THE DEPENDENCY CHAIN

Why the Most Important Parts of a Strategy Are Often the Parts Nobody Talks About

Public Interest Briefing 006



Executive Summary

Every organisation depends upon something.

Some depend upon energy.

Some depend upon suppliers.

Others depend upon specialist knowledge, technology, logistics networks, critical infrastructure, customers, finance or regulatory frameworks.

Most organisations understand at least some of their direct dependencies. Far fewer understand the dependencies that sit behind them.

The challenge is that modern economies, industries and organisations are increasingly interconnected. A disruption in one area can rapidly create consequences elsewhere. What begins as an energy issue may become a manufacturing issue. A supply chain issue may become a customer issue. A skills shortage may become a growth constraint.

These connections are known as dependency chains.

A dependency chain is the sequence of conditions, capabilities, resources and relationships that enable an activity, organisation or system to function successfully.

The concept is simple. The implications are profound.

The semiconductor industry provides a powerful example. A single advanced chip depends upon specialist design software, highly purified materials, photolithography equipment, rare gases, highly skilled engineers, stable energy supplies, advanced manufacturing facilities and global logistics networks. Weakness in any one area can create disruption throughout the entire chain.

The same principle applies to steel, construction, defence, healthcare, utilities, transport, technology and government.

The challenge for decision-makers is that dependency chains often extend beyond what is immediately visible.

Most organisations can see their suppliers.

Fewer can see their suppliers' suppliers.

Fewer still can see the dependencies behind those suppliers.

As a result, many strategic risks remain hidden until they begin creating operational consequences.

Understanding dependency chains does not eliminate risk.

However, it improves decision clarity.

It allows leaders to:

- Identify critical vulnerabilities.
- Understand where disruption may emerge.
- Recognise hidden concentrations of risk.
- Improve resilience.
- Prioritise investment more effectively.
- Anticipate future constraints.

Perhaps most importantly, it enables organisations to understand not only the risks they face, but how those risks may interact.

The interaction points between risks are often where the greatest impacts emerge.

This publication explores dependency chains, why they matter, why they are frequently overlooked and how organisations can improve resilience by understanding the systems upon which they depend.

Decision Clarity Reflection

Most organisations spend significant time analysing what they do.

Fewer spend the same amount of time analysing what enables them to do it.

Before proceeding, consider the following questions:

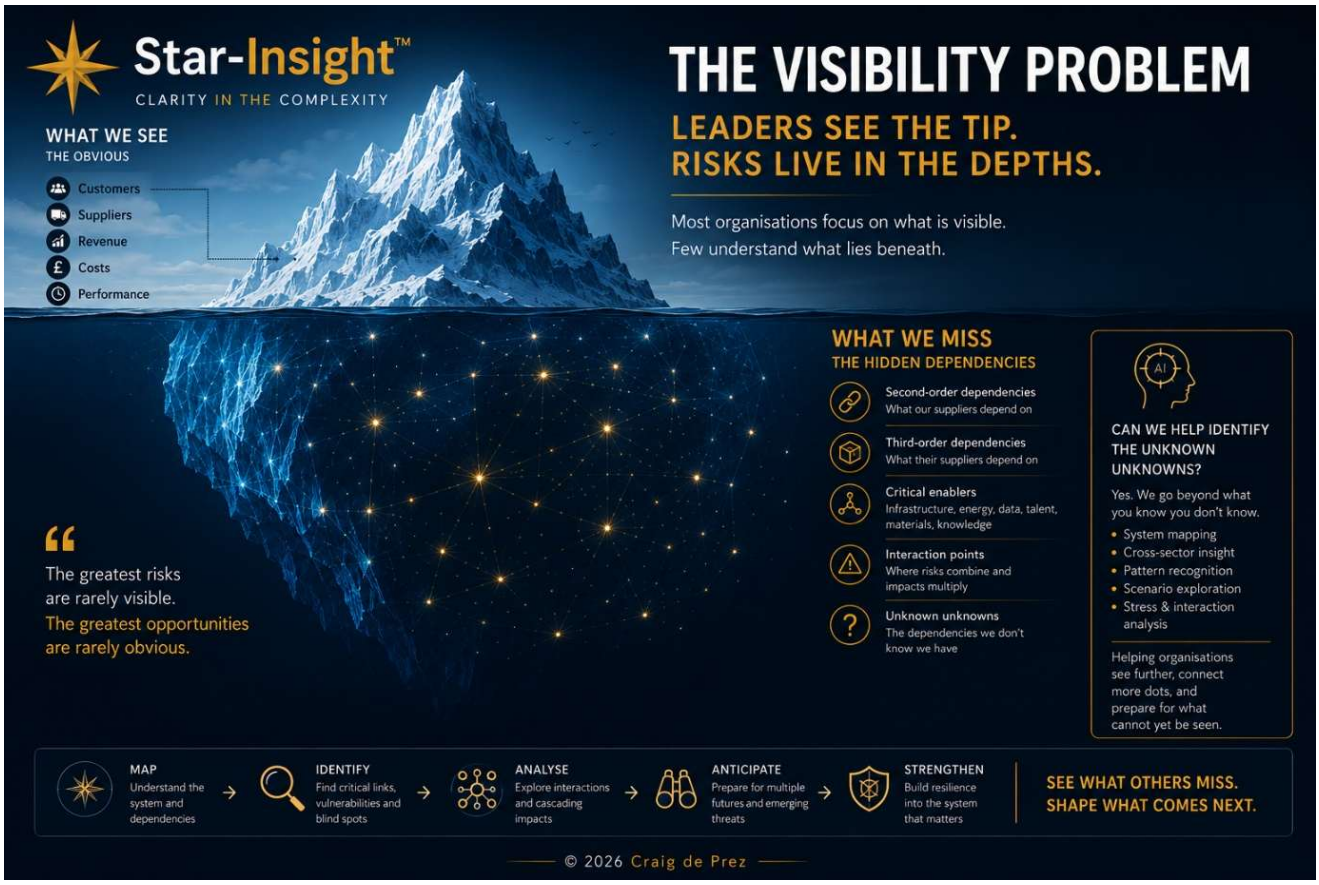
- What are the five most important dependencies within your organisation?
- Which of those dependencies would cause the greatest disruption if removed?
- Which dependencies do you understand least?
- Which dependencies have never been formally mapped?
- Which risks could interact to create consequences greater than the sum of their individual effects?

The answers may reveal opportunities, vulnerabilities and assumptions that would otherwise remain hidden.

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1. The Visibility Problem



Most organisational risks are not hidden because they are deliberately concealed.
They are hidden because they sit beyond the normal field of view.

Management reports typically focus on:

- Revenue
- Costs
- Customers
- Projects
- Performance
- Operational issues

These metrics are important.

However, they often describe outcomes rather than underlying dependencies.

A business may report strong sales growth while becoming increasingly dependent upon a single supplier.

A manufacturer may improve productivity while becoming exposed to a constrained energy market.

A technology company may scale rapidly while relying upon knowledge held by only a handful of individuals.

