

# **BUILDING RESILIENT ORGANIZATIONS**

## **ABSTRACT**

A theoretical model is presented identifying the salient features that characterize a resilient business organization. Drawing on the systems theory literature, a business is firstly characterized in terms of its technical, social and economic sub-systems. Secondly, the kinds of perturbations a business system might need to guard against are identified according to local, national and global spheres of influence. Thirdly, I argue that a resilient business system must attend to the goals of redundancy, requisite variety and resources. Finally, when these attributes (sub-systems, spheres of influence, goals) are juxtaposed certain business artifacts become evident as critical to enabling organizational resilience.

**Keywords:** resilience, systems theory, external perturbations, complexity

## **INTRODUCTION**

The concept of resilience has its genesis in individual psychology and the science of child behavior (Coutu, 2002; Reinmoeller and van Baardwijk, 2005), has been actively taken up in the social-ecological literature (Walker and Salt, 2006), and more recently brought into the business literature (Coutu, 2002; Hamel and Välikangas, 2003; Reinmoeller and van Baardwijk, 2005). Resilient people are able to deal with trauma in their life (e.g., illness or divorce), to overcome adversity and bounce back. Resilient ecological systems are able to cope with natural disaster (e.g., fire or flood) by recovering. Resilient businesses can deal with shocks (e.g., a market crash or terrorist attack) and survive. Resilience, it seems, is the

imperative for the 21<sup>st</sup> century.

We are increasingly living in a turbulent world. One hundred years ago major disasters in one country had minimal effects on another. Today, however, business transactions transcend the globe, business corporations operate in multiple countries and the actions of individuals (e.g., through terrorism) can affect the world economy. Stability, therefore, appears to belong to a bygone era.

In the business literature, resilience seems to have taken on an almost a mystical or religious fervor. Coutu (2002), for example, suggests that resilient organizations need three key ingredients: acceptance of reality, deeply held values that yield meaning, and the ability to improvise. Hamel and Välikangas (2003) claim that resilient organizations should pursue the goal of zero trauma (akin to zero defects in the quality literature) and in doing so must address four challenges: the cognitive challenge (free of denial, nostalgia and arrogance), the strategic challenge (ability to generate alternatives or options), the political challenge (divert resources into new ideas) and the ideological challenge (renewing continuously). While these ideas have some appeal, they offer little by way of tangible insight into characterizing resilient organizations or for developing resilient organizations.

Psychological approaches to resilience are limited because a business is more than the sum of its individual employees. Developing resilient employees, one-by-one could be time-consuming and will not necessarily result in a resilient business system. Following best practice is also limited, as optimizing business activity assumes a stable environment. The renewal and risk literature generally offers a reactionary approach, waiting to deal with problems as they arise. Waiting for catastrophe would appear rather blasé. The medical model of zero trauma suggests that trauma can be eradicated, like defects. By its very nature, however, trauma is random and unpredictable; eradication implies forewarning.

At the heart of resilience thinking in the social–ecology literature are notions of adaptability, self–organization, and non–linear trajectories (Walker, cited in McDonald, 2007). These are systems theory ideas: adaptation implies interaction with the environment, self–organization suggests the ability to adjust to the environment, and non–linear trajectories recognize that the future may hold something different than the past. Fletcher, Miller, and Hilbert (2006) offer the following definition for resilience: *...the capacity of a system to undergo disturbance or perturbation and maintain its defining structure, functions and controls by absorbing the disturbance and reorganizing*. This definition appears suitable for describing ecological systems as well as business systems inasmuch as it relies on an understanding of the capacity of the system to adjust to external influences (perturbations), and acknowledges that a system has a continuity (must maintain its identity) rather than focus on reinventing (renewing) itself. Modeling resilience for a business, rather than an ecological, system requires unpacking this definition in this way:

- What is a (business) system?
- What kinds of disturbances or perturbations might impact a (business) system?
- What capacity enables a (business) system to be resilient to perturbations?
- What artifacts (practices, characteristics) must be resident (maintained) within a (business) system to enable reorganization?

An examination of these questions will provide a means for understanding resilience of a business organization.

