ISSN 0961-8309

Volume 41(1) Sept. 2020

Christine Welch[1], Tammi Sinha[2] and Christopher Milner[1]

[1]Portsmouth Business School, UK

[2]Winchester Business School, UK

Variety, innovation and readiness for change in organizations

SYSTEMIST

Publication of
The UK Systems Society

Published by the UK Systems Society

Registered office: Sidelands, Nutgrove Lane, Chew Magna, BRISTOL, BS40 8PU

Registered Charity, No: 1078782

Editor-in-Chief: *Systemist*
Professor Frank Stowell
University of Portsmouth
Portsmouth
Hampshire PO1 2EG
Email: editor-in-chief@systemist.org.uk

Managing Editor: *Systemist*
Dr Christine Welch
Gatcombe House, Copnor Road
Portsmouth PO3 5EJ
Tel: +44 2392 16 0254
Email: editor@systemist.org.uk

Variety, innovation and readiness for change in organizations

Abstract

This paper considers organizations as dynamic open systems, seeking to maintain viable relationships with their environments. It recognizes the endemic nature of change and how modern organizations must respond by innovating in order to remain sustainable and progress, and must promote a culture of readiness. The possible tension between continuous improvement for efficiency in processes and a holistic perspective for innovation is noted, taking into account a need to capture contextual knowledge from all levels in the business. The authors suggest that the Viable Systems Model (Beer, 1985) may be a useful tool for reflection on design of effective management in a balanced and flexible organization. This model attempts to balance variety between organizations and their environments, and between operational units and management, through recursive levels of autonomy.

Keywords: *Viable Systems; Requisite Variety; Innovation; Business Process Improvement.*

Received: 18 September 2020 Accepted: 28 September 2020

Introduction

"We are the inheritors of categorized knowledge; therefore we inherit also a world view that consists of parts strung together, rather than of wholes regarded through different sets of filters. Historically, synthesis seems to have been too much for the human mind – where practical affairs were concerned. … The modern world of science and technology is bred from Aristotle and Aquinas by analysis. The categorization that took hold of medieval scholasticism has really lasted it out. We may see with hindsight that the historic revolts against the scholastics did not shake free from the shackles of their reductionism" (Beer, 1973 p.63)

Business organisations are not just legal and commercial entities. An organization can be conceived as a complex, purposive socio-technical system created in order to bring about and maintain some desired transformation. As a system, it subsists within wider system(s) and an environment of phenomena and forces beyond its control. The term 'system' is here used to denote a mental model that may be useful for the purposes of inquiry and reflection, not in the ontological sense of an object or artifact with concrete, real-world substance (Checkland, 1985, p.765). Viewed as systems involving human beings, organisations are both open and dynamic. On any given day, an organisation can be viewed as a static entity, with an agenda and structures. However, this structure and the relations through which they subsist over time will constantly change as individual people (with their unique characteristics) join and leave, and therefore ideas, visions and culture co-evolve. Organisations are open to a continuing, creative process of interpretation and reinterpretation (Schein, 2017). This reflects, in part, what Vickers referred to as a contemporaneous system for maintaining a stable relationship between organisational system and environment. This is analogous to the relationship which a ship must maintain with the sea in order to remain afloat (Vickers, 1965; 1970). A charted course is helpful if the captain and crew want to reach a destination, but the primary task is to keep the water on the outside. While some authors have viewed business management as primarily concerned with setting of appropriate goals and objectives (e.g. Simon's (1982) view of bounded, technical rationality), Vickers gave primacy to a continuing process of learning about the *organisation in its environment.* This depends upon engagement from everyone involved in the

business with its on-going journey. Formal structures vary – some businesses are structured around distinct, functional activities, others operate in collaborative, multi-skilled teams, but all contributions must be taken into account as part of the collective endeavour of learning and sustaining the organisation. The objective of this paper is to discuss, using relevant literature, how sustainability may be achieved in 21st Century organisations and how the Viable Systems Model (Beer, 1985) might be used as a vehicle for reflection upon organisation amidst the uncertainties of continual transformation.

The term 'sustainability' is now often heard in relation to modern business. This matches well with Vickers' idea of relationship maintaining. The concept has many dimensions. Economic sustainability is clearly essential to a business, at least in the longer-term, but the social dimension must be considered as equally critical to the long-term existence and prosperity of companies (Porter and Kramer, 2006; Martens and Carvalho, 2016). Schein and Schein (2018) point to a need for organizational leaders to recognize increasing task complexity involving "*a dynamic mix of emerging technologies, collaboration between many kinds of expertise provided by team members, and ecosystem partners, who often come from different occupations and national cultures*" (2018, p.21). They also point to a need to embrace the socio-technical nature of production, in which problems that arise may originate in relationships between 'socio micro systems' than in designed artifacts or processes. Without such recognition, managers may be subject to blind spots and poor communication can lead to action that is counter-productive. Not only are workplaces changing but so also are our expectations and values in the work environment. As technologies and the nature of 'work' change, social norms also evolve. It has been noted that technological developments can happen very rapidly, but social systems tend to change more slowly (Roland, 2004; Kemp and Rotman, 2005). This is an important consideration in the management of socio-technical systems, in which the two are indivisible. Nor is technology the only disruptor in the business environment, as the recent global pandemic has illustrated. The rate at which disruptors arise is accelerating to a point in which managers must ask the questions 'what business are we in, and how do we do new things, better'? In response to a turbulent environment, 're-imagining' is needed (Skobelev & Borovik, 2017; Paschek, et al, 2019). Managers are suggesting that their organisations will need to transform approximately every three years in order to keep pace (D'Auria, et al, 2020).

