy
        - Faster decisions
        - Stronger user satisfaction
        - Higher BI adoption
        - Reduced uncertainty
        - Higher performance outcomes
    - Poor information quality leads to:
        - BI avoidance
        - Decisions based on intuition/judgment instead of evidence
        - Loss of trust in BI
        - Inefficient processes
        - Strategic misalignment
    - Therefore, Information Quality is the core performance driver in BI control systems.

CLOSE OR DISTANT INFORMATION SEARCH



- Close vs. Distant Information Search — Linked to Performance Control Systems
    - The diagram shows two knowledge environments:
        - Local knowledge environment (Close to present reality)
            - Familiar, similar, incremental learning
            - Supports adapting and improving
            - Lower uncertainty
            - But exposed to three traps:
                - Familiarity trap → relying too much on what we already know
                - Maturity trap → incremental improvement only
                - Propinquity trap → staying inside existing networks
        - Distant knowledge environment (Challenges present reality)
            - Novel, external, diverse knowledge
            - Supports reframing and disrupting
            - Higher uncertainty
            - Enables innovation but requires more judgment and interpretation
- How this connects to Performance Control Systems
    - Performance Control Systems = Diagnostic Control + Interactive Control
        - Diagnostic Control → Close Information Search
            - Diagnostic controls rely on:
                - Stability
                - Predictability
                - Standardized metrics
                - Efficiency
                - Known cause–effect relationships
            - Therefore, diagnostic control naturally reinforces local search.
            - Why?
            - Because diagnostic controls use:
                - KPIs
                - Pre-established routines
                - Standard operating procedures
                - BI dashboards with fixed definitions
                - Past performance benchmarks
                - These systems encourage incremental improvement (“improving,” “adapting”), not radical innovation.
            - This places the organization at risk of:
                - Familiarity trap
                - Maturity trap

        - Propinquity trap
    - Conclusion:
      Diagnostic control → Close search → Exploitation learning → Incremental innovation
- Interactive Control → Distant Information Search
    - Interactive control encourages:
        - Exploration of uncertainty
        - New knowledge discovery
        - Debate and dialogue
        - Challenging existing assumptions
        - Double-loop learning
    - Therefore, interactive control supports distant search.
    - Why?
    - Because interactive control is about:
        - Scanning for new technologies
        - Testing alternative sources
        - Challenging existing indicators
        - Acquiring knowledge from unfamiliar environments
        - Creating new frames of reference
        - This moves the organization toward reframing and disrupting stages.
    - This helps avoid the traps by opening up:
        - New partners
        - Different industries
        - New data sources (external, crowdsourced, AI-generated)
        - Emerging technologies
    - Conclusion:
      Interactive control → Distant search → Exploration learning → Radical innovation

EVIDENCE AND KNOWLEDGE TRAPS

	Familarity	Maturity	Propinquity
Research	Low	Medium	High
Existing	High	High	High
Stakeholder	Low	Medium	Medium
Judgement	High	Medium	High

- Diagnostic System Role:
    - Filters out low-quality judgement and “over-mature” existing data
- Interactive System Role:
    - Increases use of research and stakeholder evidence (distant search)

SUMMARY OF LOC PRESENCE

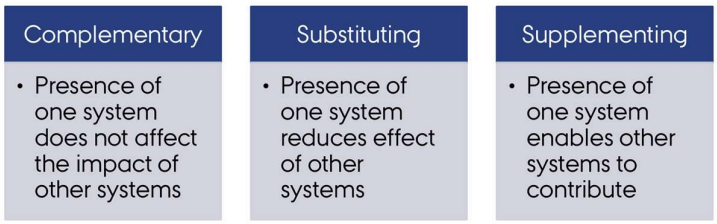
	Weak presence	Strong presence
Belief (value)	Local leadership	Org. culture
Boundary (integration)	Adhoc	Standardized
Interactive (search)	Known knowledge	Novel knowledge
Diagnostic (quality)	Biased knowledge	Reliable knowledge