### **THE COMPLEX ARRANGEMENT OF BUSINESS SYSTEMS**

There have been numerous attempts to define the static elements of a business system. Rasiel and Friga (2001), for example, consider a business across seven elements: strategy, structure,

skills, staff, style, systems and shared values. Rasiel and Friga (2001) claim that strategy, structure and systems are the 'hard' elements, whereas skills, staff, style and shared values represent the 'soft' elements. These seven elements have become a popular way of examining business organizations through the consulting work of McKinsey and Co. However, Glassop (2005) argues that the effort required to consider seven elements is cumbersome and that four attributes capture the essential dimensions: strategy, structure, staff (inclusive of style, skills and shared values) and systems. Socio-technical systems (STS) theory further refines these criteria to the technical system (procedures, methods, equipment) and the social system (staff and how they are structured into a social system) (Emery 1997). However, STS ignores strategy and the economic realities of undertaking work. Money is the life-blood of an organization; without money, a business organization ceases to exist. I contest that a business system needs to be considered in terms of its technical, social and economic sub-systems.

- The technical system of a business involves those parts of the business that are independent, that rely on nothing for their existence (Glassop, 2007). The technical system includes: machinery, tools, computers, buildings, policies, procedures and process maps. These technical artifacts exist independent of work being undertaken; they are the structural attributes of the business (Glassop, 2007).
- The social system of a business refers to the open systems that are dependent on closed systems to function (Glassop, 2007). The social system includes the employees of a business and how employees are organized (organization structure). Employees represent the organizational parts of a business system that depend on the technical system in order to undertake work (Glassop, 2007).
- The economic system of a business is its life-blood; the process that allows work to be undertaken (Glassop, 2007). Money purchases the technical system (equipment) and compensates the social system (people). The economic system is inter-

dependent; it flows from the interaction of the technical and social systems (e.g., product/service income). The economic system includes all the financial aspects: assets, liabilities, cash flow, working capital, equity and so on.

A business systems is not a simple structure, it is a complex web of parts (technical structure, social organization and economic process). To consider the notion of resilience, we must include this complex arrangement.

### **PERTURBATIONS TO A BUSINESS SYSTEM**

Returning to the definition of resilience offered by Fletcher, Miller, and Hilbert (2006), we find that resilience is: "...the capacity of a system to undergo disturbance or perturbation..."

The kinds of perturbations a business system is likely to encounter must be investigated.

Perturbations are disturbances that emanate from the environment towards a system. The environment of a business system is everything that exists beyond the boundaries of that system. The boundaries of a business system are often difficult to grasp as a business can be dispersed over several locations. Zaiger–Roberts (1994) offers a way to consider the boundary of any system in terms of three criteria: time, territory and task:

- A business generally operates between certain hours (e.g., 9am to 5pm), thus the business exists during its business hours or at a specific time that work is actually being undertaken (e.g., when I am at my computer at home).
- A business typically operates in certain locations (territories) where the employees of the business reside. Location can be a fixed address (a building), a person working from home, or indeed the space utilized while traveling to another location (in a train or plane). A business exists in the territory (location) where employees are doing work.

- The third element to define the boundary of a business system is its (primary) task; that is, what the business seeks to achieve (i.e., offer products and/or services of a certain kind). A business exists when the primary task of the business is being undertaken by employees in a certain place.

Time, territory and task act as ribbons hanging from a maypole, where the maypole is the business itself. Employees hang onto these ribbons (time, territory and task) and when doing so, the *task* (work) of the business system is deemed to be occurring at a specific *time* in a specific *territory* (place). For example, if I am in a train reviewing papers for work, then the task of the organization is being undertaken, even if the location is transient.

The environment that surrounds a business is everything that might impact the time, territory and task of the business. Environment, however, can extend a long way. Under chaos theory we know that small perturbations in one region may eventually impact a system in unpredictable ways (Capra, 1996: 132). Therefore, it is necessary to consider different spheres of influence. Such spheres of influence can be considered as ever-widening concentric circles surrounding the business: local, national and global spheres of influence (see Table 1):

The local sphere of influence includes those conditions (variables) that have an immediate impact on the operation of the business. Local conditions might be considered “in-house” perturbations as they occur within the realm of a single business operation. Local perturbations might include problems with the technical system (e.g., machine failure, a business fire), the social system (e.g., employee illness or strike) or the economic system (e.g., fraud).