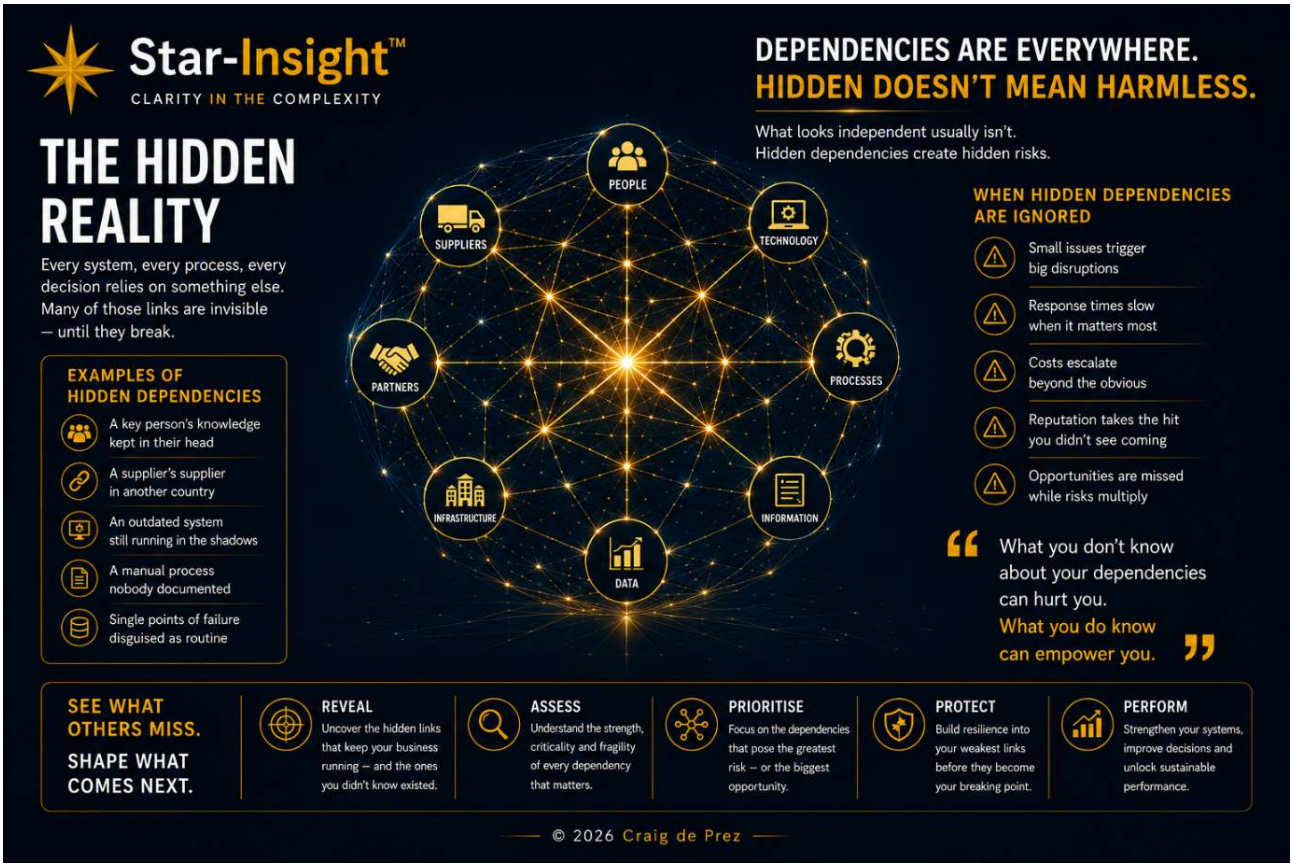
The challenge is that many dependencies remain invisible until they fail.

This creates a dangerous illusion.

What appears stable may simply be untested.

Understanding dependency chains begins by recognising that not everything that matters is immediately visible.

2. What Is A Dependency Chain?



A dependency chain describes the sequence of relationships, resources, capabilities and conditions required for an outcome to occur.

Consider a simple example.

A loaf of bread appears straightforward.

Yet behind that loaf may sit:

Farmer

↓

Seed

↓

Fertiliser

↓

Fuel

↓

Agricultural Machinery

↓

Transport

↓

Mill

↓

Bakery

↓

Retailer

↓

Consumer

Every stage depends upon something else.

If sufficient disruption occurs at one stage, consequences can propagate throughout the system.

The same principle applies to organisations, industries and nations.

Dependency chains are therefore not simply supply chains.

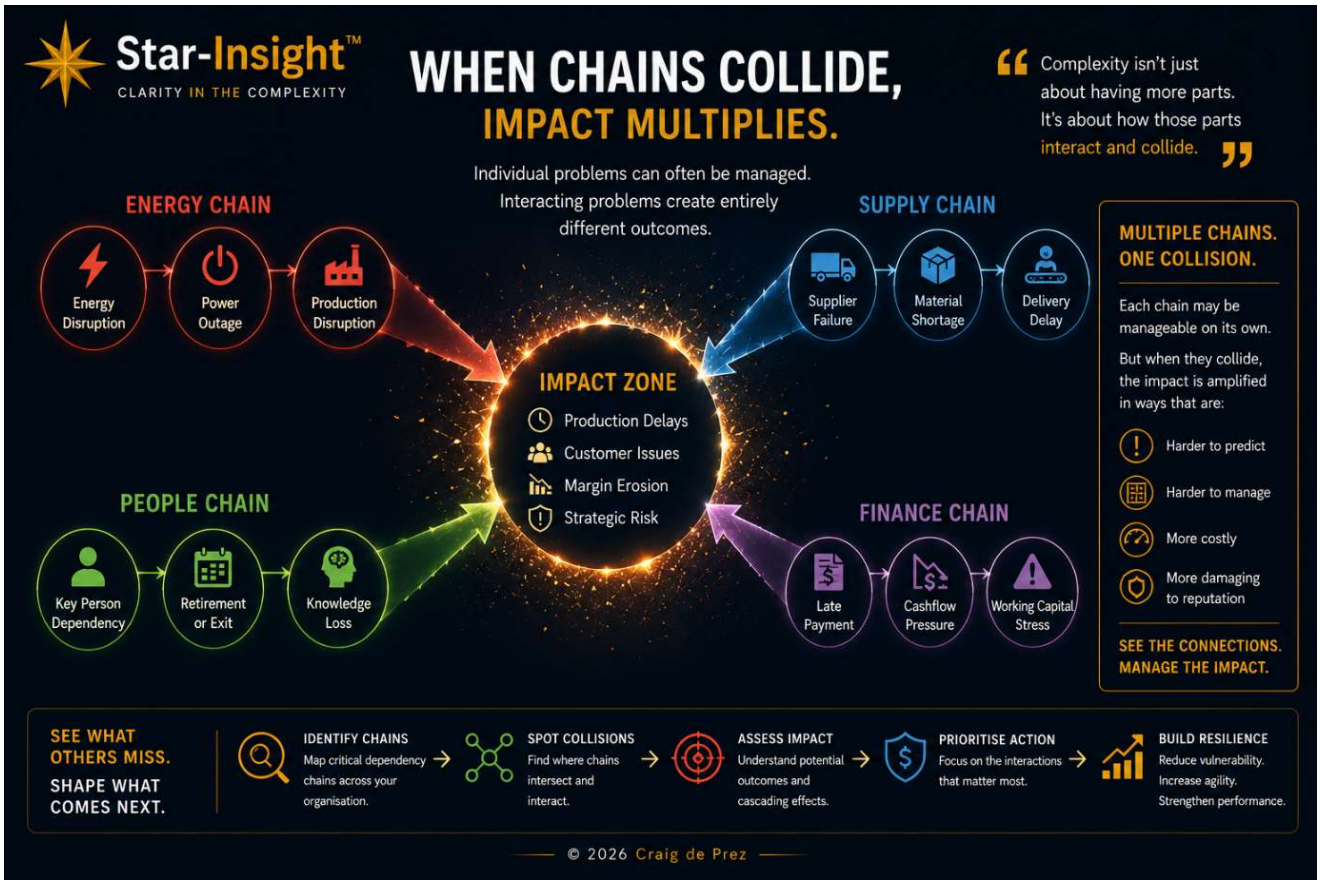
They include:

- Skills
- Knowledge
- Energy
- Infrastructure
- Technology
- Regulation
- Finance
- Data
- Relationships

Dependency chains exist everywhere.

The challenge is recognising them before they become problems.

3. Why Dependency Chains Matter



History provides numerous examples of dependency chains becoming visible only after disruption occurs.

The COVID pandemic exposed global supply chain dependencies that many organisations had never fully considered.

Semiconductor shortages demonstrated how a relatively small component could disrupt entire industries.

Energy market volatility revealed the extent to which industrial competitiveness depended upon access to affordable power.

In each case, the issue was not merely the disruption itself.

It was the discovery that critical activities depended upon systems that were more fragile than previously assumed.

The lesson is straightforward.

Dependencies matter because outcomes depend upon them.

When dependency chains become constrained, delayed, weakened or broken, consequences often extend far beyond their original source.

The challenge becomes even greater when multiple dependency chains interact simultaneously.

4. First-Order Dependencies

First-order dependencies are the dependencies most organisations recognise relatively easily.

These are the direct relationships that enable daily operations.

Examples include:

- Key customers
- Core suppliers
- Energy providers
- Technology platforms
- Logistics partners
- Banking relationships
- Regulatory approvals

Most organisations maintain at least some awareness of these dependencies because they interact with them regularly.

However, visibility alone does not guarantee understanding.

Questions worth considering include:

- Which supplier would create the greatest disruption if removed?
- Which customer represents the highest concentration of revenue?
- Which systems are critical to daily operations?
- Which relationships are essential to future growth?

Many organisations stop their analysis at this point.

Unfortunately, dependency chains rarely stop there.

The greatest vulnerabilities often sit beyond first-order dependencies.

5. Second-Order Dependencies

Second-order dependencies are the dependencies that support your dependencies.

These are often less visible but frequently more important.

A manufacturer may depend upon a steel supplier.

The steel supplier may depend upon:

- Electricity
- Natural gas
- Raw materials
- Logistics networks
- Skilled labour

A software company may depend upon a cloud provider.

The cloud provider may depend upon:

- Data centres
- Energy infrastructure
- Semiconductor availability
- Telecommunications networks

The challenge is that organisations often assume these supporting dependencies will always exist.

History suggests otherwise.

Disruptions frequently emerge from areas that decision-makers do not directly control and may not routinely monitor.

Second-order dependency mapping helps organisations understand where hidden vulnerabilities may exist beyond their immediate field of view.

6. Third-Order Dependencies

Third-order dependencies are where complexity begins to increase significantly.

These are the dependencies that support the dependencies that support your dependencies.

At this level, consequences become increasingly difficult to predict without deliberate analysis.

Consider artificial intelligence.

Many organisations view AI primarily as software.

Yet AI depends upon:

AI

↓

Semiconductors

↓

Photolithography Equipment

↓

Specialist Optics

↓

Rare Materials

↓

Advanced Manufacturing Capability

↓

Stable Energy Infrastructure

↓

Highly Skilled Engineers

A disruption occurring several stages away from the visible application can still influence outcomes significantly.

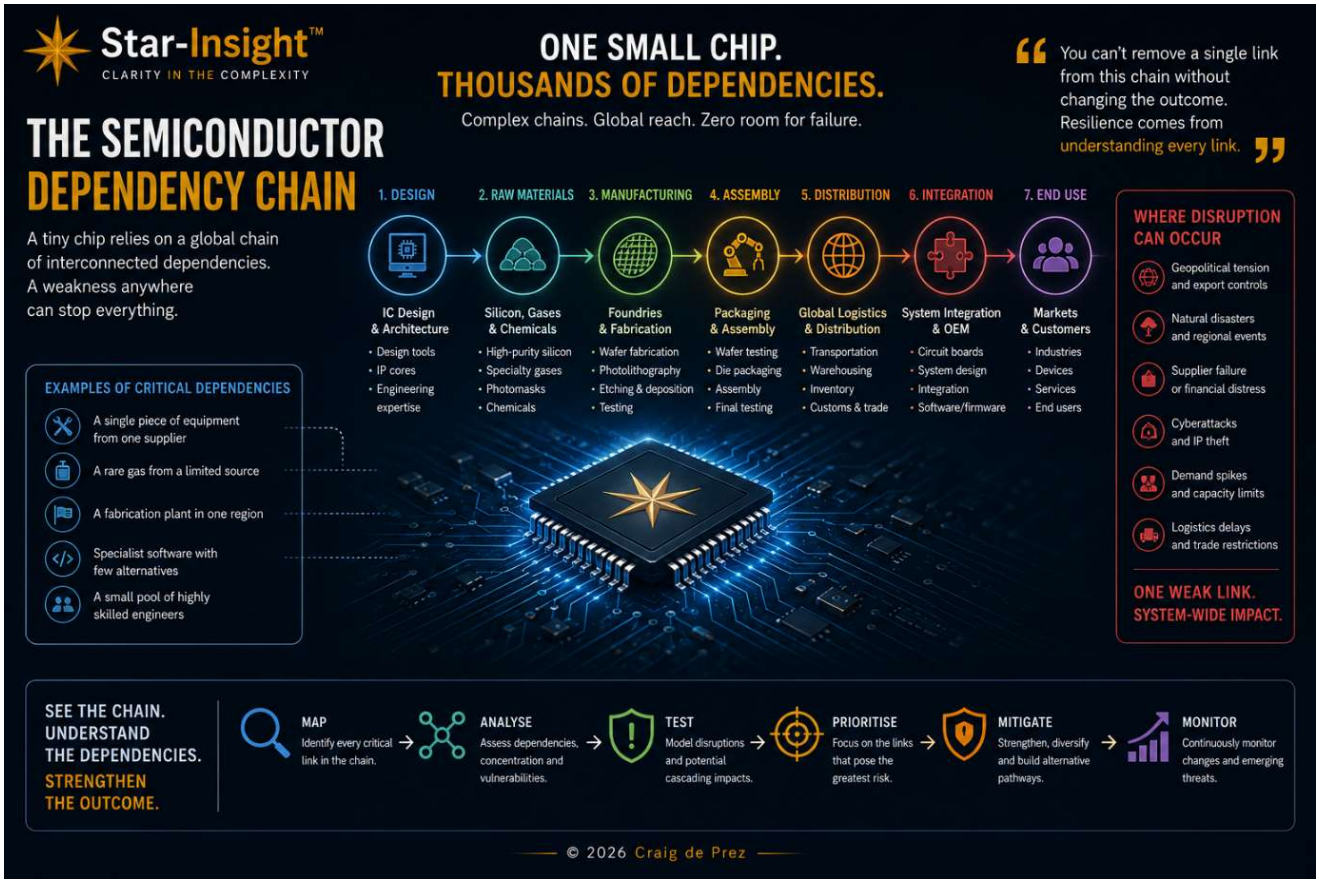
This is why many strategic surprises appear unexpected.