- Weak LOC → biased, local, convenient knowledge (low performance)
- Strong LOC → reliable, novel, distant knowledge (high performance)

Loc Implementation

- Belief System Positively Enforces the Other Systems
    - The belief system communicates values, purpose, and desired behavior.
      It motivates employees, aligns mindset, and encourages evidence-based work.
    - It serves as the *central force* that energizes both sides of ambidexterity.
- Positive Forces → EXPLORING (Innovation & Learning)
    - These come from Belief System + Interactive Control System.
        - Belief System
            - Inspires creativity
            - Encourages use of evidence and data
            - Establishes "why" exploration matters (values, vision)
        - Interactive Control System
            - Stimulates dialogue and learning
            - Encourages distant knowledge searches
            - Helps avoid knowledge traps
            - Surfaces new strategic opportunities
            - Supports innovation (disrupting, reframing)
        - Together (Belief + Interactive)
        - They create positive, exploratory forces:
            - Empowerment
            - Creativity
            - Curiosity
            - Learning from novel knowledge
            - Innovation and reframing
        - This is the "EXPLORATION" side of ambidexterity.
- Negative Forces → ALIGNING (Control & Efficiency)
    - These come from Boundary System + Diagnostic Control System.
        - Boundary System
            - Sets limits: what NOT to do
            - Defines acceptable behaviors
            - Standardizes processes
            - Prevents misuse of data, controls integration
            - Protects from risk and uncertainty
        - Diagnostic Control System
            - Monitors performance against standards
            - Ensures quality of evidence
            - Drives accountability
            - Reduces biases and variability
            - Ensures efficiency and predictable results
        - Together (Boundary + Diagnostic)
    - They create negative, aligning forces:
        - Accountability
        - Efficiency
        - Predictability
        - Error reduction
        - Routine optimization
    - ⟞ This is the "ALIGNMENT" side of ambidexterity.

Loc Implementation - The Loc Interconnectedness



- Complementary Relationship
  - Definition
    - The presence of one system does not affect the impact or usefulness of the other systems.
  - Meaning
    - Systems operate in parallel, without interfering.
    - Each contributes its own effect independently.
    - No synergy and no conflict.
  - Example
    - A strong boundary system (rules)
    - Works independently of the belief system (values)
  - ➞ Employees follow rules and feel motivated by values, but neither system changes the other.
  - When it occurs
    - In stable organizations
    - When BI routines are well-established
    - When systems touch different behavioral aspects
- Substituting Relationship
  - Definition
    - The presence of one system reduces the effect or usefulness of another system.
  - Meaning
    - One system crowds out the other.
    - Too much control reduces the need for another form of control.
    - Can create imbalance.
  - Example
    - Very strong diagnostic control (strict KPIs, dashboards)
    - Can reduce the relevance of interactive control because employees focus on hitting metrics instead of exploring new ideas.
  - Employees think: "Why explore new data sources if I'm only evaluated on these KPIs?"
  - When it occurs
  - In highly transactional leadership
  - In environments with strong efficiency pressure
  - When systems overlap in purpose (e.g., both trying to ensure performance)
- Supplementing Relationship
  - Definition
    - The presence of one system enables and strengthens the contribution of other systems.
  - Meaning
    - The systems reinforce one another.
    - Synergy: each system becomes more effective because another is present.
    - The whole is greater than the sum of its parts.

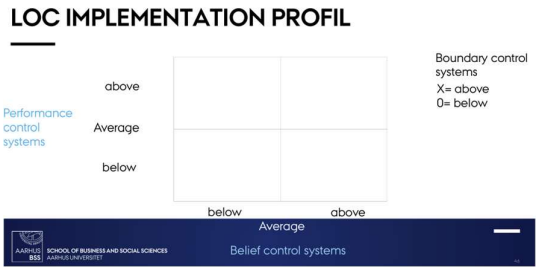
    - Example
        - A strong belief system (knowledge values + evidence-based culture)
        - Strengthens interactive control (search for novel knowledge)
        - This improves the functioning of boundary (clear integration rules)
        - And improves diagnostic (reliable knowledge quality)
        - ➞ Belief system "activates" the others by aligning behavior and reducing resistance.
    - When it occurs
        - In innovative, evidence-oriented organizations
        - Under transformational leadership
        - When BI maturity is high