The national sphere of influence includes those conditions (variables) that might impact the industry or marketplace within which the business is operating. Porter’s five forces (buyers, suppliers, substitutes, new entrants, industry rivalry) offers a way of examining some of these

perturbations (Fleischer and Bensoussan, 2003), however, Porter examines influences from the marketplace only. National perturbations might include: demand fluctuations (i.e., consumer interest in product/services), productivity fluctuations (e.g., a national strike or a road disaster preventing employees from reaching their place of work) and micro-economic fluctuations (e.g., interest rate fluctuations, changes to political governance. The PEST model—political, economic, social, technological— might also be appropriate here (Fleischer and Bensoussan, 2002).

The global sphere of influence includes those conditions (variables) that impact all business organizations in a universal way. Such impacts might be subtle, take some time for their effects to germinate or be felt immediately (e.g., in the case of a world war or terrorist activity, such as the bombing of the world trade centre). Within a business system global effects might include: resource fluctuations (e.g., the supply of oil), labor fluctuations (e.g., skill shortages) and macro-economic fluctuations (e.g., trade restrictions, embargoes, stock market crash).

---

Insert table 1 about here

---

Environmental perturbations can be classified as those external influences affecting one (individual), some (categorical) or all (universal) business systems (Glassop, 2007).

### **RESILIENT CAPACITY**

Inspecting the definition of resilience we note resilience as: "...the capacity of a system ...” (Fletcher, Miller, and Hilbert, 2006). To have “capacity” means to have: "...the power of receiving or containing...” (Macquarie Dictionary, 1981: 289). If a business system can be defined in terms of a technical structure, a social organization and an economic process, then resilient power must reside along these three dimensions. In this section I consider resilient

power to be contained in: structural redundancy, organizational variety and processual resources.

### **Redundancy Provides Structural Reliance**

The concept of redundancy has often been seen as a dirty word in the business sector, where, for example, a business has excess capacity (employees) that it needs to shed: make redundant. However, in the biological and systems sciences literature redundancy is an essential feature of an open system (Bertalanffy, 1950). To use a biological analogy, human beings store excess energy by way of fat stores. Fat stores ensure that there is a ready supply of energy (to conduct work) in the absence of available inputs. Obesity is where fat stores have become radically excessive: the system becomes cumbersome and prone to breakdown (e.g., illness). Anorexia, by contrast, is where the fat stores are minimal, threatening the very existence of the system (e.g., with heart failure). Conversely, if a living system did not store any energy then energy supplies would be directly related to inputs. Irregular inputs (e.g., gluts and shortages) would create instability (peaks and troughs in energy supply).

Redundancy is an essential feature of maintaining stability of form and hence the continued ability to function.

In a business sense, the concept of redundancy has been incorporated into socio-technical systems theory (STS) (Emery, 1997). STS is underpinned by two principles: redundancy of parts and redundancy of functions: Redundancy of parts means having a social system (employees) that ensures that the task of the business can constantly be delivered. For example, if an employee is absent, who does their work? That is, the business system must ensure that it is not reliant (dependent) on any single individual (energy source) for work to continue. Redundancy of functions means looking at the functional roles within a business and ensuring that backups are in place. For example, empowerment allows employees and managers to both make business decisions. That is, the business system is not reliant on a

single role to make a decision. STS is the basis for theories of self-managing (semi-autonomous) work groups (Glassop, 2000).

System continuity requires a certain level of redundancy to be built-in. Finding the midpoint between obesity and anorexia is not easy (as anyone with a weight problem knows). However, a system must incorporate some redundancy so that the *structure* can be relied upon to continue working efficiently.

### **Requisite Variety Guarantees Organizational Capability**

The principle of requisite variety states that, in order to survive, a system must be as, or more, complex than its environment: variety can only come from variety (Ashby, 1956). A simple example is that an Ant cannot answer a telephone, whereas a human being can; the complexity frames are different.

In the story of David and Goliath we might consider that one system (Goliath) is more complex than another system (David); however, size is not indicative of complexity.