Management in organisations focuses primarily upon creation and delivery of value for customers, which in turn can lead to profit for other stakeholders. Put simply, value is the relationship between what someone beyond the boundary of the organisation desires and what they are willing to pay for it (Miles, 1961). Creating and/or delivering something of value to another person, and doing it as effectively and with as little waste as possible, is one of the keys to organisational sustainability. Much management thinking has therefore focused upon value analysis - an organized and creative approach to promoting value by eliminating unnecessary costs that add nothing to quality of features desired by a customer (Miles, 1989). Porter (1985) proposed a process view of value in his Value Chain Model, as an aid to strategic thinking. In this, he distinguishes between activities that contribute directly to creation of value and those which play a supporting role. In more recent times, the idea of a value web has emerged, since whole value chains are often distributed among a number of organisations. Given a constant tension between opportunities and threats in the environment, strategists need to endeavour to managing risks, seek for additional influence over customer desires and generate new ways to create customer value. At the same time, it will be necessary to seek ways to eliminate waste (Pil and Holweg, 2006). In the decades since Miles' work, systematic approach to business process management (BPM) have been devised and applied in order to promote both efficiency and effectiveness. BPM draws together a set of principles, methods and tools that combine knowledge from Information and Communication technologies, management sciences and industrial engineering (Aalst, et al, 2016). As a process view of value creation has become dominant, operations management thinking has become concerned with smoothing flows of value, and value stream mapping techniques have been developed (Hines and Rich, 1997; Sinha, et al, 2010). A number of management approaches, including Business Process Re-engineering, Lean and SixSigma have been adopted by organisations seeking to optimise their processes[11]. Some authorities have suggested that the relative success of systematic approaches such as these may be based in the extent of employee involvement arising from them (Radnor and Walley, 2008).

[1] BPR was focused upon rapid and revolutionary change in organisations; Lean is a philosophy derived from the Toyota production system, focused upon smoothing flows and eliminating wastes in production processes; while SixSigma uses statistical techniques to reduce process variation and enhance control. See, e.g. Ozcelik, 2010; Assarlind, et al, 2013.

Organisational life is messy and redolent with ambiguity. Mapping of value streams can only be one aspect of an on-going endeavour to move forward while keeping 'an even keel'. Ciborra (2000) drew attention to a paradox arising in modern management. On the one hand, key stakeholders seek to establish control over organizational practices and use of resources. However, the search for sustainable competitiveness in a complex and changing world requires that they encourage innovation. Engaged actors must be empowered to exercise their initiative and creativity, individually and in groups. Rather than establishing control, Ciborra suggests that managers need to engage practical intelligence, which he describes as '*the intelligence of the octopus: flexible, polymorphic, ambiguous, oblique, twisted, circular'* (Ciborra, 2002, p.94). Creativity is widely regarded as '*critical for success and survival through its role as a key input to innovation*' (Litchfield & Gilson, 2012, p.108). Innovation is seen as crucial to competitiveness (see, e.g. Çekmecelioğlu & Günsel, 2013; Gisbert-López et al, 2014; Khalili, 2016). Creativity can 'fundamentally challenge existing ways of doing things within as well as across organisations' (Andersen & Kragh, 2013, p.82). It follows that these qualities are fundamentally associated with change.

Change

Change is now recognized to be endemic in business. In a survey in 2018 of more than 2,000 managers, 47% reported that in order to survive, they needed to reinvent their businesses every three years or less. In 2020, this figure had increased to 58% (Zhexembayeva, 2020). This author goes on to point out two key reflections. First, the popular notion of 'best practice' may no longer be a useful starting point for change. Instead, organizations should seek to learn from their own failures through sharing and discussion. Secondly, the adage *'if it ain't broke, don't fix it'* may no longer be useful in a climate of endemic change. Organizations should become proactive rather than reactive about transformation. BPM focuses upon incremental change to bring about improvements to existing operations. Typically, it uses established tools and techniques of measurement to consider the situation 'As-Is' and move towards a desired 'To-be' on a continuing basis. As such, it is proactive but bounded by existing assumptions and activities. At the same time, organizations are faced with disruptions in the environment, which might come from any direction. In recent years, digital innovation has provided scope for re-imagining how business might be done, or what new ways might be found to please (new) customers. A focus on innovation is less bounded than a search for

continuous improvements. Mendling, et al, (2020) have pointed out a tension that is apparent from the literature. Digital (or any) innovation produces generative capacity to do things differently. BPM, on the other hand, focuses on enhanced efficiency of performance. Digital innovation tends to unfold on an 'ad-hoc and anarchistic fashion driven by situational opportunities' (Mendling, et al, p.2010) and thus it is generated from the bottom up. BPM, on the other hand, unfolds from strategic requirements – its impact is top-down. Organizations seeking to pursue successful transformations need to address this tension within an overall focus upon collaborative learning. Motwani, et al (2002), looking into successful implementation of enterprise resource management systems, suggest that *readiness* for change is a key to success. The term 'readiness' refers to organizational members' beliefs, attitudes, and intentions (Armenakis, 1993). At one time, there was a widespread belief that up to 70% of change initiatives resulted in failure, but much depends upon the way in which 'success' is defined. Opinions vary as to the extent of failures in change initiatives, since there may be partial successes and, indeed, unintended benefits, as well as actual failure (Hughes, 2011). In 2007, Williams reported a survey by the IT Governance Institute covering 1600 IT projects. 52% of these were expected to lead to negative returns, 31% actually destroying value for the companies concerned. Thomas, et al (2016) suggest that managers often feel obliged to make clear the value desired from proposed change at the inception of an initiative. Such statements are of necessity rigid and simplified. Judgment of success or failure may therefore be attributed to poor discourse about benefits. McClean, et al (2017), reviewing case work on change projects, found that the factors most often identified as involved in success were culture and environment, as well as motives and expectations. Jurisch, et al (2016), using case survey methodology, demonstrated that emergent risks are critical in business process change, especially those relating to user participation, management support, governance and target volatility. Jinasena, et al (2020) confirm the importance of going beyond the use of fixed operational indicators in judging success or failure, pointing out that '*multiple stakeholders of such projects need to cooperate, collaborate, and create a synergy of necessary capabilities linked to strategic objectives'* (2020, np). It is the task of management to inculcate a culture of readiness for change.

