**Why secondary schools fail the complexity test and what they need to do to pass it**

**Abstract**

**Purpose** – The first purpose is to show how a school's choice of organisational structure determines its capacity for individual and organisational learning. A second is to explain how capacity and complexity are connected and why this is critical for participant agency (staff, students, and parents). A final purpose is to show how the revised practices of VT schools expose organisational frailties within the traditional same-age system not previously realised.

**Design/methodology/approach** – This paper draws on insights from school leadership teams participating in programmes of transformative learning as part of their transition to a multi-age structure, work spanning more than two decades and involving over two hundred schools. The paper combines organisational concepts, complexity theory, and insights from transitioning schools to highlight differences between complicated and complex school systems and their effect on learning and learners.

**Findings** –Schools with a traditional same-age form of organisation are *complicated*, organisationally closed and have a restricted capacity for learning and absorbing value demand. Schools that have successfully transitioned to a multi-age form of organisation (VT) are complex by design, systemically open, and better equipped to meet individual and organisational learning needs. Only schools can change their organisational form, and this has significant implications for school leadership preparation and training.

**Originality value** – This paper challenges the view that schools with same-age organisation are complex but goes further by saying that the lack of complexity is an obstacle not only to change but to school values and learning. Insights from VT schools cast considerable doubt on the viability of traditional same-age structures in complex societies but shed light on how any post-COVID-19 paradigmatic change might yet be achieved.

**Keywords** – Secondary schools; agency; transformative learning; complexity theory; organisational learning; school capacity.

**Paper type** – Research

**Introduction**

Lagadec (1993: 54) noted how "Our ability to deal with chaos depends on structures that have been developed before the chaos arrives". Arguably, the chaos has arrived in the form of COVID-19 and our school structures have been found wanting. There is even “talk in the shires” of change! However, despite so many efforts, there has according to Tyack and Cuban (1996) been a long “failure of reform” as schools "tinker to utopia". No satisfactory explanation has been offered for such stagnation as authorities persist with trying to prod into life a system that has changed little in 175 years . It should be no surprise, therefore, that some schools have decided to break cover and develop their own system, a paradigmatic shift.

The embryonic development of the vertical tutoring system is an attempt by schools to abandon the tenets of the traditional same-age hypothesis and design a values-led alternative. Their journey through transformative learning, critical reflection, and the co-construction of a working model reveals insights into their former state that go some way to explaining the systemic assumptions and tinkering that otherwise stymies attempts at paradigmatic change (King and Frick, 1999; Maccia and Maccia, 1966).

Tyack and Tobin (1994), coined the phrase "the grammar of schooling" to describe the operational principles and constructs endemic to traditional same-age schooling. Subsequently, Fullan (2020) listed eight component features of 'grammar' which include (a) batching of students by age, grade, and subject; (b) ignoring or miscasting the inequity problem, and (c) separation of parents/communities from schools. Together they contribute to what Fullan (2020) calls the "default culture", one that "blunts any serious attempt at change", while for Cuban (2019), the ‘grammar of schooling’ makes the system “seemingly invulnerable to alternative ways of organising schools”. Such longevity suggests that schools are far from the complex adaptive systems they need to be.

By exploring the experience of schools that have rejected same-age organisation and co-constructed a values-led working model based on the foundation of multi-age tutor groups, it is possible to unravel the reasons behind such stasis. Insights from these schools reveal a substantive difference in the way each system (same-age and multi-age) understands, interprets, and builds the *capacity* needed for individual and organisational learning. The purpose of this paper is to show how the form of organisation employed by a school has a direct influence on individual and organisational learning capacity, and the complex adaptivity essential to any organisation in which children are involved.

This paper has three other sections. The first section draws attention to constructs often present in descriptions of complex adaptive systems and organisational change theory. These are, (1) *Ashby's Law of Requisite Variety* and Stafford Beer's *First Principle of Organisations* (Ashby, 1956; Hilder, 1995); (2) the concept of *autopoiesis* *and homeostasis* (Maturana and Varela, 1980 and 1987; Bider, 2019; Luhmann, 1986), and (3) a comparison of *simple, complicated, and complex* *problems* (Glouberman and Zimmerman, 2002). This section provides a conceptual framework for understanding schools as organisations and how they go about building tackling the learning demand on their system.