Complexity refers to heterogeneity (diversity) of parts within the system, whereas size refers to quantity of homogeneous (similar) parts (Godfrey-Smith 1996:24). A recent case of two New Zealand school girls causing the multi-national Glaxo corporation to revise its marketing campaign for one of its products (Ribena) demonstrates that information complexity is not the province of large corporations (ABC, 2007). The school girls had proof that the Glaxo claim of a high Vitamin C content in Ribena was false. Hence, Glaxo was forced to revise its marketing approach (because of an external perturbation). In this case, Glaxo had the necessary complexity to appropriately respond to the perturbation. The inability to thwart a business takeover might be a case where one business has more complexity than another business. Thus, the *organization* of a business system must be as or more complex than its environment if survival in that environment is to be guaranteed.

## **Resources Ensure Processual Continuity**

Open systems require various inputs to maintain their existence (Katz and Kahn, 1966). In the biological world, inputs refer to the food, air and water needs of most animals. For a business system, inputs refer to the raw materials (technical system), people (social system) and money (economic system) that enables work to be undertaken. A steady flow of inputs into the system ensures that work (energy) goes uninterrupted.

The planet has a finite amount of resources; for example, oil, water and clean air. In the business world, perturbations are often felt in relation to natural resources. Recently, Australian businesses have been pressured to reduce their water usage in the face of six years of drought. On a global level, low oil production has caused an increase in petrol prices, thereby affecting many businesses, especially those reliant on transport (e.g., airlines). The global call for a reduction in green-house gasses to arrest perturbations in weather patterns is also being felt in the business world through the call to reduce carbon emissions. Resource (input) continuity ensures that the *process* of undertaking work goes undisturbed.

The term “resilient” offers little by way of understanding on its own. Resilient capacity, I suggest, requires incorporating the right amount of redundancy to enable ongoing work activity, having an appropriate level of complexity to respond to environmental perturbations and a continual flow of resources to keep a business alive.

## **CHARACTERISTICS OF A RESILIENT BUSINESS SYSTEM**

Thus far, I have ascertained that a business system has three primary sub-systems: technical, social and economic. I have also determined the range of perturbations that might affect a business operation according to local, national and global spheres of influence. I have further identified that a resilient business system must have the capacity to provide structural reliance

(through redundancy), organizational capability (through requisite variety) and processual continuity (through resources).

The final aspect of resilience that needs analyzing is: how does a business system:

“...maintain its defining structure, functions and controls...” (Fletcher, Miller, and Hilbert 2006)? That is, what do we mean by: “structure, function and controls”? What artifacts (practices) must a business system maintain if it is to be considered a resilient business system?

The characteristics that describe a resilient business system must emerge from the juxtaposition that describes: a business system (technical, social and economic), the range of likely perturbations (local, national and global) and the capacities that enable resilience to be forthcoming (redundancy, requisite variety and resources). Table 2 sets out some artifacts that might be incorporated into a business system to make it resilient to perturbations.

---

Insert Table 2 about here

---

### **Building Redundancy In**

Building redundancy into the business system requires ensuring that the business structure has the capacity to keep running under the influence of a perturbation. An optimal level of redundancy can be achieved by building in business know-how (technical, social and economic). That is, by ensuring that the business system is not overly dependent on any specific device or person. Dependence exposes risk; the risk that the dependent person or thing (e.g., machine) may not deliver.

Technical redundancy includes knowledge of how the task of the organization is undertaken (procedures and process maps), maintenance programs to ensure that equipment is properly maintained and won't fail, and contingency planning as preparation for an unforeseen event

(e.g., an earthquake). The degree to which technical know-how is available throughout the organization will determine its exposure to a disturbance.

Social redundancy includes an understanding of what people are required to do, the knowledge that tasks can be undertaken by multiple people (through cross-skilling), and planning for succession should an individual leave or be promoted. Ensuring that the task of the business is not dependent upon certain individuals provides reliance on the system and not any specific individual/s.

Economic redundancy ensures that the business is able to operate in terms of paying immediate bills; that is, having sufficient working capital to keep the business afloat.

Insufficient funds may prevent securing needed inputs and paying for labor. Economic redundancy also means having short-term budgets and financial plans in place to provide financial security.