The imperative to reinvent the business demands continual readiness for change within organizational culture (Schein, 2017), reflecting a sharing of norms and values. How can this be approached in terms both of formulating appropriate

strategies and putting these into effect? Weiner (2009) suggests that readiness refers to a shared resolve among organization members to bring about change, together with their shared belief in their collective capability to do so. Weiner points out that readiness is both a multi-level and a multi-faceted construct. Since an organization may be regarded as a dynamic, open system that is (co-)created and recreated on an ongoing basis by the interactions of the people who are its members (Emery, 2000; Bednar, 2009), readiness for change may be regarded as an emergent quality arising from those interactions. The foundations of readiness lie in both the contextual understandings of engaged professional actors (managers/leaders, employees, customers/clients and possibly partner organizations) regarding potential for change, and their perceptions of the adequacy of current capabilities, resources and leadership in context. In order to promote and capture necessary learning, engaged actors will need appropriate tools and techniques to explore context for change.

Ackoff (1974) offered a categorization of different problematic situations facing managers. Messes, he describes as complex issues which are not well formulated or defined, i.e. open systems of interconnected problem-spaces. Well-formulated or defined issues, with different, contextually dependent solutions, he describes as Problems, i.e. open systems of multiple decision-spaces. In the third category are Puzzles – well-defined problems with a specific solution that can be worked out by applying a recognised method, i.e. a closed system of a decision-space. Pidd refers to this taxonomy in the following way: "*One of the greatest mistakes that can be made when dealing with a mess is to carve off part of the mess, treat it as a problem and then solve it as a puzzle – ignoring its links with other aspects of the mess*." (2003, p.62).

If a mess is broken down into its component parts, and an optimum course of action is applied to each part, the result will not be optimal for the system as a whole which the mess represents. The act of breaking down the system will have destroyed it, i.e. emergent properties have been lost (Ackoff, 1986). We suggest that the interaction of processes (within organizations and across organizational boundaries) create situations that are 'messy'. Thus, the tools and techniques managers adopt to manage value streams and processes must be similarly dynamic, flexible and fit for the purpose of addressing 'wicked' problems. An undue focus on efficiency in particular processes is likely to lead to just the type of fragmentation and sub-optimality that Ackoff warns against. Most uses of the term

'value stream' call for a holistic approach to process analysis. This paper suggests that the Viable Systems Model (Beer, 1985) may provide a holistic view that can be used flexibly.

The Viable Systems Model

A viable system is one which can maintain a stable relationship with its environment and hence its continued existence through appropriate feedback. A viable system balances the demands of its environment but also acts as a coherent whole, so as act effectively. Beer (1985) based his concept of 'viability' of systems in reflections upon Ashby's (1956) Law of Requisite Variety. The key principle here is that only variety can absorb variety, variety being the number of discernibly different states that a dynamic system can occupy. Clearly, for a very complex system it is not possible to enumerate all of these possibilities. Organizational systems are comprised of individual members who are themselves purposeful, intentionally and collectively formulating objectives (Ackoff and Emery, 1972). However, an organization is more than just a collective. It is the interactions between members in their multiple, contextually-dependent roles, that generates those perceived emergent properties that characterize a particular organization as a human activity system (Bednar, 2007). If any part of a system changes or leaves, the effect of that change is reflected in a change in the state of the system as a whole (Ackoff and Emery, 1972). It follows that a system to control an organization must match or exceed the variety of its operational units, or seek to reduce their variety. Beer reflected upon the way in which balance is achieved in the human body, through interaction of three parts. First, *Operation*s – in the context of the body this is the organs and the muscles which carry out all its primary functions. Secondly, the *Metasystem* that ensures all the various Operational units work together in an integrated and harmonious way – achieving internal balance. The third part is the *Environment* - those parts of the outside world which are of direct relevance to the system in focus. Operational units must maintain balance with the Environment if the system is to remain viable. Many examples exist of practical application of the Viable Systems Model to real world organizations (examples can be found, for instance, in Espejo and Harnden, 1989). This paper suggests that this model could be used to maintain an overview of the impact of on-going change upon the effectiveness of operations, in order to enhance value stream analysis in the context of process improvement.

Change and Viability

Projects to bring about business improvement are often initiated as a response to perceived poor performance (or perhaps a less-than-optimal return on investment for stakeholders). In all but the smallest organizations, this suggests that a messy system of problems needs to be addressed. Change may be undertaken incrementally, through efforts at continuous improvement, or may be the result of radical, strategic decisions.