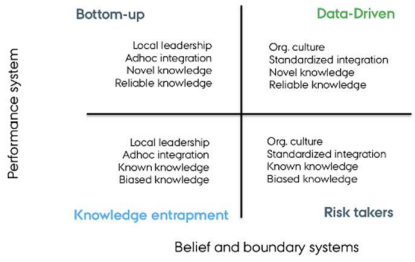
Loc Implementation – Implementing the Loc Framework

- Balanced Implementation of the LOC Framework
    - Definition
        - All four control systems (Belief, Boundary, Diagnostic, Interactive) are implemented in a coordinated and harmonious way, with equal presence and mutual support — regardless of whether the level is weak or strong.
    - Key Characteristics
        - Symmetry → no system dominates
        - Coherence → systems reinforce each other instead of working against each other
        - Behavioral harmony → employees receive consistent signals on what to value, how to act, how to learn, and how performance is evaluated
        - Strategic alignment → exploration and efficiency are balanced
    - What it looks like in practice
        - Strong balanced:
            - Clear values (belief), well-integrated processes (boundary), solid BI quality rules (diagnostic), and active
            - learning/search (interactive)
            - Evidence-based culture deeply embedded
        - Weak balanced:
            - All systems present but at a low level
            - Organization relies on local leadership, ad-hoc routines, known knowledge, and biased evidence
            - Still balanced due to symmetry, but maturity is low
    - Why it matters
        - Balanced implementation avoids contradictions such as:
            - "Explore new ideas!" (interactive) but "only follow rules strictly" (boundary)
            - "We value knowledge sharing!" (belief) but "you're only rewarded on short-term KPIs" (diagnostic)
        - Balanced LOC = less conflict, more clarity, better BI maturity.
- Unbalanced Implementation of the LOC Framework
    - Definition
        - One or more control systems dominate, overpower, or override the others, leading to misalignment, confusion, or behavioral distortions.
    - Key Characteristics
        - Systems become uncoupled and work at cross-purposes
        - Messaging to employees becomes contradictory
        - Some systems become too strong, others too weak

        - Creates learning traps, silos, and biased decision-making
    - Typical Examples
        - Diagnostic dominates
            - KPI-driven culture
            - Little room for exploration
            - Interactive system becomes weak → organization learns only what it already knows
            - Leads to: efficiency at the expense of innovation
        - Boundary dominates
            - Rule-heavy environment
            - Integration is rigid and bureaucratic
            - Employees follow processes but do not search for new evidence
            - Leads to: compliance over learning
        - Interactive dominates
            - Lots of exploration, experiments, external information search
            - But without good diagnostic or boundary controls
            - Leads to: chaos, lack of focus, learning without performance
        - Belief system dominates
            - Strong rhetoric about values, knowledge, and innovation
            - But no integration or quality rules
            - Leads to: symbolic leadership, low credibility
    - Common consequences
        - Conflicting incentives
        - Fragmented BI use
        - Ineffective decision-making
        - Misalignment between strategy and behavior
        - Organizational drift (doing many things, but nothing well)