Redundancy ensures that a business system can be relied upon; that the system can continue to function irrespective of perturbations that might occur.

### **Developing Requisite Variety**

Requisite variety requires that the business have a level of complexity that provides flexibility and responsiveness. The old adage “don’t have all your eggs in one basket” might be an appropriate warning here.

Technical variety includes having a diversity of products and customers. Diversity guarantees that the business is not reliant on just a few customers and/or products. Reliance on a few, exposes a business should something happen to their product or customer. The whims of the market can be guarded against by having diversity in products and customers. Competition intensity might also need to be considered. The lack of competition may give rise to complacency and too much competition might cause a business to be reactionary. t

Social variety refers to the diversity of the workforce and how they are managed. Employee morale is important for having employees willing and able to respond to a disturbance.

Employee involvement and holographic management ensure that the workforce is flexible and that business decisions are not located with single individuals (thereby increasing risk).

Economic variety means attending to the financial risk profile of the business. From a Balance Sheet perspective, this means ensuring that the firm is not over extended in terms of debt, having excess stock (that might become obsolete) or insufficient stock where demand for products/services cannot be met. Also, economic capability can be more assured with a stable/competent Board of Directors (or governing body).

Requisite variety guarantees that the organization of the business system includes the necessary capability to respond to perturbations.

### **Securing Resources**

Business organizations are value-added entities that rely on a steady stream of inputs.

Without inputs, a business cannot add value for its customers and will become irrelevant.

Globalization places pressure on resources through increased competition and a decline in natural resources (e.g., decline in trees and thus timber and paper). How dependent an organization is on specific resources will determine the degree to which it is able to guard against perturbations (Jaffee 2002).

Technical resources include the raw materials that a business requires to produce its products or services, the technology that is needed to add-value and the information that it is reliant upon for decision-making. The level of dependence on inputs needs to be ascertained to guard against perturbations in supply of inputs.

Social resources includes access to the labor that a business requires, the degree to which incumbent employees are trained and developed, and whether the business is able to keep

such employees through career development programs. While some labor turnover might be appropriate to bring fresh ideas into a business, too much turnover is disruptive to the business system and costly. Also, certain industries regularly experience labor shortages that not only increase labor costs, but threaten the very task of the business. Labor shortages are currently being felt in Australia in the areas of nursing, accounting, construction, medicine and dentistry. Immigration laws are being refined to attract individuals in these fields, but, in turn, these changes to immigration laws are affecting educational organizations.

Economic resources to ensure processual continuity include access to funding (i.e., the attractiveness of the business to stock market/investors, thereby enabling/preventing growth), the degree to which the business is interfered with through government regulations (thereby thwarting growth and consuming management attention) and whether the business has done its homework vis-à-vis its long-term outlook (in seeking growth).

The regular supply of resources to a business ensures operational continuity. Continuity of supply should never be assumed, but monitored to guard against potential perturbations.

### **RESEARCH AGENDA**

Resilience is pivotal to surviving in today's turbulent, global business world. The need to diagnose how resilient a business is will allow intervention programs to increase resilience.

Relying on individuals being resilient assumes that the whole is equal to the sum of the parts. We know from systems theory literature that the whole acts different to the sum and therefore need a way to view the whole business. Relying on a business to meet certain 'challenges', as Hamel and Välikangas (2003) suggests, does not provide a concrete means for determining how these challenges should be met. Best practice models have their limitations as they tend to suggest that every business is the same, irrespective of its products customers, size,

heritage, and so on. However, as the TQM literature has demonstrated, companies pursuing best practice in TQM can do so in a variety of ways, and does lead to a level of sustainability. The model outlined in this paper provides a way to examine how resilient our business organizations really are. The degree to which certain artifacts are present in an organization may offer a way to diagnose levels of resilience and plan appropriate interventions. However, the model is yet to be empirically tested. The detailed items, noted in Table 1 and 2, need to be verified via case study analysis. Case study analysis will enable items to be fully investigated to ascertain their relevance and inclusion in the listing. Scales must then be developed for these items to facilitate examination of different organizational states. Widespread data collection can then occur to isolate the likely points at which a business system might experience catastrophic collapse (Fletcher, Miller and Hilbert, 2006). This kind of modeling is consistent with identifying attractors; that is, ascertaining the strength of a business's internal characteristics to guard against different levels/kinds of external perturbation. Sensitivity analysis of this kind will lead to more in-depth understanding of the dynamics that generate resilient businesses in a complex world.