The literature review that follows explores the challenges involved when linking schools as organisations with complexity theory. By introducing the three constructs (above), it is possible to arrive at a more nuanced appreciation of expert commentary and the degree to which any commentary is shaped by the traditional school model, "the default culture".

A third section focuses on the connection between organisation, capacity, collaboration, complexity and learning, a form of hermeneutic circle. An explanation is offered as to why schools in their same-age form cannot transform and actively if unconsciously, resist change. This section clarifies the difference between *complicated* and *complex* forms of organisation as applied to schools.

A brief discussion follows on why schools fail the complexity test, why it is essential that they pass it, and the unlearning needed for any re-sit.

**Three organisational constructs**

***A) Ashby's law***

Schools exist to absorb the *value demand* on their system, and (for this paper) value demand comprises the learning needs of participant actors (staff, students, and parents). The system's ability to absorb value demand relies on its capacity to cope with such complexity. Ashby's law of requisite variety can be simplified as "variety absorbs variety" (Hilder, 1995). An interpretation of Ashby's law in respect to schools is as follows: for a school to absorb the learning demand on its system (one that might otherwise threaten to overwhelm it), the school requires an equally complex means of absorption. In short, its capacity to cope should match value demand. Schools in more challenging circumstances face an unprecedented variety of learning and social demands compared with schools less challenged. Any failure to meet value demand leads to *failure demand* (Seddon, 2008: 32), a situation giving rise to repeat work, extra technical and learning support, and exponential costs downstream.

Beer's first *principle of organisation* (Beer, 1979), based on Ashby's law, states, "Managerial operational and environmental varieties, diffusing through an institutional system, tend to equate; they should be designed to do so with minimal damage to people and cost". For schools, the demand for services and the school's response tend to balance over time. How to achieve that capacity-demand balance is of critical importance to system participants (staff, students, and parents). The role of leadership is to *design* a means of ensuring that the school has sufficient capacity to cope with the variety of demand, something it must do this with "minimal damage and cost". Problems arise when the capacity of the school is unable to cope and funding no longer available to address the resource issue, a situation that if left unaddressed leads to failure demand.

This situation leaves schools with one option, to reduce the demand side, and the author's work with up to 200 schools during transformative learning programmes (see Mezirow, 1978; Schein, 1996; Cranton, 2006) suggests that all schools are obliged to take it. As the variety of external demands on the school complexify, schools react by *smoothing* the demand to suit their system (see Johnston and Clarke, 2001: 178). Because same-age structures cannot alter their internal management environment, their capacity to handle demand has minimal leeway. They react by influencing the demand profile, effectively reducing the flow of information, and closing their system.

***B. Autopoiesis and homeostasis***

Autopoiesis (Maturana and Varela, 1980) provides a biological explanation for shared features of organisational behaviour based on survival and identity. These include a self-referencing and historically path-dependent system, one predicated on the idea that the same patterns of behaviour repeat over time. An organism (organisation) will only change if it becomes deeply disturbed and perceives a threat to its existence (see Atkinson 2015: 20) - the unsaid intention underpinning transformative learning programmes! Autopoiesis explains how self-referencing and closed systems like schools (Betts, 1992; Banathy, 1991) reproduce the same organisational form over time (Luhmann, 1986) and retain long-standing and rationalised processes of power (see Vanderstraeten, 2002).

Homeostasis describes a system able to maintain identity while (seemingly) adapting to external change (Bider *et al*., 2020). Again, the capacity issue arises. If schools are closed, autonomous, self-referencing, and self-constructing systems, the "default culture" suggested by autopoiesis, they are reliant on single-loop learning strategies for handling capacity issues. Organisational change (third loop learning) is not on their agenda. Luhmann (1986) identifies two autopoietic sub-systems, communication, and organization. The first produces communication based on already existing communications, while the second "constantly produces new decisions based on already made ones" (Bider et al. 2020). This is a roundabout way of saying that self-referencing schools are path-dependent and reliant on single loop strategies they have used in the past solve problems, attempts that have often failed.

Again, this speaks to limited capacity. The subversive *trick* the school has learned is how to manage homeostasis by altering its environment to suit its system! Under no perturbational pressure to react and not knowing alternative triple loop methods, schools *smooth* the demand on their system.