The causes are often visible.

The connections are not.

Understanding third-order dependencies improves strategic awareness and reduces the likelihood of being surprised by developments that emerge elsewhere in the system.

7. The Semiconductor Example



Few industries illustrate dependency chains more clearly than semiconductors.

Modern economies depend upon semiconductors.

They underpin:

- Consumer electronics
- Telecommunications
- Defence systems
- Medical equipment
- Automotive manufacturing
- Industrial automation

- Artificial intelligence

Yet semiconductor production depends upon an extraordinarily complex network of capabilities.

These include:

- Specialist design software
- Intellectual property libraries
- Highly purified chemicals
- Rare gases
- Advanced manufacturing equipment
- Stable energy supplies
- Highly skilled engineers
- Global logistics networks

No single nation controls every stage of the chain.

Instead, capability is concentrated across a relatively small number of countries and organisations.

This creates both strength and fragility.

Specialisation improves efficiency.

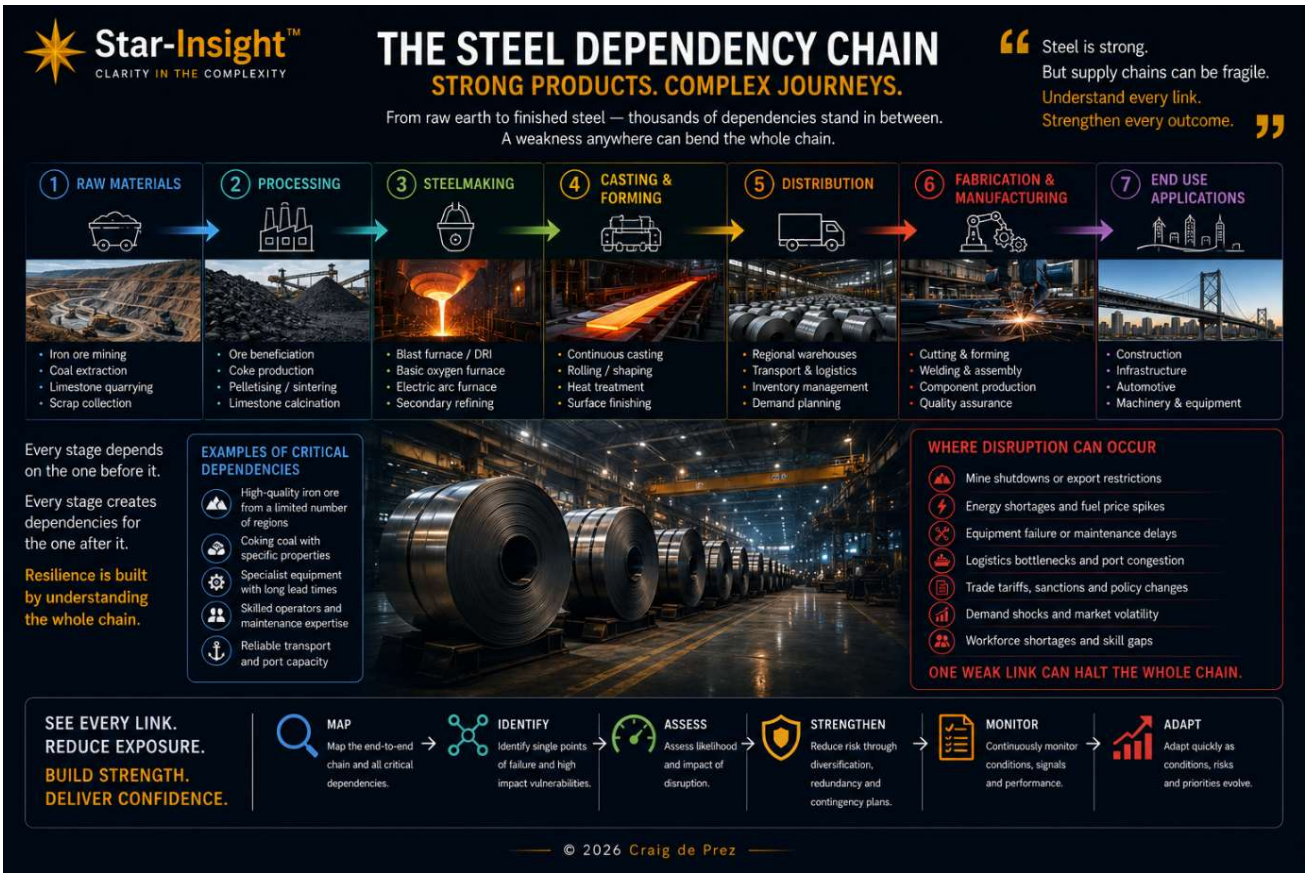
Concentration increases vulnerability.

The semiconductor sector demonstrates why dependency chains have become increasingly important in discussions concerning economic resilience, technological sovereignty and national security.

The challenge is not simply producing chips.

It is maintaining the ecosystem that enables them to exist.

8. The Steel Example



Steel remains one of the foundational materials of modern civilisation.

Infrastructure, transportation, defence, construction, manufacturing and energy systems all depend upon it.

Yet steel production itself depends upon a broad range of interconnected capabilities.

These include:

- Iron ore
- Scrap metal
- Energy
- Transport networks
- Ports
- Industrial equipment
- Skilled labour
- Environmental compliance systems

The steel industry also illustrates how dependency chains extend beyond production.