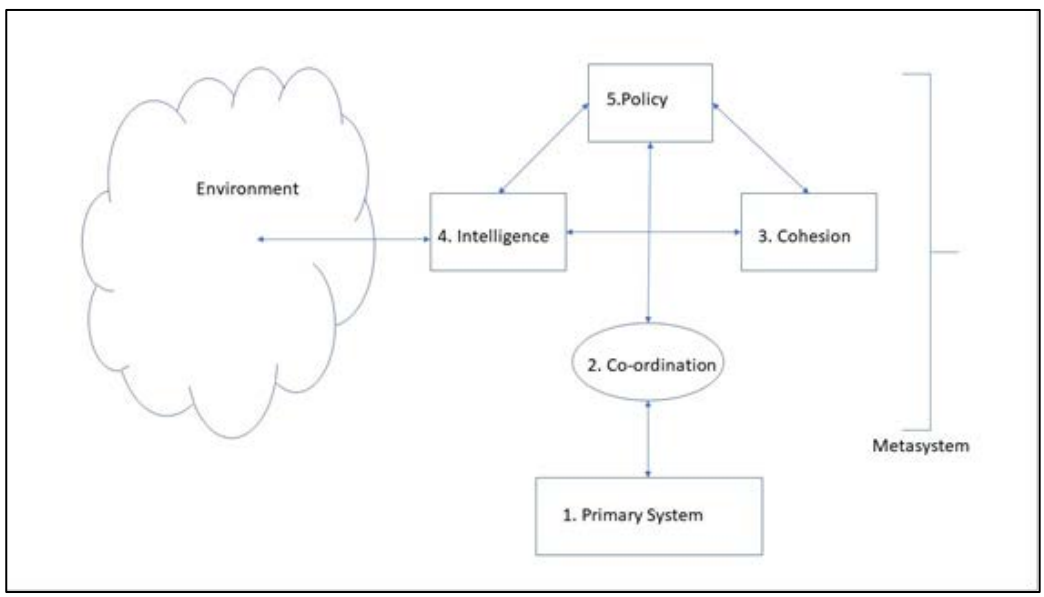

Figure 1 - Elements of the Viable Systems Model

Variety is a measure of complexity and, in the case of complex purposive systems such as a business organization, there is always therefore a problem of balance. Unbalanced variety creates critical tensions: between operations within the system and its environment; and between operational units and management attempting to control their variety (Soliman, et al, 2018). Further tensions arise between autonomy of operational units as against the whole, as management struggles with unbalanced variety. As operational units vie to achieve balance, sub-optimality occurs, i.e. optimizing individual units in isolation from their interactions within the whole system does not result in optimality (balance) for the emergent whole. Thus, too much autonomy leads to loss of synergy while too little threatens the

emergent properties that reflect the purpose of the organization. Further tensions arise between current and future desired states (Hoverstadt, 2011).

Design of appropriate management and control processes have posed difficulties for some organizations, with power often vesting in an elite group close to (and hence accountable to) key stakeholders. This resulted in a hierarchical structure in many cases and had the effect of privileging the views of a small group, starving the organization of learning from contextual knowledge of grass roots actors. Today, polarisation has occurred through the impact of digital technologies, so that many large organizations now have a relatively flat structure and team working has become the norm, but the cultural paradigm of centralised control often still prevails. Its origins lay in Taylorist principles (Taylor, 1911), of Scientific Management, which emphasised a need to break down processes into specific tasks and standardize skill sets in order to reap the benefits of economies of scale. However, products and services of the 21st century require greater variety in technical skill than those of the 20th. For instance, consider the Ford Motor Company. Founder Henry Ford was a mechanical engineer who designed and built a prototype car in his youth before establishing an early assembly plant. He understood the full process of building a motor vehicle. However, the current CEO of Ford, James D. Farley Jnr, is a graduate of economics and computer science with an MBA. He has success in overseeing sales strategy but not in vehicle assembly – this is achieved through people and technologies in specialist roles within the various plants worldwide. Complexity in customer demands and in technology (and the consequent variety) has led to diversification and specialisation that have outstripped the capacity of a Taylorist approach to provide effective centralised control.

Espejo and Harnden (1989) point out that a viable system is one in which actors can respond appropriately to new situations in their environment. The question then arises how strategic managers can act to ensure that everyone within the organization will contribute in the right way to effective adaptation? In a complex purposive activity system, such as an organization, can strategists be sure that their decisions will lead to effective action? History is littered with policy decisions which transpired to be ineffective or counter-productive. Many of the failed IT projects referred to by Williams are the result of a mismatch between the complexity of the transformation involved and the skill set of those deciding to initiate the project. There is a fatal disjuncture between the necessary knowledge

to avoid failure and the locus of decision-making. Espejo and Harnden (1989) refer to 'residual variety' between the briefings received by policy-makers and their actual capacity to make informed decisions. Such a dilemma can often result in anxiety among strategic management about their role, leading to arbitrary decisions and increasing demands for detailed reporting from operational units. We do not carry all our knowledge on the surface of thought. For instance, when we drive, we constantly take in features of the context of travel and adapt our control of the vehicle to the conditions; few of us can later describe exactly the process by which we did this. Human knowledge can be explicit (e.g. reciting aspects of Highway Code) but very often it is implicit in context, or tacit, i.e. the knower is not even aware of its existence although she can draw upon it in action (Polanyi, 1958; 1966; Nonaka and Takeuchi, 1995). In a situation in which senior managers lack necessary tacit knowledge to monitor processes in detail, they often seek for ever greater opportunities to improve their explicit knowledge. Balance can only be achieved by amplifying management variety and attenuating organizational variety.

Espejo suggests that a process of unfolding of complexity will occur (Espejo, 2004), from the most complex level of abstraction to the most concrete. Defining primary activities for the system is the province of policy-makers but implementing those primary activities falls to others. This this unfolding has been observed to produce "*rigid social systems, where those in power positions have forced unfair constraints over the majorities at the local level, and often excluded them*" (Espejo, 2004, p.671). Hierarchical control must be consensual to function effectively in a complex organization: co-operation and compliance are needed. Ultimately, command-and-control approaches do not work even where they are supported by a prevailing cultural acceptance of centralised power, because management cannot manage effectively by decree. Consider the impact of a work-to-rule during industrial disputes – operational actors are able to bring about chaos by enacting exactly what policy-makers have told them to do. Where command-and-control is the prevailing culture, actual practice – doing what it takes to get the job done – is often quite different from that which is officially sanctioned. This is an instance of autonomy being taken, rather than granted (Hoverstadt, 2011). Through self-organization, an informal structure is likely to emerge that makes autonomous action possible. Where, at any point, complexity in a primary activity exceeds the capacity of those responsible for implementation, structural unfolding will occur to encompass a further level of autonomous management – de facto or de jure.

Recursion

When considering the Viable Systems Model in relation to organisational structures, an important principle emerges. At every level, each sub-system must itself fulfil the criteria for viability, including all the elements of the model. If the organization fails to match environmental complexity it will inevitably fail. This may be because its performance falls short of customer expectations, government regulation, availability of resources, or any of a plethora of reasons since environmental complexity has no inherent limit. Balance can only be achieved by reducing complexity or by matching it.

