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## **A systems perspective on exploring the sustainability of leadership initiatives in a secondary school setting**

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# **A systems perspective on exploring the sustainability of leadership initiatives in a secondary school setting**

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## **Abstract**

*This paper uses a systems approach to examine the implementation of a design thinking (DT) initiative in a Singaporean secondary school setting. In particular, the paper uses the systems representational tools attributed to Senge (1990) to better understand the factors and relationships that underpin successful change initiatives in terms of the change process and related outcomes. The systems approach sheds light not only on those managerial and behavioural factors that facilitate initial acceptance and adoption of the design thinking change initiative, but also those factors that might inhibit or undermine ongoing change and success. As such, the paper provides interpretive insight about what constitutes effective systemic change in the implementation of design thinking, and on the nature of individual managerial intervention necessary to sustain ongoing and effective use of the design thinking and other initiatives.*

**Keywords:** *Leadership; change; education; design thinking; systems thinking*

## **Introduction**

A central goal of Singapore's education system is to build and sustain its reputation as a world-class system. To achieve this aim in relation to the Singapore School System (SSS), numerous education reforms have been implemented over time and the reform process continues to be a major focus of policy makers and stakeholders (Oon-Seng, 2012).

One basis for reform has been an emerging consensus that the 21<sup>st</sup> century demands different types of skills and knowledge to cope with professional and personal life (Gardner, 2006; Wagner, 2008; Boyle, 2014) but that developing such skills and knowledge is not necessarily well-matched to pedagogies prevailing within the education system. It is not surprising then that a response of many within the education system, especially within the school system, has been to seek and embrace change in the form of new pedagogical approaches (Anderson, 2012).

This paper explores a Singapore secondary school initiative which has sought to bring change to schools in the form of an innovative and creative approach to teaching and learning that fosters innovation and creativity in student thinking. In particular, the paper relates to change where a design thinking process (DT) (Liedtka, 2011) had been embraced in developing a DT-infused approach to pedagogy. In turn, that pedagogical approach was required to develop students' design thinking/creative thinking skills, and also to weave constructive experiences that would

provide the scaffolding skills for lifelong learning and, indeed, the future workplace (Anderson, 2012). The requirements of such change correspond well with the stated distinctiveness and nature of DT as a human-centred and empathy-driven collaborative process, and its usefulness in both developing creative thinking skills and dealing creatively with problematic situations (Estrada & Goldman, 2017). A particular feature of the DT process is that, here, the development of a DT-infused pedagogy as a “problem solution” would necessarily take account of the social/human nature of the education environment and its stakeholders, as well as the technical.

However, reforms and initiatives such as this not only require effective leadership at government level but require and depend upon tailored Teacher Development programmes (TDP) being put in place to bring about and support enduring teacher-led change within schools. Furthermore, leadership is regarded as even more important when a new initiative that requires fundamental change to the mind-sets and mental models of teachers and students is being implemented. It is not surprising then, that leadership, in its different forms and at different levels, is seen as a key concern for educational systems globally regardless of the specific societal, economic or cultural settings (Hallinger, 2011).

This paper thus takes a multiple level approach to understanding such systemic issues that confront those who seek to effect beneficial change in a secondary education setting. In particular, the paper examines how change effected through the adoption of DT can be understood and evaluated using frameworks that are underpinned by notions of systems thinking, as articulated by the systems representational tools of Senge (1990, 1999), and demonstrated in this paper, as causal loop diagrams (CLDs).

The paper is structured as follows: first, a brief selective overview of literature on leadership and DT is provided in relation to understanding the role of a leader initiating change and the rationale for using DT for teaching and learning. This is followed by outlining the case setting and the methodology underpinning the case research employed in this study. Finally, the findings are discussed using a multi-perspective approach to interpret and understand the change process.

### **An overview of the literature**

In this section, we present the strands of literature, leadership and DT in education, and change management, that in their confluence informed this study.

#### ***Leadership in education***

The growing interest in enhancing school effectiveness has meant that understanding change processes and how change can be effected have become critical requirements for education managers in general, and for school leaders in particular. Indeed, the importance of school leadership and the contribution of school leaders to overall school effectiveness is acknowledged by several international studies (Tajasom & Ahmad, 2011; Robinson, Lloyd & Rowe, 2008; Hallinger, 2011).

In addition, an increasing emphasis on improving student achievement has drawn attention to the role of school leadership (Hargreaves & Fink, 2003; Sergiovanni, 2009).