Loc implementation Profile





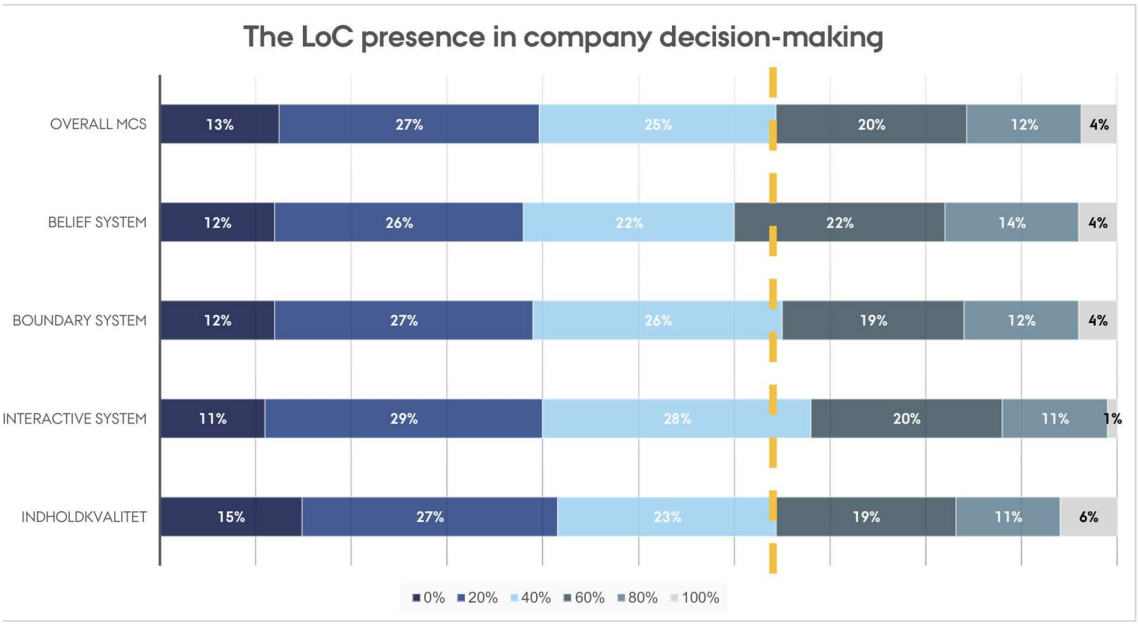
    - This matrix helps you diagnose whether an organization's LOC implementation is balanced or unbalanced by comparing:
        - Performance control systems
          (Diagnostic + Interactive systems)
        - vs.
        - Boundary control systems
          (Boundary + Belief systems influence integration & rules)
    - The matrix compares whether each of the two groups is:
        - Above average (strong presence)
        - Average (moderate presence)
        - Below average (weak presence)
- How to Read the Matrix

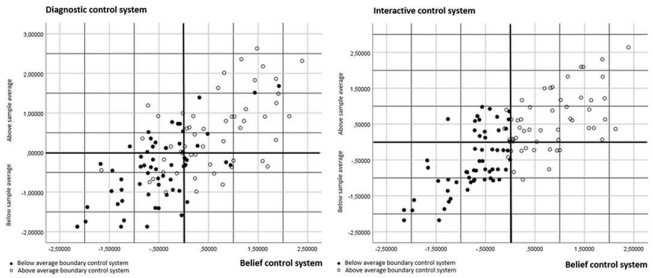
- Horizontal axis → Boundary control systems
  - Left = Below average (weak integration rules, ad hoc routines)
  - Right = Above average (strong standardized routines + clear values)
- Vertical axis → Performance control systems
  - Top = Above average (strong diagnostic + interactive)
  - Bottom = Below average (weak search + low quality control)