Since tacit knowledge is the key to management of variety at operational level, internal autonomy must balance. Imbalance in organisational complexity leads to arbitrary management and loss of control. A balance may be achieved only by amplifying management variety and attenuating organizational variety; and by amplifying organizational response and (where possible) attenuating environmental variety. How may this be achieved? Hoverstadt (2011) suggests that attenuators could include standardization of products or services; grouping of customers into defined segments with similar characteristics; grouping of employees into work groups linked to primary activities, e.g. divisions, departments, teams. Amplifiers of variety could include increased autonomy of operational units to create responses to environmental or management variety through empowerment to develop and use tacit knowledge and information. George (2003) points out that environmental complexity may be more difficult to address in service industries than in traditional manufacturing. Taking the example of motor manufacture, greater variety in customer demand is absorbed by a modern car plant than was the case with, say, Ford's 1919 production plant for the Model T. Robotics have enabled economies of scope to replace economies of scale – the loss of production time in switching from, say, red to yellow paint is minimal and hence the customer's desires can be satisfied without undue loss of productivity. However, Toyota, for instance, still produce a finite range of models and styles for which they are able to balance variety of operations and management within their system. This contrasts with the financial services market in which a confusing plethora of 'product' offerings have been developed by different firms in the market. This complexity of offering is a feature which, according to George, must be reduced if service organizations are to achieve benefits from 'Leaning' their processes. However, in some cases this is more easily said than done. Radnor and

Walley (2008) point out a fear that success in streamlining health care provision could lead to new demands that would cancel out efficiencies (2008, p.17). Since medical research is continually improving the range of potential treatments, it may be impossible ever to reduce complexity of offering to a level that can be readily matched by operational variety. This reflects a systemic principle that, in defining the scope of 'an organization', we draw a boundary between system and environment. Each response does this anew.

In VSM, different recursive levels within the structure of the system deal with different types of complexity. Thus, focus on decisions falls on different operational units but there is, of course, a need for interaction to avoid de-stabilising other levels.

Unlike hierarchical organizational structures, VSM is not about power as such but about empowerment to manage complexity and difference. Agreement is needed between managements at each recursive level and their operational sub-units about appropriate frameworks for operations.

Primary activities

In any organization, primary tasks can be defined. These are those tasks that must be done to deliver value to the external environment (as opposed to those that must be done to keep the organization ticking over). The identity of a system rests on its primary tasks, i.e. the answer to the question 'what business are we in?' The principles laid down by Womack and Jones (2003) for Lean process management also reflect this view, since it would not otherwise be possible either to specify value demanded by customers or to identify value streams. How should each primary task be structured? In a viable system, breakdown by level reflects the fact that the whole organization can cope with more variety than any one individual within it. The nature of the complexity itself yields the appropriate breakdown into sub-systems. Hoverstadt (2011) suggests that there are a number of potential drivers of complexity, depending upon the primary task(s) addressed by the organization. These may include technology (what operational units must do); geography (the location of the service delivery); customers (who they are and their characteristics); time (when and at what intervals service delivery is required). The order in which complexity is unfolded in the structure is also crucial to performance. This reflects comments by Harris and Harris (2008) about

experiences of Lean project teams. For instance, many Business Process Re-engineering projects failed to deliver because of the resultant decoupling and lack of balance between support activities and the primary activities they are intended to serve (Hoverstadt, 2011, p.102). This may be compared with Checkland's idea of congruence between serving systems, such as data systems, and systems to be served that are directly involved in purposeful activity (Winter, et al, 1995). Unfolding of structure in a viable system needs to follow the natural flow of work. Every primary activity is made up of other primary activities, for which customers are internal.

Beer's organization of the Model was inspired by his reflections upon the interactions among structures in the human body, when viewed as a system. He envisioned this in terms of three interacting aspects: muscles and organs, nervous systems and interaction with the environment. Thus, the first of his elements of interest is operational (analogous to muscles and organs); the second is a Metasystem that ensures that the system is able to act as a balanced and integrated whole (like the sensory system and the brain); the third is the environment within which operations occur. The model focuses on the sub-systems necessary to achieve viability (See Figure 1).

The Metasystem

Maintaining balance within a viable system is the role of System 2 (co-ordination). Autonomy in one primary activity system may impinge on and disrupt another and co-ordination is needed to prevent or control such disturbances. The need for System 2 intervention increases with the number of activities, degree of interdependence between them and degree of co-incidence in their potential impact on the environment. For instance, if the primary activity of sales is approached from geographic drivers, teams are unlikely to disrupt one another at the point of contact with customers. However, if their organization reflects characteristics of product, then the same customer might encounter different teams from time to time and co-ordinating activities may be needed. Interdependence may be internal: one primary activity may be the customer of another or it may be environmental. Co-ordination is needed at each level of recursion and poor design of System 2 could be detected through performance measurement, incidence of chaotic activity, problems that recur or conflict between operational teams. Effective design of System 2 is particularly crucial in relation to change management (see comment on

BPR above). Clearly, from the point of view of viability of the whole, it is better to have a system for anticipation and avoidance of problems, than one which detects and solves them.