A shortage of steel can influence:

- Construction schedules
- Defence programmes
- Infrastructure delivery

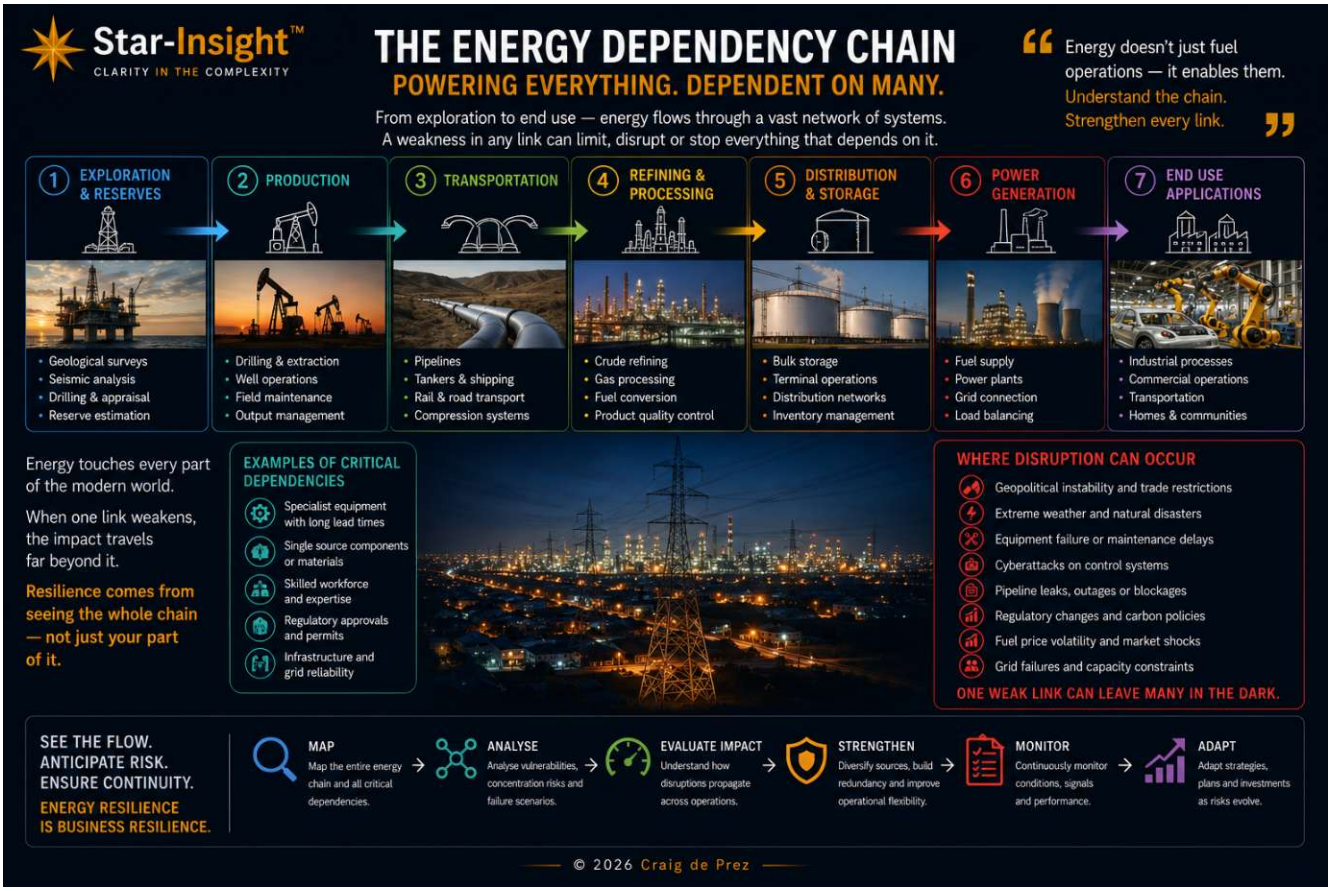
- Manufacturing output
- Energy projects

In many cases, the most significant impacts occur downstream.

The challenge therefore becomes understanding not only the production chain itself but also the sectors that rely upon it.

The steel example demonstrates that dependency chains frequently operate across multiple industries simultaneously.

9. The Energy Example



Energy may be one of the most important dependency chains of all.

Almost every economic activity depends upon access to reliable and affordable energy.

Manufacturing depends upon energy.

Data centres depend upon energy.

Transport depends upon energy.

Water infrastructure depends upon energy.

Healthcare depends upon energy.

Energy therefore acts as an enabling dependency for countless other systems.

The challenge is that energy systems themselves depend upon:

- Generation capacity
- Fuel supplies
- Transmission networks
- Distribution infrastructure
- Maintenance capability
- Skilled engineers
- Investment
- Regulatory frameworks

This creates a layered dependency structure.

A disruption affecting energy infrastructure may create consequences throughout multiple sectors simultaneously.

Understanding energy dependency chains is therefore not solely an energy-sector issue.

It is a resilience issue.

For many organisations, energy sits beneath a significant proportion of their operational capability whether they recognise it or not.

10. The Knowledge Example

Knowledge is frequently overlooked as a dependency.

Unlike infrastructure, machinery or inventory, knowledge is often invisible.

Yet many organisations depend heavily upon:

- Experienced employees
- Specialist expertise
- Informal processes
- Institutional memory
- Technical know-how
- Customer relationships

In some cases, critical knowledge may exist primarily within a single individual or small group.

The risks associated with this dependency often remain hidden until:

- Retirement
- Resignation
- Illness
- Organisational change
- Business growth

Knowledge dependencies can therefore become significant constraints on resilience, scalability and continuity.

The challenge becomes particularly important in sectors facing ageing workforces, specialist skills shortages or rapid technological change.

Many organisations invest heavily in technology while investing comparatively little in preserving critical knowledge.

Yet knowledge itself can be viewed as infrastructure.

If it disappears, capability may disappear with it.

As future industries become increasingly dependent upon expertise, innovation and technical capability, knowledge dependency chains may become every bit as important as physical ones.

11. Why Organisations Miss Dependencies

Dependency chains are not inherently hidden.

In many cases, the information exists somewhere within the organisation.

The challenge is that it often exists in separate places.

Finance may understand financial dependencies.

Operations may understand production dependencies.

Procurement may understand supplier dependencies.

IT may understand technology dependencies.

Human Resources may understand skills dependencies.

Each department sees part of the picture.

Few see the whole picture.

As a result, organisations often develop excellent visibility within functions while lacking visibility across functions.

This can create blind spots.

A procurement decision may create operational consequences.

An operational decision may create financial consequences.

A financial decision may create capability constraints.

None of these outcomes are necessarily wrong.