## REFERENCES

- ABC. (2007). Students' Juicy Discovery Lands Ribena Producers in Court. *7:30 Report*.  
Source: <http://www.abc.net.au/7.30/content/2007/s1882263.htm>
- Ashby, W.R. (1956). Self-regulation and Requisite Variety, in F.E. Emery (ed), *Systems Thinking: Selected Readings Volume 1*, ISBN: 0140803955 105–124.
- Bertalanffy, L., von (1950). The Theory of Open Systems in Physics and Biology, in F.E. Emery (ed), *Systems Thinking: Selected Readings Volume 1*, ISBN: 0140803955 pp. 70–85.
- Capra, F. (1996). *The Web of Life: A new synthesis of mind and matter*, ISBN: 0-00-654751-6..
- Coutu, D. (2002). How Resilience Works. *Harvard Business Review*. ISSN: (printed): 0017-8012. May 2002, pp. 46–55.
- Emery, F.E. (1997) Characteristics of Socio-Technical Systems, in E. Trist and H. Murray (Eds), *The Social Engagement of Social Science: A Tavistock anthology, Vol II: The socio-technical perspective*, ISBN: 9781853431654. pp. 157-186.
- Fletcher, C., Miller, C., and Hilbert, D.W. (2006). Operationalising Resilience in Australian and New Zealand Agroecosystems, in J. Wilby, J. Allen and C. Loureiro-Koechlin (Eds), *Proceedings of the 50<sup>th</sup> Annual Conference: The International Society for the Systems Sciences*, ISSS, Sonoma, USA.
- Fleischer, C. and Bensoussan, B (2002) *Strategic and Competitive Analysis*. ISBN: 0130888524

- Glassop, L.I. (2002). The Benefits of Teams, *Human Relations*, ISSN (printed): 0018-7267. 55(2): 225–249.
- Glassop, L.I. (2005). Professionalizing the Family Business: What does it mean? in L.I. Glassop and D. Waddell (Eds). *Managing Family Businesses*, ISBN: 978-1 920889-06-7. pp. 21–37.
- Glassop, L.I. (2007). *Rethinking Causality: Pattern as the science of change*. ISBN: 978-1-920889-18-0.
- Godfrey-Smith, P. (1996). *Complexity and the Function of Mind in Nature*, ISBN: 0-521-45166-3.
- Hamel, G., and Välikangas, L. (2003) The Quest for Resilience. *Harvard Business Review*. ISSN (printed): 0017-8012. September 2003, pp. 52–63.
- Jaffee, D. (2001) ‘Resource Dependency Theory: resource dependence and agency costs’ *Organizational Theory: tension and change*, ISBN: 0-07-234166-1. pp. 217–225
- Katz, D. and Kahn, L. (1966). Common Characteristics in Open Systems, in F.E. Emery (Ed.), *Systems Thinking: Selected Readings Volume 1*. ISBN: 0140803955 pp. 86–104.
- Rasiel, E., and Friga, P.N. (2001) *The McKinsey Mind: Understanding and implementing the problem-solving and management techniques of the world’s top strategic consulting firm*, ISBN:-10: 0071374299.
- MacDonald, T. (2007) Resilience Thinking: Interview with Brian Walker. *Ecological Management and Restoration*, ISSN (printed): 1522-4740. 8:2, pp. 85–91.
- Reinmoeller, P., and van Baardwijk, N. (2005) The Link Between Diversity and Resilience. *MIT Sloan Management Review*. ISSN (printed): 1532-9194. Summer 2005, pp. 61–65.

Zaiger–Roberts, V. (1994). The Organization of Work: Contributions from open systems theory, in A. Obholzer and V. Zaiger–Roberts (Eds,) *The Unconscious at Work: Individual and Organisational Stress in the Human Services*, ISBN (paperback): 978-0-415-10206-3. pp. 28–38.