Among the many roles that leaders undertake in schools, understanding and initiating change is seen as an important factor in attempts to seek continuous improvement, particularly in teaching and learning. As schools make attempts to stay relevant or competitive in a technologically driven society, managing change is, itself, getting more complex (Fullan, 2001). As a consequence, some researchers caution that a more “sophisticated” leadership is required to operate in a society where increasing attention is given to school leadership (Dimmock & Tan, 2013; Fullan, 2006; Leithwood & Jantzi, 2000).

It is suggested by some researchers (Fullan, 2006; Dimmock & Tan, 2013) that such sophistication requires leaders to adequately equip themselves with a spectrum of various change management and other leadership skills, including those described as knowledge building and relationship building, bridging the analytical and the behavioural spectrums in order to implement and manage change in educational institutions.

However, the prescriptive nature of such advice about developing leadership skills belies a lack of consensus about what constitutes leadership, as is evident in the plethora of definitions of leadership that have been advanced over time (DeRue, Nahrgand, Wellman & Humphrey, 2011). Nevertheless, common threads run through these definitions, and include, for example, notions of “influence” and “power”. In addition, given that leadership is regarded as a social process, it is not surprising that several actors may be involved in mutually influencing the leadership process, wittingly or unwittingly engaging in interactions that support or impede the achievement of organisational goals. However, Burns (1978) has long stated that, amongst other findings, the main change agent for achieving desired outcomes could be regarded as the leader.

A consistent theme emerging from the literature on leadership is that “leadership matters” in orchestrating and implementing change (Bass & Bass, 2008, p. 11), especially in dynamic environments (e.g. Peterson, Walumbwa, Bryon & Myrowitz, 2009). For the purpose of this paper, then, leadership can be viewed as a form of influence to facilitate individual and collective efforts to learn and change, but also to effect organisational and pedagogical change.

### ***Design thinking (DT)***

The notions, conceptual frameworks and philosophies underpinning design thinking (DT) (Liedtka, 2011; Estrada & Goldman, 2017), and its relevance to business and educational contexts, were developed and advocated by the Stanford University Institute of Design/Design School (SU-DS) through its various professional and educational programmes and workshops (McCullagh, 2010). Since its conception, DT has increasingly been seen as a powerful means of reshaping management thinking and practices in the business context (Lee, 2011) and its practice has long extended across other sectors (Rowe, 1987).

Within education, DT has been described as one of several approaches to pedagogy that seek not only to engage students in a general sense, and in a manner that facilitates and enhances individual creativity, but that also provides a platform to signal the importance of, and to facilitate the process of innovation within organisations (Brown, 2008; Martin, 2009). Indeed, there is recognition that engagement in DT not only facilitates skills that enhance creative thinking, but also helps create mind-sets that are open to innovation and creativity (Goldman, 2018). This paper relates to an educational reform and change initiative where DT has been central to the development of a DT-infused approach to pedagogy with a view to generating similar outcomes.

In general, DT can be described as an exploratory, iterative, collaborative five phase human-centred and empathy-driven process for dealing with problematic situations (Liedtka, 2011; Goldman, 2018) in a manner that considers the insights and needs of problem owners and stakeholders: in this case, teachers, students, school managers, families etc.

DT involves a spectrum of emotional, behavioural, cognitive and practical skills, traits and mind-sets. DT processes emphasise the value of: (i) being able to display empathy in sensing that a problem or issue exists and needs addressing; (ii) an ability to identify and clearly define the issue for, and with problem owners; (iii) an ability and willingness to ideate or brainstorm with others for possible ways of addressing, solving or resolving the problem; a sense of pragmatism or action-orientation with respect to implementation that meets problem owners, end-user or stakeholder needs; (iv) demonstrating an ability to prototype solutions or interventions to meet those needs; and then (v) a willingness to seek feedback from those stakeholders by involving them in a test programme to refine (Brown, 2008).

For those engaged in the DT process, *per se*, core benefits are also considered to be behavioural and attitudinal, in that experience in using DT can help to build student confidence and trust, especially in relation to a student's preparedness, aptitude and belief in their ability to tackle and address unfamiliar issues and unstructured problems in uncertain and complex environments. This notion, of believing in, and extending one's ability to tackle problems has been termed as "creative confidence" by Kelley and Kelley (2013), a construct that aligns with Bandura's (1977) notion of self-efficacy and Tierney and Farmer's (2002) notion of creative self-efficacy.