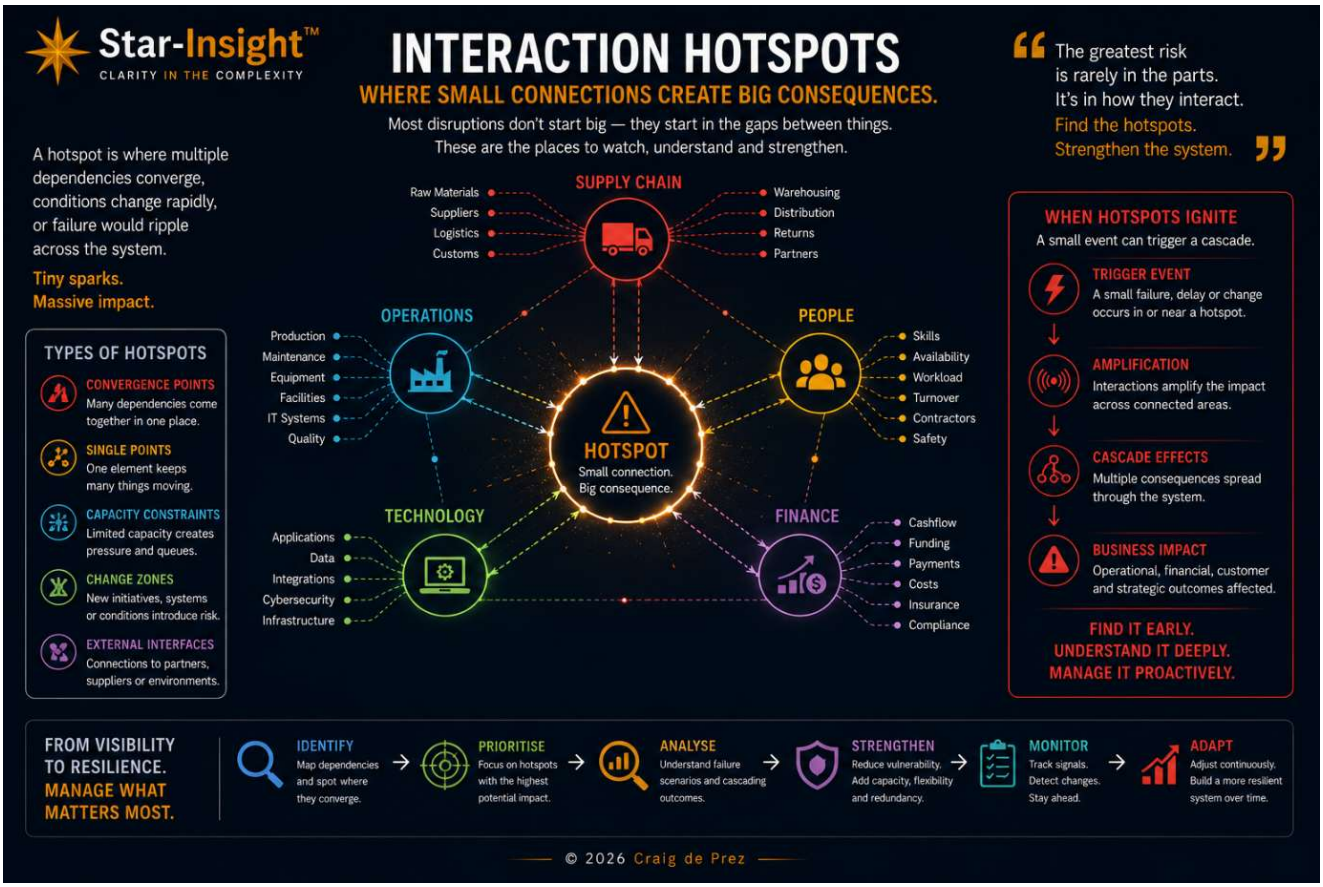
The challenge is that the interactions between them are not always visible at the point decisions are made.

Many organisations are structured around departments.

Dependency chains are structured around systems.

The distinction matters.

12. Interaction Points



Many risks can be managed in isolation.

The greatest challenges often emerge when multiple risks begin interacting simultaneously.

Consider the following scenario:

- A major customer delays payment.
- Energy costs increase.
- A key engineer retires.

Each issue may appear manageable individually.

Together, they may create:

- Cashflow pressure.
- Reduced operational capacity.
- Delayed projects.
- Customer dissatisfaction.
- Increased financial risk.

The outcome is not simply the sum of the individual issues.

The interaction between them creates a new situation.

These interaction points often represent the most important areas for decision-makers to understand.

Examples include:

Supply Chain Disruption
+
Energy Volatility
+
Labour Shortages

↓

Production Delays

+

Technology Change
+
Skills Gaps
+
Competitive Pressure

↓

Capability Constraints

Customer Concentration
+
Late Payment
+
Working Capital Pressure

↓

Financial Stress

The interaction points between risks are often where the biggest impacts emerge.

Understanding dependency chains therefore requires more than identifying individual dependencies.

It requires understanding how those dependencies influence one another.

13. Dependency Chains In Business

Every business depends upon a network of interconnected capabilities.

Some of these dependencies are visible.

Others are hidden.

Examples may include:

Revenue Dependency

- Key customers
- Key markets
- Key contracts

Operational Dependency

- Equipment
- Suppliers
- Energy
- Logistics

People Dependency

- Skills
- Leadership
- Institutional knowledge

Technology Dependency

- Software
- Data
- Connectivity
- Cybersecurity

Financial Dependency

- Cashflow
- Credit facilities
- Investor confidence

The challenge for leadership teams is not simply identifying these dependencies.

It is understanding which ones matter most.

Questions that can help include:

- Which dependency would create the greatest disruption if removed?
- Which dependency would be hardest to replace?
- Which dependency is least understood?
- Which dependency is becoming more important over time?

Businesses that understand these relationships are often better positioned to anticipate change and respond effectively when disruption occurs.

14. Dependency Chains In Government

Dependency chains are equally important within public services and government.

Healthcare depends upon:

- Workforce availability
- Energy
- Pharmaceuticals
- Medical equipment
- Digital systems

Education depends upon:

- Teachers
- Infrastructure
- Funding
- Technology
- Community support

National security depends upon:

- Defence capability
- Energy security
- Industrial capacity
- Supply chains
- Critical infrastructure

Government therefore faces the challenge of managing multiple dependency chains simultaneously.

The difficulty is compounded by scale.

Changes in one area can create consequences elsewhere.

For example:

Energy

↓

Industrial Competitiveness

↓

Employment

↓

Tax Revenues

↓

Public Services

A decision made within one policy area may therefore create consequences across multiple others.

This is one reason why systems thinking is becoming increasingly important for policymakers.

The objective is not merely to optimise individual departments.

It is to improve the performance of the wider system.

15. Questions Decision-Makers Should Ask

Understanding dependency chains begins with asking better questions.

The following questions may provide a useful starting point.

Visibility

- What are our most important dependencies?
- Which dependencies have never been formally mapped?
- Which dependencies do we understand least?

Resilience

- Which dependency would create the greatest disruption if removed?
- Which dependency would be hardest to replace?
- Which dependency has the least resilience built around it?

Knowledge

- What critical knowledge exists in only one person's head?
- Which capabilities would be difficult to rebuild if lost?

Supply Chains

- What sits behind our suppliers?
- What dependencies do our suppliers rely upon?
- Where are the concentration risks?

Technology

- Which systems are mission-critical?
- What would happen if they became unavailable?

Finance

- Which assumptions underpin our financial forecasts?
- What dependencies support those assumptions?