- **The 4 Quadrants (Exam-Ready Interpretations)**
  - **Top-Right Quadrant → Strong–Strong**
    - **Balanced, high-maturity LOC implementation**
    - **Best scenario: Aligned + high performance**
    - **Boundary systems (SOPs, processes, integration) are strong**
    - **Performance systems (diagnostic + interactive) are strong**
    - **Characteristics**
    - **Clear values and rules**
    - **Strong evidence integration**
    - **High quality BI use**
    - **Active learning + strong innovation**
    - **Reliable performance monitoring**
    - **➞ Ideal for evidence-based, innovative organizations.**
    - **Common real-world example:**
      Digital-born companies, advanced data-driven firms.
  - **Top-Left Quadrant → Weak Boundary / Strong Performance**
    - **Unbalanced: Chaotic innovators**
      - **Strong interactive + diagnostic performance controls**
      - **BUT weak integration, weak routines, weak rules**
    - **Characteristics**
      - **Lots of exploration, new knowledge, crowdsourcing**
      - **But no stable integration protocol**
      - **BI outputs not embedded into decisions**
      - **Risk of "analysis chaos" or lost learning**
    - **Exploration without alignment → innovation with no execution.**
  - **Bottom-Right Quadrant → Strong Boundary / Weak Performance**
    - **Unbalanced: Bureaucratic and efficiency-driven**
      - **Strong rules, SOPs, integration routines**
      - **BUT weak diagnostic + weak interactive controls**
    - **Characteristics**
      - **Processes and routines are clear**
      - **But BI is hardly used**
      - **Known knowledge only, no novelty**
      - **Strong risk of maturity, familiarity, and propinquity traps**
    - **Well-organized but slow, non-innovative organization.**
  - **Bottom-Left Quadrant → Weak–Weak**
    - **Balanced but low maturity (weak balanced)**
      - **Weak integration and boundary controls**
      - **Weak performance controls**
    - **Characteristics**
      - **Ad hoc BI integration**
      - **Low quality knowledge**

    - **Local leadership dominates**
    - **No systematic search or innovation**
    - **Weak evidence-based culture**
- **➞ Balanced but immature → low performance, low learning.**
- **Common real-world example:**
  Organizations without BI strategy or early-stage BI adoption.

Case Example





LOC IMPLEMENTATION SCENARIOS

Balance and unbalance

	Implementation scenarios					
	Balanced		Unbalanced			
Knowledge control systems	Controls installed	Controls unattended	Positive forces	Negative forces	Belief and boundary controls	Performance controls
Belief	Organizational	Local	Organizational	Local	Organizational	Local
Boundary	Standardized	Adhoc	Adhoc	Standardized	Standardized	Adhoc
Integrative	Novel	Known	Novel	Known	Known	Novel
Diagnostic	Reliable	Bias	Bias	Reliable	Bias	Reliable
Consequences	Data-driven	Knowledge trap	Novelty spin	Operational	Risk takers	Bottom-up

⭐ Step 1 — Read case signals
(Full steam ahead? Proof-it path? Strong culture? Chaos? Strict KPIs?)

⭐ Step 2 — Pick ONE of the 6 scenarios
(Positive forces, performance controls, etc.)

⭐ Step 3 — Copy the row-values from the table
(Copy the characteristics under that scenario.)

⭐ Step 4 — Justify with case cues
(Why does "full steam ahead" = positive forces? Why does "prove it" = performance control?)

Assignment
which LoC implementation scenario(s) seem(s) more likely with :
Full steam ahead?
Proof it path?

Which LoC implementation scenario is more likely with “Full steam ahead”?

- Positive forces (Unbalanced)
- This scenario matches speed, innovation, exploration, and belief-driven push.
- Because “Full steam ahead” signals:
    - Fast progress
    - High ambition
    - Taking risks
    - Pushing new ideas before evidence is fully validated
    - Strong top-management belief
- ✓ Copy from the table (Positive forces column):
    - Belief: Organizational
    - Boundary: Adhoc
    - Integrative: Novel
    - Diagnostic: Bias
    - Consequences: Novelty spin

Which LoC implementation scenario is more likely with “Proof it path”?

- Performance controls (Unbalanced)
- This scenario matches caution, validation, KPIs, data-first, risk aversion.
- Because “Proof it path” signals:
    - Show evidence before acting
    - Controlled pace
    - Validation and measurement
    - Reliability over novelty
    - Data-driven justification
- Copy from the table (Performance controls column):
    - Belief: Local
    - Boundary: Adhoc
    - Integrative: Novel
    - Diagnostic: Reliable
    - Consequences: Bottom-up