Such *creative confidence* can be associated with an empathetic mind-set that seeks, accepts and responds to *constructive criticism* from peers; a mind-set that has *tolerance of ambiguity* and is open to *avoiding premature closure* of solution options and then the sunk-cost fallacy; and a mind-set that accepts failure as a means of learning about and developing other creative options – a notion described by Goldman (2018) as "failing forward".

Research has shown that DT has been used within different educational settings in different ways and that positive outcomes have been experienced from such use. For example, whilst Harvard Business School has woven DT into its curricula, by contrast, Tan and Wong (2012) have reported the successful introduction of DT in promoting spiritual ideals in a school setting.

In further contrast, Boni, Weingart and Evenson (2009) report the successful use of DT in the conduct of MBA student action-research projects promoting cost effectiveness in the health sector.

The diversity of these studies indicates the opportunity and potential benefit of using DT in different settings (Todd, 1999). However, there is scant literature that examines the process of implementing DT in educational settings in general, or school settings in particular. There is a similar absence of literature about the systemic nature of factors and relationships that underpin successful implementation, or for example, the systemic role that behavioural factors such as the perceptions of teachers, and/or societal/cultural norms play in successful implementation.

In addressing these matters, the wider research project to which this paper contributes seeks to illustrate the value and utility of DT in facilitating pedagogical developments in a Singaporean school setting, and the value and utility of developing a systems perspective and approach to understanding and managing the implementation process that contributes to change. As a precursor, the following section outlines the nature of the study and relevant findings.

## **The Singapore secondary school case**

### ***Methodology***

This paper reports on part of a wider project that takes a multi-level approach to understanding systemic issues which confront those who seek to effect beneficial change in an education setting. It addresses the issues at three levels – micro-teacher, macro-teacher hubs and mesa-school level. It does so through a case study that facilitates exploration of a change undertaken in a Singapore secondary school setting. We accept the diverse views of Stake (1995) and Yin (2014) that case study research, even though it may manifest in different approaches, is an important form of qualitative research that allows core phenomena and related behavioural and cultural matters to be studied in depth and to be adequately understood (Baxter & Jack, 2008). This view accords with Denzin and Lincoln (2011) who also emphasise the benefits of the “thick” description and interpretation facilitated by qualitative inquiry and by qualitative case research.

We suggest that a case study in a Singapore secondary school setting has wider interest and relevance in as much as Singapore is commonly regarded as an early adopter of new ideas for organisational and educational developments such as design thinking (Koh, Chai, Wong, & Hong, 2015). In addition, Singapore is recognised to be a high performing education system compared to other developed countries (Oon-Seng, 2012; Schwab, 2011). It is well known for adopting new ideas for continuous improvement in learning and teaching. However, Singapore is also distinctive in that organisational structures are predominantly hierarchical, with a culturally inherent authoritative style (Hofstede, 2001) of management. The Singapore setting

has added interest therefore, because, for example, the collaborative nature of DT by its nature challenges hierarchy and authoritarianism. As such, it presents an interesting challenge for those leading change and also for those seeking to develop appropriate conceptual frameworks to understand such problematic situations.

In this research, the case organisation is a Singapore secondary school that had engaged its teachers in a school-based Teacher Development Programme (TDP) which included participation in the SU-DS teacher development workshops, and had implemented DT for two years. The students were aged between 13 and 14 – secondary one and two.

For the wider study, semi-structured interviews with teachers were deployed as the main vehicle for data collection, especially for exploring the perceptions and opinions of teachers in what could be considered a “natural language” setting where participants’ experience and understanding of what constitutes design thinking is embedded in the context of their teaching.

In total, individual face-to-face interviews were conducted with 16 teachers for about sixty minutes each. An interview guide reflecting the objectives of the research, and developed by drawing on the relevant literature, was used to direct information gathering in three main areas: teacher understanding of DT and of the DT initiative and its importance; teacher involvement in the implementation of the initiative; and the attendant benefits and challenges for teaching and learning.

All interviews were audio-recorded and then transcribed before main themes were identified through close reading of transcripts. Subsequently, the process included integrating interview notes, coding and categorising the coded data. Analysis of the data was informed by use of the Conastas (1992) category approach which facilitates the interweaving of literature-informed perspectives and those perspectives surfacing from the empirical case study.

### ***Findings: The Singapore secondary school (SSS) case and the design thinking initiative***

Here, we examine the adoption and implementation of the DT initiative, and briefly overview a selection of relevant findings. First, we outline and discuss teachers’ perceptions of the process of DT, and of perceived individual and school-wide benefits. We then discuss teacher experiences of “change”, the nature and extent of engagement in its various forms and the accompanying attendant challenges in adopting DT.