**TABLE 1**

**Potential perturbations for a business system**

<b>Business sub-system / Sphere of influence</b>	<b>Technical System</b>	<b>Social System</b>	<b>Economic System</b>
<b>Local conditions</b> <i>(one business)</i>	<ul style="list-style-type: none"> <li>• Physical disaster (e.g., machine failure)</li> </ul>	<ul style="list-style-type: none"> <li>• Employee disaster (e.g., accidents, illness, strikes)</li> </ul>	<ul style="list-style-type: none"> <li>• Financial disaster (e.g., fraud, cash flow)</li> </ul>
<b>National conditions</b> <i>(some businesses)</i>	<ul style="list-style-type: none"> <li>• Demand fluctuations (peaks and troughs)</li> </ul>	<ul style="list-style-type: none"> <li>• Productivity fluctuations (highs and lows)</li> </ul>	<ul style="list-style-type: none"> <li>• Micro-economic fluctuations (e.g., inflation, exchange rates, interest rates)</li> </ul>
<b>Global conditions</b> <i>(all businesses)</i>	<ul style="list-style-type: none"> <li>• Resource fluctuations (shortages and gluts)</li> </ul>	<ul style="list-style-type: none"> <li>• Labor fluctuations (excess and shortage)</li> </ul>	<ul style="list-style-type: none"> <li>• Macro-economic fluctuations (e.g., trade restrictions)</li> </ul>

TABLE 2

Potential artifacts in a resilient business system

<i>Resilience Attribute</i> (goal)	<i>Business System Artifacts</i> (technical–social–economic sub–systems)
<p><b>Redundancy</b> (provides structural reliance)</p>	<p><b>Technical (reliance on know–how):</b></p> <ul style="list-style-type: none"> <li>• Process maps &amp; procedures (knowing how the system works)</li> <li>• Technology maintenance (knowing that technology works)</li> <li>• Contingency planning (knowing what to do when failure occurs)</li> </ul> <p><b>Social (reliance on know–how):</b></p> <ul style="list-style-type: none"> <li>• Role &amp; competency profiles (knowing who does what)</li> <li>• Cross–skilling of employees (knowing more than a single task)</li> <li>• Succession planning for key roles (knowing how to keep tasks going)</li> </ul> <p><b>Economic (reliance on know–how):</b></p> <ul style="list-style-type: none"> <li>• Cash flow (knowing we can operate business)</li> <li>• Days interest (knowing debts can be serviced)</li> <li>• Financial budget/plan (knowing our financial future is secure)</li> </ul>
<p><b>Requisite variety</b> (guarantees organizational capability)</p>	<p><b>Technical (market capability):</b></p> <ul style="list-style-type: none"> <li>• Product diversity (capable of offering more than one product)</li> <li>• Customer diversity (capable of servicing more than one customer)</li> <li>• Competition intensity (capable of dealing with competition)</li> </ul> <p><b>Social (productive capability):</b></p> <ul style="list-style-type: none"> <li>• Employee morale (support, loyalty, values)</li> <li>• Employee involvement/participation (empowerment)</li> <li>• Holographic management (flexibility)</li> </ul> <p><b>Economic (risk capability):</b></p> <ul style="list-style-type: none"> <li>• Debt–equity ratio (financial risk)</li> <li>• Days inventory &amp; sales backlog (ability to respond to demand)</li> <li>• Board stability (ability to respond to perturbations)</li> </ul>
<p><b>Resources</b> (ensures processual continuity)</p>	<p><b>Technical (input continuity):</b></p> <ul style="list-style-type: none"> <li>• Resource dependency (degree of access)</li> <li>• Technology dependency (degree of control)</li> <li>• Information dependency (degree of need)</li> </ul> <p><b>Social (labor continuity or skills):</b></p> <ul style="list-style-type: none"> <li>• Access to skilled labor (secure skills)</li> <li>• Employee development program (develop skills)</li> <li>• Career development program (keep skills)</li> </ul> <p><b>Economic (business continuity or growth):</b></p> <ul style="list-style-type: none"> <li>• Business strategy/plan (clear business direction)</li> <li>• Access to funding (support from the stock market)</li> <li>• Regulatory profile (minimal interference from government)</li> </ul>