Strategic Change

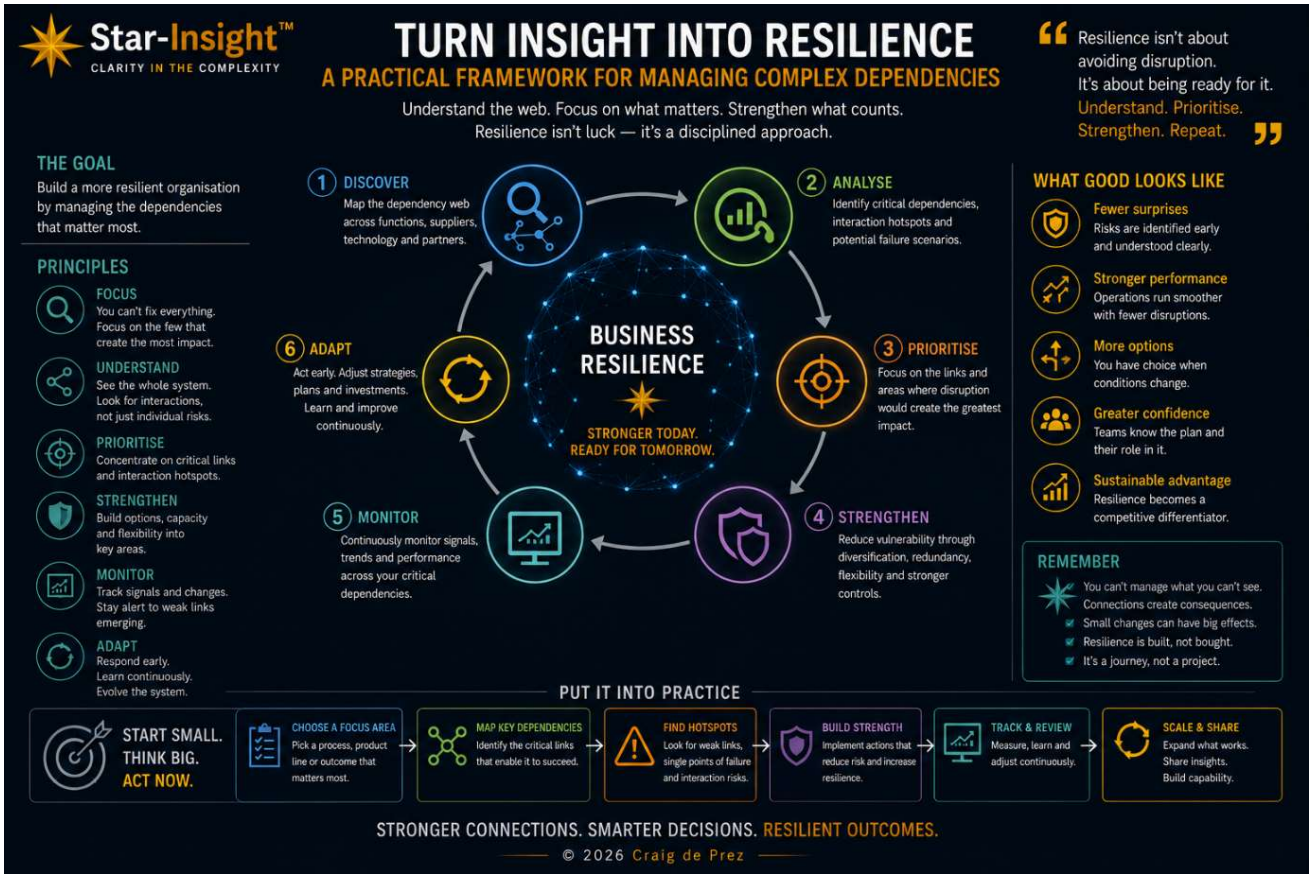
- Which dependency is becoming more important over time?
- Which dependency is becoming less important?
- Which future constraints are visible today but not yet critical?

Interaction Points

- Which risks could interact?
- Which dependencies influence multiple parts of the organisation?
- Where might small disruptions create disproportionate consequences?

These questions may not eliminate uncertainty.

However, they can significantly improve decision clarity.



Understanding dependency chains is only the first step.

The real value emerges when insight is translated into action.

Organisations that understand their dependencies are often better able to:

- Prioritise investment.
- Improve resilience.
- Reduce vulnerability.
- Strengthen continuity.
- Anticipate future constraints.

The objective is not to eliminate risk.

The objective is to make better-informed decisions in a complex and interconnected world.

Decision Clarity Reflection

Most organisations devote considerable attention to performance.

Relatively few devote the same level of attention to the dependencies that make performance possible.

Before moving on, consider:

- Which dependency concerns you most?
- Which dependency have you not examined recently?
- Which dependency would surprise your leadership team if it failed?
- Which dependency is becoming increasingly important?
- Which interaction point creates the greatest uncertainty?

The answers may reveal opportunities for greater resilience, stronger planning and improved decision-making.

They may also highlight areas that deserve further exploration.

Final Reflection

Dependency chains are not new.

What has changed is their scale, complexity and significance.

Modern organisations operate within systems that are increasingly interconnected. Technologies rely upon materials. Materials rely upon energy. Energy relies upon infrastructure. Infrastructure relies upon people, investment and policy.

The challenge is not merely understanding individual components.

It is understanding the relationships between them.

Many strategic failures occur not because decision-makers overlook the obvious.

They occur because a critical dependency sits just beyond visibility.

A supplier's supplier.

A retiring specialist.

A constrained energy market.

A technology dependency that was never fully understood.

A risk that appears manageable in isolation but becomes significant when combined with others.

Dependency chains therefore offer a different way of viewing resilience.

Rather than asking:

"What could go wrong?"

Decision-makers might also ask:

"What enables this to work in the first place?"

The answer frequently reveals opportunities, vulnerabilities and assumptions that would otherwise remain hidden.

The future is unlikely to become less interconnected.

If anything, artificial intelligence, automation, digital infrastructure, geopolitical competition, industrial policy and economic security concerns suggest that interdependence will continue to increase.

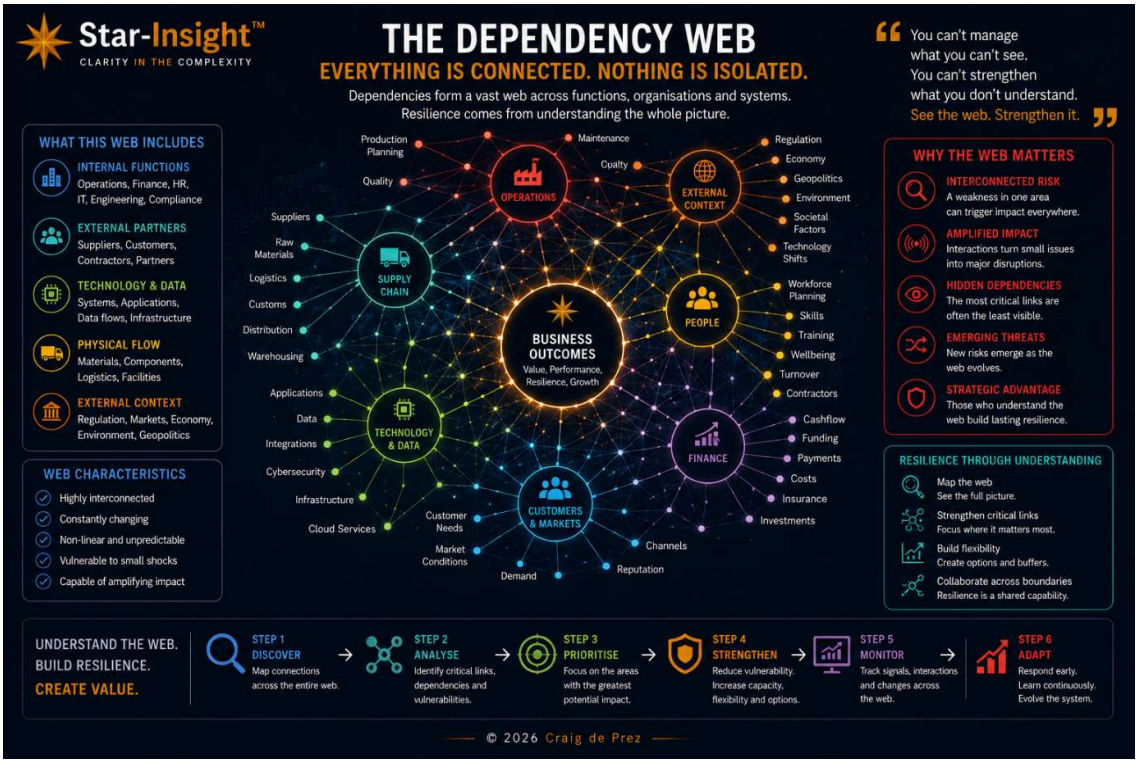
Those organisations that understand their dependency chains are unlikely to eliminate uncertainty.