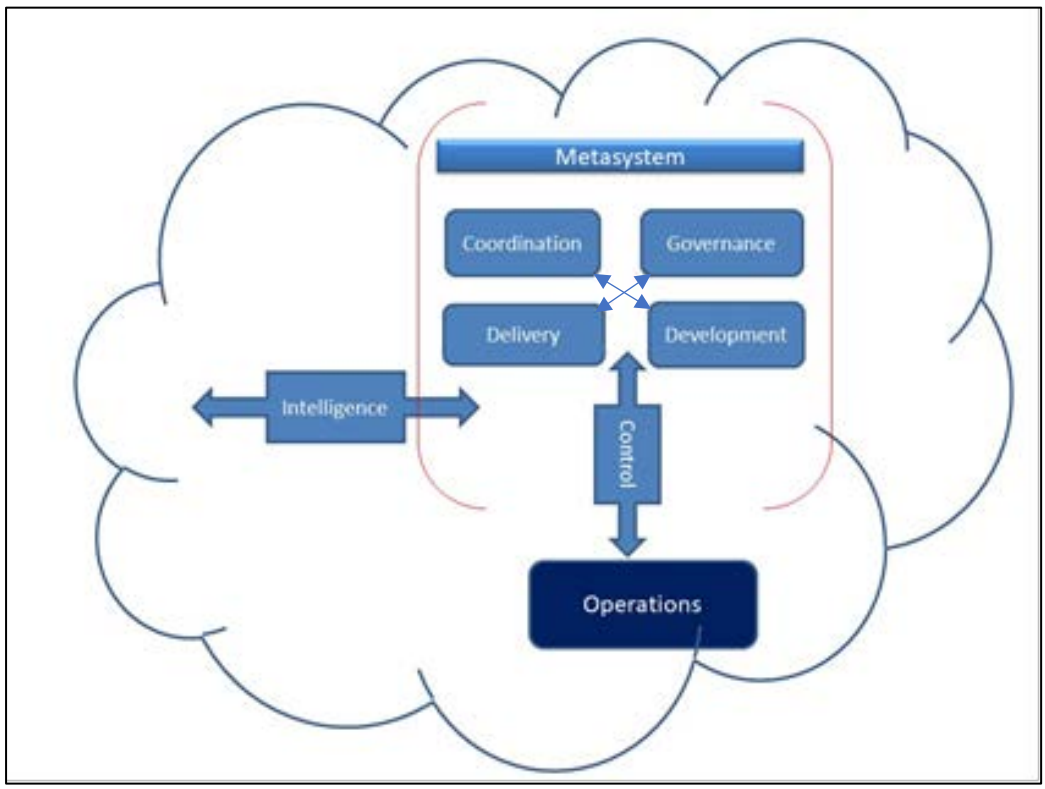

Figure 2 - Elements of the Viable Systems Articulated for Business Management

Features of System 2 will vary with the nature of primary activities but could include established protocols, boundary agreements and standards. However, shared 'language' and organization culture are also System 2 features (Hoverstadt, 2011, p.107). Examples of failure to create effective System 2 abound, but good design is less likely to be noticed and discussed. An example arose in the late 1990's in the Nestle Corporation when they contemplated introduction of an enterprise resource planning (ERP) system. During analysis they discovered that different operational units were paying more than 20 different prices for vanilla

supplies, when their market power as a combined customer could have driven the unit price down considerably (Worthen, 2002). Co-ordination challenges reflect the tension between autonomy of operational units and a need for synergy across the system as a whole. Identifying and removing unnecessary complexity (e.g. through a Lean initiative) is clearly beneficial in this respect.

The next aspect of the Metasystem (System 3) addresses getting things done. This is *delivery* of value to a customer. This will involve a bargaining process between management and constituent sub-systems within a viable system, exchanging resources for performance. Experience suggests that rigid budgetary control mechanisms can cause dysfunction since they encourage ad hoc practices designed to increase autonomy and flexibility, e.g. creative accounting and scrambles to spend the residual budget at the end of an accounting period – both wasteful of resources that could be directed towards value generating activities. Within VSM, autonomy within agreed limits is indicated so that there can be a flexible response to deployment by those with the required tacit knowledge. Performance measurement is crucial here and needs to be designed so as to be both adequate and appropriate at every level of recursion in organizational structures. Opportunities to explore actual practice within the operational unit(s) concerned may be preferable to remote gathering of statistical measures. This is often reflected in the design of a Lean system, e.g. rather than sending messages, personnel walk to the operational unit that needs information so that interpretation is facilitated. Managers walk to the site of production in order to inspect reports in situ (Harris and Harris, 2008).

'Future' management is the focus of System 4 within the Metasystem. Development is needed to ensure a good match is maintained between variety in an organization and in the environment within which it operates. Since change is endemic in the business environment, a viable system is one that is prepared respond in order to cope with on-going change. Thus, a part of the activity in System 4 will be external communication and intelligence gathering. Intelligence looks for strategy gaps and opportunities to close them – this drives evolution and therefore maintenance of viability. Since customers are both the recipients and the source of value to the organisation, it is vital that System 4 brings in data from the outside world, feeds this into processes generating innovation, and also serves to project information outwards to the world to promote renewed desire for the organisation's output among existing and new customers. Here, there will be

crucial interactions between Systems 4 and 5. It is vital that the organisation maintains a reflexive relationship to its environment. Building capacity for knowledge creation and exploitation through innovation is a key role of System 4 (development). Its job is to build organizational flexibility and capability, holding the whole together over time. It has often been observed that an undue emphasis on efficiency can undermine System 4 activities through 'short-termism'. This is characterised by constant 'firefighting' activities by management.

Misguided command-and-control management approaches often treat all operational units as if they are alike, imposing change from above. However, since they are not alike in their primary activities, differences in rate of adaptation are inevitable. Collaboration between Systems 2 and 4 is needed to ensure that differences are managed and that fragmentation does not occur. Such differences are often at the heart of failures of change projects as they are dismissed as evidence of e.g. resistance or lack of commitment. However, change projects must recognise a need to address requisite variety. Lack of uniformity of progress reflects this and should be expected. In a viable system, changes need to be addressed in chunks that are achievable in practice without loss of synergy. This will involve what Hoverstadt (2011, p.116) describes as structural redundancy. If, for instance, a new IT system is introduced, then it is unrealistic to expect those engaged within the relevant operational units to (a) carry out their normal work delivering value, (b) convert/transfer data from the old system to the new, and (c) learn how to use the new system, without any deterioration in measured performance. Systems 2 and 4 activities need to address the resource and co-ordination issues involved in balancing internal and external complexities through modelling of current and future desired states of the whole system.

In practice, the relationship between structure and strategy is close and they are linked in an evolutionary cycle. This is reflected in known and documented problems such as 'not invented here syndrome'. It is necessary for System 4 to be designed so as to break this cycle, through active monitoring and gathering of external business intelligence. It is here that problems can arise through standardizing on 'best practice'. While this activity can be fruitful it can also lead to problems if that identified practice is then embedded in key processes, especially if they are software driven as in Enterprise Resource Planning systems. What is 'best' is a reflection of a snapshot of the balance between operational and environmental complexities at a given moment in time, in a particular

organizational system. However, disturbances in the environment require a flexible response and that practice may not remain 'best' for very long, as these disturbances impact upon the system. System 4 must be designed to cope with this potential paradox. It may be that System 4 activities may be used to draw in customers, blurring the boundary between organisation and environment in a process of co-creation of value. This has been seen, for instance, in the case of aircraft manufacturing, but the scope for co-creative activities to enhance organisational sustainability is growing, particularly in the context of Industry 5.0 initiatives, in which smart technologies enable mass personalisation of goods and services (Özdemir and Hekim, 2018; Aslam, et al, 2020).