#### *Teachers’ views of the nature and value of design thinking*

Despite its relatively widespread use, there is no one commonly used or accepted definition of DT. Consequently, its interpretation and expression has varied across applications and academic disciplines. However, this research suggests that teachers’ understanding of DT points to some degree of common accord. For example, we note teacher recognition of core DT notions, and an emphasis on the humanistic aspect of solving problems (Simon, 1987).

The findings of this study suggest that a common knowledge base had been acquired by a majority of teacher participants through the training provided at the SU-DS teacher development workshops, and at the school respectively. A typical interpretation recognised DT as a learner-centred approach to learning:

*Design thinking is a human approach that makes one to understand other people's feelings about what they need. It teaches to think about what others value, not what we teachers value.*

Another similar view was expressed as follows:

*It is not a text-book style of teaching. We are connecting students with "real people". This makes the difference. Students can now know the meaning of "true empathy" and feelings of people.*

Indeed, empathy was a specific notion surfaced by all teacher participants as a beneficial outcome of DT training and DT processes and engagement. Findings suggest that empathy may manifest in different ways or at different levels. For example, it may reflect early teacher recognition that students may be more focused on *self*, before then using DT processes to help students become aware of their feelings, and/or to engage them in an empathetic switch from *self* to *others*. In the simplest sense, then, design thinking processes can provide an opportunity for participants to understand their own and other people's views and needs. For example, some teacher participants appeared able to recognise their *learned* view that understanding the importance of empathy is a critical component underpinning related skill development for themselves and for students. This finding concurs with others that DT helps to nurture a "deeper understanding" of others (Anderson, 2012; Brown, 2008; McDonagh & Thomas, 2010).

#### *Developing a new way of thinking – Requirements and challenges*

As a parallel to previous comments, most teacher participants stated their belief that a DT-informed-pedagogy would help the school to address the challenge of nurturing new ways of thinking and the skills that are considered important to cope with the demands of the 21<sup>st</sup> century. A typical comment was that:

*Our students need new skills and a different way of thinking to survive in the 21<sup>st</sup> century. The school is doing the right thing in trying out design thinking. Students are forced to think. They will know there are many ways to solve problems.*

Such teacher views suggest a belief that DT is, for them, a timely and appropriate approach to the nurturing of creative and critical skills. They also accord with Martin's (2009) view that the success of a DT initiative aimed at nurturing creative thinking within an educational setting, requires it to be a fully integrated learning and teaching pedagogy compatible with the prevailing national curriculum. By contrast, some traditional pedagogical approaches may tend to compartmentalise teaching and learning.

Nevertheless, some teacher participants expressed reluctance about incorporating DT into their teaching activities. This research suggests that such reluctance can be attributed to one of several factors or challenges, such as the perceived additional burden on teachers, the practicability and difficulties of implementation, the extant student mind-set and student behaviours, and doubts about whether expected “traditional” academic results and achievements would be compromised. A typical view of teacher participants was expressed as follows:

*Using design thinking is very different from our normal (traditional) teaching. It is new to me and my students. It is not easy to suddenly change students. It also applies to teachers.*

Most of the participants expressed a view that the predominant student focus would be on getting good academic results. We note that such focus was also echoed amongst teachers, in as much as academic achievements, in and of themselves, are highly prized in Singapore’s schools and because academic results and achievements drive competition between schools.

A common teacher assessment was that they did not have the time and resources to effectively integrate DT into their overall pedagogy or subject teaching. One teacher emphasised:

*We can do anything well if time is in our hands. Design thinking takes up a lot of our time in classroom. The school need to consider this [lack of time] problem before we talk about anything else.*

Such concerns about lack of time were expressed by all participants as a factor impacting effective implementation. They felt that a premature, perhaps under-prepared introduction of DT into the classroom environment would not contribute to effective implementation.

Most participants also raised issues related to resource availability and adequacy, in general. For example, a typical teacher response was:

*For design thinking, we need a room like the one in Stanford. We need proper resources. This cannot be compromised. Resource is so basic and important for design thinking. The school must give teachers and students rooms and resources suitable for doing design thinking.*

Other resourcing-related comments about the nature, layout and size of classrooms available for integrating of the DT initiative, indicate that study participants were disappointed with the available facilities, especially given their view that the school was not exposed to “real” budgetary constraints that might prevent additional or ongoing investment.

Some conveyed a sense of resistance and/or diminishing enthusiasm and commitment to the implementation of the initiative, as indicated in phrases such as: “wasting everybody’s time”, “bad start”, “no point rushing it” etc. Others felt that school leader(s) could have anticipated

and responded to these challenges in readiness for the launch of the DT initiative. Yet others voiced a more general disappointment/dissatisfaction with the devised implementation plan for DT.