***3. Simple, complicated, and complex problems***.

Table 1. Simple, complicated, and complex problems (Glouberman and Zimmerman, 2002)

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The question posed by Glouberman and Zimmerman (2002) is where to place service organisations (like schools). "Effect lists" and the pedagogy of a "what works" agenda suggest a search for *simple* classroom recipes and teaching laws, the idea that demand can be met by having a great teacher in every classroom. However, students who need a longer cooking time and extra preparation require more technical expertise and support to make them more alike and achieve parity of output. Here, matters get complicated and confused. The complexity column takes a different view. Growing a child into the person they were meant to be requires extensive cross-border collaboration, information flows, feedback loops, and a more ecological approach. It also involves studying demand needs and how best to absorb them, a very different, more spontaneous, and creative view of capacity enablement.

The unperturbed, autopoietic-minded, same-age school will, of course, lay claim to all three methods of problem-solving and point to places in the school that appear to cover all contingencies. While the same-age organisation provides a *complicated* system (Table 1), one marked by a pre-existing and fixed organisational capacity, linked by complicated systems of referral and delay, the VT school explores the complexity option. It builds its organisational architecture dynamically and responsively by promoting a synergy of school-student-home learning relationships needed to meet demand. It creates the complexity described in the literature review below that enables the school to better absorb the complexity of demand that confronts it.

**Literature Review**

Stacey (1996; 10) speaks of interacting agents constantly adapting to each other "according to sets of rules" that improve their praxis and that of the system. This suggests that organisational learning occurs through a polyphony of feedback systems and patterning that not only resists structural control but embraces a high degree of unpredictability. Turner and Baker (2019: 5) identify 30 attempts at definition, settling on "open dynamical systems that are able to self-organise their structural configuration through the exchange of information, energy and other resources within their environment to transform these resources to support action" (Larson, 2016: 12). Self-organisation is an essential feature of complex adaptive systems (CAS) and is described by Meadows (2009: 188) as "the ability of a system to restructure itself, to create new structure, to learn and diversify".

 Poli (2013: 145), introduces the idea of emergence whereby a complex system is creative and so "includes the capacity to change, learn, and over time become different from what one was before". For Turner and Baker (2019: 5), "CAS tend to transform to new states once the systems have learned to be adaptive to their new environment; this is termed 'emergence' within the complexity literature". Cilliers suggests that while a complicated system is described in terms of its connected elements, a complex system is interactive, and continuously changing (Cilliers, 1998).

Morrison (2005: 324) notes that "individuals, families, schools, communities and societies exist in symbiosis: complexity theory tells us that their relationships are necessary, not contingent, and analytic, not synthetic". Morrison talks of the school is an ecosystem (Capra 1996: 301), on where learning acts like "a strange attractor" (Mittleton-Kelly, 2003). In his discussion on school leadership, Morrison (2010: 386) suggests that complexity theory (CT) should be regarded as "a set of challenges, proposals, tenets and alternative, non-linear ways of thinking that offer new directions for school leaders and managers to consider". Stacey (2011) argues that a CAS should focus on the significance of local interactions (say, tutor-child-parent). It is a theme taken up by Holland (2014, cited by Hawkins and James, 2016) who makes the critical connection between capacity, complexity, and learning, i.e. "complex adaptive systems are composed of elements, called agents that learn or adapt in response to interactions with other agents". For, Weick and Westley (1996: 206) learning diminishes in conditions of extensive structure, a condition that formal bureaucratic schools cannot escape (see Lumby, 2019; Mifsud, 2017;).

There is no shortage of analyses regarding schools as complex adaptive systems (Rigby *et al*., 2016; Keshavarz *et al*., 2010; McGee and Edson, 2014; Heinrich and Kupers (2018); Horvath *et al*., 2015; Fidan and Balci, 2017; Hawkins and James, 2017; Seel, 2000). For Keshavarz *et al*., (2010: 1468), a CAS is comprised of nested systems, continuous adaptation, distributed networks of control that enable emergence, and acceptance of unpredictability. Their study (Keshavarz *et al*., 2010) concludes that schools resemble 'social complex adaptive systems' of rules-based agents, but "significant differences" separate them from a "true" CAS. It is unclear how rules-based agents can create such a socially collaborative system.