Again, interaction between the sub-systems making up the Metasystem in VSM is required in practice. Perceiving environmental disturbances, making explicit strategic gaps for the organization and opening up those gaps is the task of System 4, but closing those gaps is the province of System 3. There will always be a need to maintain balance between Systems 3-4-5. It is in highlighting such interactions that the model may be of most use to managers in maintaining organisational synergy through continual change.

The last of the sub-systems making up the Metasystem relates to organizational identity. System 5 is manifest in activities we tend to group under the heading of governance. Clearly, a system that loses its integration and views of identity ceases to be viable, since the tensions between management and operations, and between operations and environment, are likely to become overwhelming. Its activities will be unsustainable. System 5 is concerned with balancing variety among all of these elements that would threaten synergy. While recognition of a need for synergy in business improvement projects is not new, attention to development of System 5 activities is not always given sufficient attention. It is a feature of innovation and change that organizational identity is not a 'given'. In a dynamic environment, in which transformation through innovation is contemplated in short cycles, the question 'what business are we in?' must be asked frequently. The answer may not be obvious. Take the example of American Airlines. In the 1990s, the airline developed an on-line booking system for its flights. Later, it was able to develop a new income stream by leasing the booking system to other airlines. Eventually, the company gained more revenue from this leasing than from operating as an airline. In a modern organisation, it is important that governance is exercised on behalf of all stakeholder groups.

Conclusions

This paper has highlighted the importance of a systemic perspective in approaches to organizational change, including business improvement initiatives. It has pointed out the importance of Ashby's law of requisite variety for organizational control and management and identified tensions arising from the degree of balance in variety between management and operational units, and between operations and the environment within which the organization's identity 'makes sense'. It is suggested that the Viable Systems Model can be useful as a vehicle for reflection, helping would-be improvers to maintain balance in the unfolding of complexity as on-going change occurs. Recognizing that a culture of empowerment and readiness for change is crucial to sustainability, communication must be effective both within the organization and reaching out to wider stakeholders. Promoting learning, using VSM as a mental model, can help an organization to avoid pitfalls of sub-optimality and short-termism, both of which can threaten survival in the medium to long-term. In order for the model to be useful, multiple iterations of reflection would be required on a continuing basis. Furthermore, it is necessary to remember that viable systems are recursive – every sub-system within a whole needs to be in balance with its wider system. Such an approach, which focuses on balance, becomes critical in a context of service delivery, since complexity within such environments is potentially infinite. In an Industry 5.0 era, when customers are both demanding and better informed about potential for mass personalisation of products, VSM provides a vehicle for managers to contemplate variety both as risk and opportunity.

References

Aalst, W.M.P. van der, La Ros, M, and Santoro, F.M. (2016). Business Process Management: Don't Forget to Improve the Process! Business Information *Systems Engineering*, 58(1):1–6.

Ackoff, R.L. (1974). *Redesigning the Future: A Systems Approach to Societal Problems*. John Wiley & Sons, New York.

Ackoff, R.L. (1986). *Management in Small Doses*. New York: John Wiley & Sons.

Ackoff, R.L. and Emery, F.E. (1972). *On Purposeful Systems: An Interdisciplinary Analysis of Individual and Social Behavior as a System of Purposeful Events.* Chicago: Aldine-Atherton.
Armenakis, A. A., Harris, S. G., and Mossholder, K. W. (1993). Creating readiness for organizational change. *Human relations*, 46(6), 681-703.

Argyris, C., and Schon, D. (1978). *Organisational learning: A theory of action perspective*. Reading, Mass: Addison Wesley.

Assarlind, M., Gremyr, I., Bäckman, K. (2013) Multi-faceted views on a Lean Six Sigma application. *International Journal of Quality & Reliability Management*, 30(4), 387-402.

Aslam, F., Aimin, W., Li, M., & Ur Rehman, K. (2020). Innovation in the Era of IoT and Industry 5.0: Absolute Innovation Management (AIM) Framework. *Information*, 11(2), 124.

Ashby, R. (1956). *Introduction to Cybernetics*. London: Chapman Hall.

Bednar, P.M. (2007). 'Individual Emergence in Contextual Analysis', *Systemica: Journal of the Dutch Systems Group*, 14(1-6), 23-38.

Bednar P.M. (2009). 'Contextual Analysis. A Multiperspective Inquiry into Emergence of Complex Socio-Cultural Systems'. In Minati, G., Abram, M. and Pessa, E. (eds). *Processes of Emergence of Systems and Systemic Properties: Towards a General Theory of Emergence*, pp. 299-312. Singapore: World Scientific.

Beer, A.S. (1985). *Diagnosing the System for Organizations*, New York: John Wiley & Sons.

Ciborra, C. (2002). *The labyrinths of information: Challenging the wisdom of systems: Challenging the wisdom of systems*. Oxford: Oxford University Press.

Ciborra, C., Braa, K., Cordella, A., Dahlbom, B., Hepsø, V., Failla, A., ... & Monteiro, E. (2000). *From control to drift: The dynamics of corporate information infrastructures.* Oxford: Oxford University Press.

D'Auria, G., De Smet, A., Gagnon, C., Goran, J., Maor, D., and Steele, R. (2020). Re-imagining the Post-pandemic Organization. *McKinsey Quarterly*, 15 May 2020. Accessed 12 October 2020 at https://www.mckinsey.com/business-functions/organization/our-insights/reimagining-the-post-pandemic-organization.

Emery, M. (2000). The Current Version of Emery's Open Systems Theory. *Systemic Practice and Action Research*, 13(5), 623-643.