However, they may be better positioned to:

- Anticipate disruption.
- Prioritise investment.
- Improve resilience.
- Strengthen continuity.
- Make better-informed decisions.

The future may not belong to those with the greatest resources.

It may increasingly belong to those who best understand the systems upon which those resources depend.



Questions Worth Exploring Further

The purpose of this publication is not to provide definitive answers.

Its purpose is to encourage deeper consideration of the systems that underpin performance, resilience and strategic success.

Questions worth exploring further include:

Organisational Questions

- What are the five most important dependencies within our organisation?
- Which dependency creates the greatest concentration of risk?
- Which dependency do we understand least?

Supply Chain Questions

- How many levels of our supply chain have been mapped?
- Which supplier dependencies remain invisible?
- What would happen if a key supplier disappeared tomorrow?

Workforce Questions

- Which knowledge assets are most vulnerable?
- How much capability depends upon specific individuals?
- What succession risks exist today?

Technology Questions

- Which technologies have become mission-critical?
- What sits behind those technologies?
- How resilient are those supporting systems?

Strategic Questions

- What assumptions underpin our plans?
- Which assumptions have never been tested?
- Which dependencies are becoming more important over time?

Leadership Questions

- Which risks are viewed in isolation?
- Which risks could interact?
- Where might the biggest surprises emerge?

The answers to these questions may provide the foundation for stronger planning, greater

Reference Sources & Further Reading

This publication draws upon publicly available information, industry reports, academic research, government publications and strategic analysis relating to:

- Supply chains and supply-chain resilience
- Industrial strategy and national competitiveness
- Economic resilience and productivity
- Semiconductor manufacturing and technology ecosystems
- Energy systems and infrastructure dependencies
- Steel production and industrial capability
- Systems thinking and complexity theory
- Strategic risk management
- Organisational resilience
- Knowledge management and institutional memory
- Critical national infrastructure
- Dependency mapping and network effects

The observations, frameworks and questions presented within this publication have been informed by research and publications from organisations including:

International & Economic Bodies

- Organisation for Economic Co-operation and Development (OECD)
- International Monetary Fund (IMF)
- World Bank
- World Economic Forum (WEF)
- United Nations Industrial Development Organisation (UNIDO)

Energy, Technology & Infrastructure

- International Energy Agency (IEA)
- International Renewable Energy Agency (IRENA)
- National Grid ESO and related infrastructure publications
- Semiconductor Industry Association (SIA)
- SEMI (Semiconductor Equipment and Materials International)

Industrial & Manufacturing Organisations

- Make UK
- Enginuity
- British Chambers of Commerce (BCC)
- Confederation of British Industry (CBI)
- Engineering Employers Federation publications

- Industry sector reports from manufacturing, engineering and supply-chain bodies

Government & Public Policy

- UK Government Industrial Strategy publications
- Department for Business & Trade reports
- Parliamentary Committee reports
- National Audit Office publications
- Government Office for Science publications
- Defence, energy and infrastructure strategy papers

Academic & Strategic Disciplines

- Systems Thinking
- Complexity Science
- Network Theory
- Organisational Behaviour
- Knowledge Management
- Strategic Management
- Decision Science
- Risk & Resilience Management

Readers are encouraged to consult additional sources relevant to their own sectors, industries and operational environments.

The objective of this publication is not to provide definitive answers, but to encourage broader thinking about the dependencies, interactions and hidden constraints that often shape outcomes across organisations, industries and economies.

Published Titles

PIB 001 - The UK Steel Challenge
Why steel remains a strategic capability rather than simply a commodity.

PIB 002 - Europe's Bottleneck
How shared industrial dependencies are reshaping resilience and competitiveness.

PIB 003 - The UK Construction Challenge
Understanding the foundations, constraints and opportunities within Britain's construction ecosystem.

PIB 004 – The Commercialisation of Policy
How Geopolitical and Regulatory Change Become Competitive Sales Tools

PIB 005 - The Defence Layer
The capability missing from many industrial strategy discussions.

PIB 006 - The Dependency Chain
Why the most important parts of a strategy are often the parts nobody talks about.

PIB 007 - The Power Gap
Why Electricity May Become Britain's Most Important Strategic Resource

PIB 008 - The Semiconductor Challenge
Semiconductors, sovereignty and strategic dependence in an increasingly uncertain world.

PIB 009 - The Memory Gap
Why nations that fail to retain institutional memory risk repeating the same mistakes.

PIB 010 - The Cyber-Security Challenge
Protecting critical systems in an interconnected economy.

PIB 011 - The Communications Challenge
Why information movement has become critical infrastructure.

PIB 012 - The Silicon Glen Question
What happens when a nation loses an ecosystem?

Each publication forms part of the wider Star-Insight™ mission to improve visibility, understanding and decision clarity within increasingly complex operating environments.

Companion Resources

Executive Asset 001 - UK Steel Strategic Exposure Assessment Workbook

A practical framework to help organisations identify and reduce commercial exposure.

Executive Asset 002 – Business Transformation Readiness (Coming Soon)

New Public Interest Briefings and Workbooks will be added periodically as new strategic challenges emerge.

Additional Resources

PIB 006 forms part of a growing series of Star-Insight™ publications exploring capability, resilience, institutional memory and industrial competitiveness.

Additional tools, scorecards, workbooks and assessments referenced within this publication are currently being refined and may become available in due course.

Readers interested in related publications and future developments are invited to visit:

https://www.reflexitmarketing.com/star-insight

About the Author

Craig de Prez is the creator of Star-Insight™, an independent strategic systems intelligence initiative focused on helping organisations, industries and policymakers improve decision quality in complex environments.

Drawing upon more than three decades of experience spanning sales, marketing, business development, enterprise software, industrial ecosystems and capability mapping, Craig's work explores the interdependencies that influence economic resilience, institutional memory, industrial competitiveness and long-term national prosperity.

Through Public Interest Briefings (PIBs), Strategic Observation Briefs (SOBs), Executive Assessments and related publications, Star-Insight™ seeks to identify overlooked dependencies, surface "unknown unknowns" and stimulate informed discussion about the choices facing organisations, sectors and nations.

The objective is not simply to highlight problems, but to explore practical mechanisms that help restore, repair and retain valuable capabilities before they are lost.

Star-Insight™
Clarity in the Complexity.

Helping organisations create better decision clarity in increasingly complex environments.

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