Hawkins and James (2018), identify school CELLS, "five complex evolving loosely linked systems" that comprise the teaching staff system, ancillary staff system, the student system, the parental system, and "significant other systems". Hawkins and James argue for distributed leadership to ensure the diversity of interactions needed to service the five CELLS, so they are "continually evolving together" (Hawkins and James, 2018: 744). The idea is to shift schools from their institutional embeddedness by allowing existing structures more freedom. The writers are firm in their commitment to schools as complex systems but have joined a long list of those believing that the traditional same-age format can complexify without significant redesign.

Boisot and Mckelvey (2016) draw attention to Ashby's Law of Requisite Variety (1956) which they pointedly rename "Ashby's Law of Requisite Complexity". Ashby (1962) demonstrated that for an organisation to be "efficaciously adaptive, the internal complexity of a system must match the external complexity it confronts" (cited by Boisot and McKelvey, 2016). Seel (2000) notes the organisational implications for a CAS. These imply (a) the presence of informational feedback loops that connect the system and change agential behaviour; (b) the need for open systems, with information consistently imported and exported across system boundaries to increase organisational learning and renew energy; (c) the idea of the manager as coach; (d) revised system boundaries determined by the interconnectivity and interdependencies of agents; (e) change generated by increasing the flow of information and tacit knowledge. In his work with multiple secondary schools, Barker (2018) shows how these are absent from same-age organisation and why schools seek an alternative that restores such factors.

Many argue that schools should be viewed as complex system (see Trombly, 2014), but this does not tally with the descriptions of CAS (above) and what happens in practice. The real problem is that secondary schools are not sufficiently joined-up to be described as complex and so cannot evolve in line with their environment. As governments pile on ever more demands, schools become ever more complicated until "smoothing" becomes a management art form. Instead of being generative they are closed to the detriment of individual and organisational learning. Like Fidan and Balci (2017: 15), it is tempting to describe schools as CAS because (a) the variety of value demand that confronts such schools is undoubtedly complex, and especially so for schools in challenging contexts, and (b) the schools' response on first sight *appears* equally complex. Schools *appear* to cope well with environmental complexity. Arguably, what is being observed is the subtle art form of smoothing demand in the guise of increased efficiency.

Structuration theory, the way structure and agency work in an organisation, acts in a way that remains sameness, path dependency and stability. Morrison (2005: 311) notes an important distinction: while structuration theory is concerned with social reproduction, "complexity theory offers a more complete theory of change as it focuses on production rather than reproduction." This observation is important because schools exercise considerable structural control over agency. Morrison notes how school leaders could bring about change (improvement) by outreaching to parents and community, altering external and internal connectivity, and being more student-centred and systemically open (Morrison, 2005: 312).

In a later paper, Morrison (2010) asserts that complexity characteristics (distributed control, self-organisation and emergence, communication and networking, creativity and openness, empowerment and teamwork, unpredictability and non-linearity, connectedness, agency and structure) "are the everyday stuff of school leadership" (citing Gronn, 2002 and 2003, Mansfield, 2003, and Fullan, 2005). While such practitioners are undeniably confronted with complex issues that require agential problem-solving and sense-making behaviour, many of the challenges that confront leaders arise from anomalies within the very organisations they run. If leadership was truly distributed as in multi-age school organisation, "the everyday stuff" of leadership can be shared across the entirety of the school, and an opportunity for triple-loop learning solutions opened (Flood and Romm, 2018).

Complexity theory leans more to an ontological and ecological disposition, a state of being far from any formulaic approach or the technical rationalism of performativity. Boisot and McKelvey (2016) offers two stark choices when confronted with complexity, "reduce it or absorb it". For those working with schools attempting a paradigmatic shift, it seems that same-age structures opt for reduction and VT schools for absorption. In summary, complexity refers to an open system, a community of agents (staff, students, and parents) able to learn by operating in the borderland of chaos and order (Kauffman and Johnsen, 1991). For a CAS, the lines between structure and agency are no longer indelibly drawn, but continuously fuse, disassemble, and reform.

**Capacity**

The central argument of this paper is that schools need to be complex, and to treat complexity as if it were merely complicated is an error (Pflaeging, 2014). So how does this manifest itself in secondary schools? To maximise organisational capacity, Dougherty (1996: 184) suggests that participant actors should be enabled to make situated judgements throughout the organisation, and evaluate "complex, fuzzy problems" making interventions as needed.