THE INDIVIDUAL LOC SYSTEM EFFECTS

		All evidence	Research evidence	Stakeholder evidence	Existing evidence
Belief system	β	.755	.708	.546	.672
	F	145.497	110.805	46.814	90.683
	R^2	.569	.502	.292	.452
Boundary system	β	.709	.632	.587	.602
	F	111.273	73.323	57.878	62.545
	R^2	.503	.400	.345	.362
Interactive system	β	.796	.719	.600	.718
	F	190.062	117.393	61.966	117.215
	R^2	.633	.516	.360	.511
Diagnostic system	β	.815	.740	.662	.682
	F	217.756	133.179	85.988	95.423
	R^2	.664	.548	.439	.465

	Overall evidence	Research evidence	Stakeholder evidence	Existing evidence
	Model 1	Model 2	Model 3	Model 4
Sector[a]	-0.124***	-0.081*	-0.144***	-0.087*
	(-2.528)	(-1.316)	(-1.985)	(-1.325)
# of employees	0.044	0.042	0.026	0.053
	(0.902)	(0.678)	(0.359)	(0.803)
Management control systems				
Belief system	0.213***	0.289***	0.039	0.256***
	(2.677)	(2.908)	(0.333)	(2.395)
Boundary system	0.138**	0.065	0.222***	0.050
	(1.898)	(0.713)	(2.074)	(0.513)
Interactive system	0.246***	0.200***	0.117	0.336***
	(2.942)	(1.915)	(0.951)	(2.992)
Diagnostic system	0.399***	0.353***	0.416***	0.222***
	(5.157)	(3.658)	(3.640)	(2.142)
R2	0.773	0.647	0.505	0.592
Adj R2	0.760	0.627	0.477	0.569
F	59.671	32.080	17.847	25.417
n	114	114	114	114

Conclusion:

✅ 1. How to know if a β (beta) coefficient is good?

✔ **General thresholds used in social sciences, management, and BI:**

β Value	Interpretation
β ≥ .70	Very strong effect (excellent)
β .50–.69	Strong effect (good)
β .30–.49	Moderate effect (acceptable)
β .10–.29	Weak effect (poor)
β < .10	No meaningful effect

✔ **Universal rule:**

The more **above 0**, the stronger the effect.
The more **near 1**, the better.

❗ **BUT the context matters:**

- In **psychology**: even β = .20 can be meaningful.
- In **engineering**: β < .50 is often considered weak.

✔ **For BI / LoC context (your course):**

β > .30 is "good"
β > .50 is "strong"
β > .70 is "excellent"

✅ 2. How to know if an F-value is good?

✔ **General rule:**

F measures **significance of the whole model**.
It depends on sample size — but here are safe thresholds:

F Value	Interpretation
F > 10	Significant (good)
F > 20	Strong significance
F > 50	Very strong
F > 100	Extremely strong

✔ **Easy exam rule:**

If F > 10 → model is significant
If F > 50 → strong model
If F > 100 → very strong model

This rule works in ANY case.

✅ 3. How to know if R^2 is good?

R^2 always ranges **0 to 1**.

✔ **Universal thresholds:**

R^2	Interpretation
.75+	Excellent
.50–.74	Very good
.30–.49	Good / acceptable
.10–.29	Weak
< .10	Very weak

✔ **Important:**

A "good" R^2 depends on the type of research:

Field	What is considered "good"?
Physics	R^2 > .90
Economics	R^2 ~ .50 is common
Management / BI / LoC studies	R^2 > .30 is good

✔ **For LoC framework in your course:**

R^2 > .50 = strong explanatory power
R^2 > .30 = acceptable
R^2 < .30 = weak

BELIEF SYSTEM – Interpretation Templates

🔵 **High β (strong effect)**

"The belief system strongly enhances evidence use (high β). This means shared purpose, values and strategic direction effectively motivate employees toward evidence-based decision-making."

🟡 **Medium β (moderate effect)**

"The belief system has a moderate effect. It provides some motivation for evidence use, but other systems also play an important role."

🔴 **Low β (weak effect)**

"The belief system only weakly influences evidence use. Shared values exist, but they do not significantly drive evidence-based behavior."