Espejo, R. (2004). The footprint of complexity: the embodiment of social systems. *Kybernetes*, 33(3-4), 671-700.

Espejo, R. and Harnden, R. (eds) (1989). *The Viable System Model: Interpretations of Stafford Beer's VSM.* Chichester: John Wiley & Sons.

George, M.L. (2003). *Lean Six Sigma for Service: How to Use Lean Speed and Six Sigma Quality to Improve Services and Transactions.* New York: McGraw-Hill.

Handy, C (1993). *Understanding Organizations*, 4th edition. New York: Oxford University Press.

Harris, C. and Harris, R. (2008). *Lean Connections: Making Information Flow Efficiently and Effectively*. New York: Taylor and Francis.

Hoverstadt, P. (2011). The Viable Systems Model, Chapter 3 in M. Reynolds and S. Holwell, (editors), *Systems Approaches to Managing Change: A Practical Guide*. London: Open University/Springer.

Hughes, M. (2011). Do 70 per cent of All Organizational Change Initiatives Really Fail? *Journal of Change Management*, 11(4), 451-464.

Jinasena, D. N., Spanaki, K., Papadopoulos, T., & Balta, M. E. (2020). Success and failure retrospectives of FinTech projects: a case study approach. *Information Systems Frontiers*, 1-16. In press, https://doi.org/10.1007/s10796-020-10079-4.

Jurisch, M. C., Rosenberg, Z., & Krcmar, H. (2016). Emergent risks in business process change projects. *Business Process Management Journal*, 22(4), 791-811.

Kemp, R., and Rotmans, J. (2005). The management of the co-evolution of technical, environmental and social systems. In *Towards environmental innovation systems* (pp. 33-55). Springer, Berlin, Heidelberg.

McLean, R. S., Antony, J., and Dahlgaard, J. J. (2017). Failure of Continuous Improvement initiatives in manufacturing environments: a systematic review of the evidence. *Total Quality Management & Business Excellence*, 28(3-4), 219-237.

Martens, M.L., and Carvalho, M.M. (2016). Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *International Journal of Project Management*, 35(6), 1084-1102.

Mendling, J., Pentland, B.T., and Recker, J. (2020). Building a complementary agenda for business process management and digital innovation. Guest Editorial, *European Journal of Information Systems*, 29(3), 208-219.

Miles, L.D. (1989). *Techniques of Value Analysis and Engineering*. 3rd edition, New York: Laurence Miles Foundation.

Motwani, J., Mirchandani, D., Madan, M., & Gunasekaran, A. (2002). Successful implementation of ERP projects: evidence from two case studies. *International Journal of Production Economics*, 75(1-2), 83-96.

Ozcelik, Y. (2010). Do business process reengineering projects payoff? Evidence from the United States. *International Journal of Project Management*, 28(1), 7-13.

Özdemir, V., & Hekim, N. (2018). Birth of industry 5.0: Making sense of big data with artificial intelligence,"the internet of things" and next-generation technology policy. *Omics: a journal of integrative biology*, 22(1), 65-76.

Pidd, M. (2003). *Tools for Thinking: Modelling in Management Science*. 2nd edition. Chichester: John Wiley & Sons.

Porter, M.E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York.: Simon & Schuster.

Porter, M. and Kramer, M. (2006). Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78–92.

Radnor, Z. and Walley, P. (2008). 'Learning to walk before we try to run: Adapting Lean for the Public Sector', *Public Money and Management*, February 2008, 13-20.

Roland, G. (2004). Understanding institutional change: Fast-moving and slow-moving institutions. *Studies in comparative international development*, 38(4), 109-131.

Schein, E. (2017). Organizational Culture and Leadership. 5th Edition, Hoboken: John Wiley & Sons.

Schein, E.H., and Schein, P.A. (2018). *Humble leadership: The power of relationships, openness, and trust*. Oakland, CA: Berrett-Koehler Publishers.

Simon, H.A. (1982). *Models of Bounded Rationality*. Cambridge, Mass.: MIT Press.

Soliman, M., Saurin, T. A., and Anzanello, M. J. (2018). The impacts of lean production on the complexity of socio-technical systems. *International Journal of Production Economics*, 197, 342-357.

Taylor, F. (1911). *Shop Management, The Principles of Scientific Management* Harper & Row, 1911.

Thomas, J., George, S., & Rose, T. (2016). Deciphering value discourse's role in explaining the persistent perception of change failure. *Journal of Change Management*, 16(4), 271-296.

Vickers, G. (1965). *The Art of Judgement: A Study of Policy Making*. London: Chapman and Hall.

Vickers, G (1970). *Freedom in a Rocking Boat*. London: Allen Lane.

Weiner, B.J. (2009). A theory of organizational readiness for change. *Implementation Science*, **4**, 67 (2009). https://doi.org/10.1186/1748-5908-4-67.

Wilkinson, A., Allen, S. and Snape, E. (1993*). Quality and the Manager, Institute of Management Report*. London: Institute of Management.

Williams (2007). 'Make sure you get a positive return,' *Computer Weekly*, 13 November 2007, pp 18 & 20.

Winter, M., Brown, D. & Checkland, P. (1995). A role for soft systems methodology in information systems development. *European Journal of Information Systems*, 4(3), 130–142.

Womack, J.P. and Jones, D.T. (2003). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. 2nd edition, London: Simon & Schuster.

Worthen, B. (2002). 'Nestlé's ERP Odyssey,' CIO Magazine, May 15, 2002.

Zhexembayeva, N. (2020). Three Things You're Getting Wrong About Organizational Change. *Harvard Business Review*, June 09, 2020, accessed 1 September 2020 at https://hbr.org/2020/06/3-things-youre-getting-wrong-about-organizational-change.

UK SYSTEMS SOCIETY

UKSS Gold Medallists

Professor Russell Ackoff
Professor Stafford Beer
Dr Fritjof Capra
Professor Peter Checkland
Professor C. West Churchman
Professor Humberto Maturana
Sir Geoffrey Vickers

***Systemist* is a publication of**
The United Kingdom Systems Society