The author's transformative learning work with secondary schools covers almost three decades and 300 leadership teams, and a journey set out in five books and various papers. When schools are asked (for example) whether they believe in parent partnership, schools are positive, and many have certificates to prove compliance with partnership standards. However, as school teams begin to reflect on policy reception (Gowlett *et al*.,) the difference between the system they espouse and the system they use widens. Critical reflection exposes the organisational assumptions and frames of reference inherent to the same-age organisational hypothesis, a significant perturbation.

The school's means of dealing with the (excessive) demands on its system are unaffordable, so the school adjusts. Overtly, it might begin with curriculum editing, but covertly, the process begins with the school exercising its authority, often with government support, over the rhetoric of school. It redefines and limits (smoothes) *what matters, what works*, *what it is to care*, *what counts as collaboration, what counts as value, what counts as assessment, what counts as data, what counts as learning and learning behaviour, what counts as communication, what counts as partnership, and what counts as measurable output.* Such a process allows the school to maintain its identity without any change to capacity. For example, parents receive data reports that offer a narrow description of their child. Schools invite parents to meet teachers in five-minute slots once a year. The more that schools reflect on operational matters, the more that organisational assumptions are exposed. School induction is another cause célèbre.

To build the capacity needed to absorb demand, schools believe the immediate solution is more staff, more resources, more technical support, more money, more managers, and more time. When these are no longer forthcoming, they look for efficiencies like curriculum editing. Inevitably they start to smooth value demand, cuttings off critical sources of sense-making and individual and organisational learning. The effect is to alienate participant actors from the learning process, reducing innovational capacity, and bring any hope of emergence to a halt. Same-age schools preach partnership and agency while actively reducing both. The multi-age alternative faces the same-demands, and it too values more investment. However, these schools renew partnership, share the learning process, and co-construct organisation, enablers that are values-led.

**Discussion**

As Mingers (1991: 336) poignantly said when describing the work of Maturana, Varela, and Luhmann, "We construct the objects of our discourse in our discourse". VT schools expand the discourse exponentially. They bring all staff back to tutoring, repopulate tutor groups with students of all ages, and rebuild the familial feedback loops and learning relationships needed for individual and organisational learning (Barker , 2018). Instead of complicating and smoothing, they complexify their capacity, creating multiple learning networks beyond the normal hierarchy of the school, a loose-coupled and values-led architecture. In this way, all participant actors are involved directly in the value-work and are more likely to invest in purpose.

The author claims limited expertise of Heidegger, but a liberal interpretation of *Dasein* suggests that practitioners fall easily into an everyday mode of organisational existence to which they must quickly adapt and rationalise. For the most part, agency surrenders to the current way of knowing defined by the *they* (in part, the assimilation of received frames of reference and organisational assumptions). Sherman, (2009) describes how "This everyday mode of being tends towards the average, a levelling down of the truest and best possibilities of *Dasein*, to a common currency of existence." While this situation brings Dasein *tranquillity* (Heidegger, 1962: 222), it remains inauthentic. Practitioners are "thrown" into such facticity and for the most part, live out their professional lives within inherited structures, an undeveloped state of organisational consciousness (Laloux, 2014; Freire, 1970). When schools become aware of this detachment—that (for example) their values-led mission "to make a difference" is compromised, low morale, gaming, and loss of moral purpose can easily follow. In Heidegger's terms, this makes the everyday world in which they operate less relevant; the sense of "*being-in-the-world*" diminishes, inducing anxiety. The challenge facing school practitioners is to respond to the anxiety that haunts them and shift from lostness in the *they* to a more authentic version of themselves, one that involves a revised way of knowing and acting in the world. The search for authenticity seems to express the rationale for change voiced by schools that risk paradigm change.

Put simply, our secondary schools are far from complex. Treating individuals as complicated through corrective curricular programmes and a discourse of learnification (Biesta, 2007), diminishes everyone. For schools to be *complex*, they must shift from the limitations and separations of a delivery system to more sophisticated and relational networks of learning. Effectively, the autopoietic school should learn to connect to more of itself, and this means rewiring its internal circuitry to ensure openness to participant agency. However, this is not what is happening. Schools are circling their wagons into impenetrable and expensive internment camps that have effectively shut down innovation and any thought of paradigmatic change.

It says much for our exceptional school practitioners that they can work around an organisation designed for separation and limitation and still make it appear to function. Had participant actors a system that might support their ingenuity rather than stifle it, schools could be so much more.

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