📘 **F-statistic (all LoC systems)**

- **High F:** "Belief system reliably predicts evidence use."
- **Medium F:** "Belief system contributes, but not strongly."
- **Low F:** "Belief system has weak statistical explanatory power."

📗 **R^2 interpretation**

- **High R^2:** "Belief system explains a large part of evidence-use behavior."
- **Medium R^2:** "Belief system moderately explains behavior."
- **Low R^2:** "Belief system explains little — other systems matter more."

⭐ **2. BOUNDARY SYSTEM – Interpretation Templates**

🔵 **High β**

"The boundary system strongly structures evidence use (high β). Clear rules, responsibilities, and standards guide behavior toward correct evidence sourcing."

🟡 **Medium β**

"The boundary system has a moderate structuring effect. Rules help, but they are not the main driver."

🔴 **Low β**

"The boundary system has limited effect. Rules or standards are unclear, inconsistently applied, or not impactful for evidence use."

📘 **F-statistic (Boundary)**

- **High F:** "Boundary controls significantly improve evidence consistency."
- **Medium F:** "Boundary controls partially guide evidence use."
- **Low F:** "Boundary controls have little predictive value."

📗 **R^2**

- **High:** "Clear rules explain a large share of evidence-use quality."
- **Medium:** "Boundary rules explain some variance but not all."
- **Low:** "Boundary controls are not central to evidence use."

⭐ **3. INTERACTIVE SYSTEM – Interpretation Templates**

🔵 **High β**

"The interactive system is a strong driver of evidence use. Continuous dialogue, cross-department collaboration, and learning loops significantly increase the use of research, stakeholder, or existing evidence."

🟡 **Medium β**

"Interactive control has a noticeable but moderate effect on evidence use. Dialogue and learning occur, but not consistently across the organization."

🔴 **Low β**

"Interactive controls weakly influence evidence use, indicating a lack of discussion, collaboration, or challenge of assumptions."

📘 **F-statistic**

- **High:** "Interactive system is a strong predictor — active learning matters."
- **Medium:** "Some predictive power, but not dominant."
- **Low:** "Interactive processes are not a reliable driver."

📗 **R^2**

- **High:** "Learning and discussion explain large variance in evidence use."
- **Medium:** "Interactive controls explain moderate variance."
- **Low:** "Interactive controls explain little."

⭐ **4. DIAGNOSTIC SYSTEM – Interpretation Templates**

🔵 **High β**

"The diagnostic system strongly predicts evidence use. Performance metrics, KPIs, and data tracking effectively enforce evidence-based behavior."

🟡 **Medium β**

"Diagnostic controls moderately enforce evidence use. KPIs work, but not as strongly as in mature data-driven organizations."

🔴 **Low β**

"Diagnostic control has weak influence. KPIs are not tied to evidence standards, or employees do not use them to guide decision-making."

📘 **F-statistic**

- **High:** "Diagnostic controls create strong accountability for evidence use."
- **Medium:** "Some accountability, but not dominant."
- **Low:** "KPIs have limited predictive value."

📗 **R^2**

- **High:** "Performance measures explain much of the variance in evidence-based behavior."
- **Medium:** "Moderate explanatory power."
- **Low:** "Limited explanatory power — other systems dominate."

⭐ **MASTER CHEAT SHEET (one line per system)**

Use this if you are in a rush:

✓ **Belief system**

- High β → Values strongly motivate evidence use
- Medium β → Some motivational effect
- Low β → Weak cultural/exploratory impact

✓ **Boundary system**

- High β → Clear rules strongly guide evidence use
- Medium β → Some guidance
- Low β → Weak structure

✓ **Interactive system**

- High β → Dialogue & learning strongly promote evidence use
- Medium β → Partial learning effects
- Low β → Weak collaborative impact

✓ **Diagnostic system**

- High β → KPIs strongly enforce evidence use
- Medium β → Partial KPI influence
- Low β → Little enforcement