Overall, the findings signal the importance of providing adequate time, physical and other resources and classroom features/layout that would contribute to a more conducive environment for implementing the DT experiment. In the next section, we seek to weave these findings and perceptions into a systems model that identifies the systemic consequences of such views, and how they may impact effective implementation.

## **A systems perspective on change and the leadership of change for the DT initiative**

### ***Systems thinking***

In the following section, we demonstrate how different features, facets and relationships implicit in the preceding case narrative and analysis can be captured and represented using notions of systems thinking, and the associated protocols and causal loops diagrams (CLDs) of qualitative systems dynamics (Senge, 1990, 1999; Maani & Cavana, 2000; Sterman, 2000).

We note that systems thinking embraces the notion of entities, variables, relationships etc. being interconnected, inter-related, and displaying high levels of mutual dependency. That is, relationships are causal relationships. We also note that the underpinning ontological and epistemological assumptions of system dynamics as a methodology are that cause-effect relationships of an *if-then* sufficiency nature exist; and that mutual dependencies exist and give rise to feedback. The twin notions of relationship dynamics unfolding over-time and non-linearity, manifesting as immediate or delayed feedback and interdependency, are central to systems thinking. So is the notion of holism - that the whole is, or properties of the whole are, greater than the sum of its “parts”, its constituent events or behaviours. We suggest that the use of a systems approach has value in surfacing and portraying time-dependent dynamic and often mutually dependent causal relationships reflected in the case-based material presented here.

We claim that variables and their inter-relationships can be appropriately surfaced through observation, interview, narrative and content analysis (as mentioned in *Methodology*), and then displayed within a CLD. CLD protocols depict causal relationships as directed arrows (See Figure 1) – with the cause being annotated as a short phrase at the tail of the arrow, and the effect at the arrow head. Mutual dependencies between events or groups of relationships are then portrayed as feedback loops (as in Figures 2, 3 & 4).

We demonstrate that CLDs may not only offer visual representations of variables and relationships that exhibit high levels of interaction and mutual dependency, but in doing so, facilitate an alternative perspective on the case material, and guide its re-interpretation using

systems concepts. By contrast, statistical approaches using cross-sectional sample data have a more limited domain of applicability related to the development of descriptive models using static, linear relationships.

In summary, our approach seeks to understand, through the initial identification of individual cause-effect relationships between pairs of variables, how those relationships may form a complex of higher level interactions and mutual dependencies, which can be characterised as causal or feedback loops. Such causal loops, may in turn, interact with one another to generate system-wide or systemic effects which may not be attributable to any one variable or cause-effect relationship.

The representational CLD may then facilitate appropriate narration and interpretation of the wider complex or system, here, the change environment, and provide complementary insights to what might contribute to and constitute a successful change initiative. The following section illustrates the approach taken via a sequence of CLDs of increasing complexity.

### ***Qualitative systems dynamics and causal loop diagrams***

First, we illustrate, via Figure 1, how the *institutional commitment to DT* is expressed through an *investment in funding teacher participation* in the SU-DS teacher development workshops, with the intent of *developing individual teacher capability and building collective capacity* within the school. Then, in Figure 2, building on and synthesising common variables and relationships in Figure 1, we provide an illustration of how attempts to engage both in capability development and capacity building across teachers may contribute to effective implementation of the DT initiative. In particular, we show how *perceived benefits* accruing to individual teachers and accruing from the collective capacity of teachers, may be perceived as “small victories” that enhance *enthusiasm and commitment of individual teachers*.

Figure 3 then incorporates those “victories” that emerge as *new educational developments* and generate *school-wide benefits*, as opposed to individual teacher benefits. Figures 4a and 4b provide further systemic insight about other factors that may emerge during implementation of the DT initiative and that may then create obstacles to further success or even undermine the initiative.

We begin by outlining how a systems representation may be constructed, annotated and narrated (see Figure 1). First, we identify important entities or variables, for example, *institutional commitment to the design thinking initiative*, *quality of capability development programme* and *ability to build teacher capability*. These variables are surfaced from the content analysis conducted (See *Methodology*).

In this case, we interpret Figure 1 as follows:

the stronger *the institutional commitment to the design thinking initiative*, the higher *the quality of the capability development programme*, leading to a greater *ability to build teacher capability*, thus heightening *the ability to build capacity through teacher networks*.

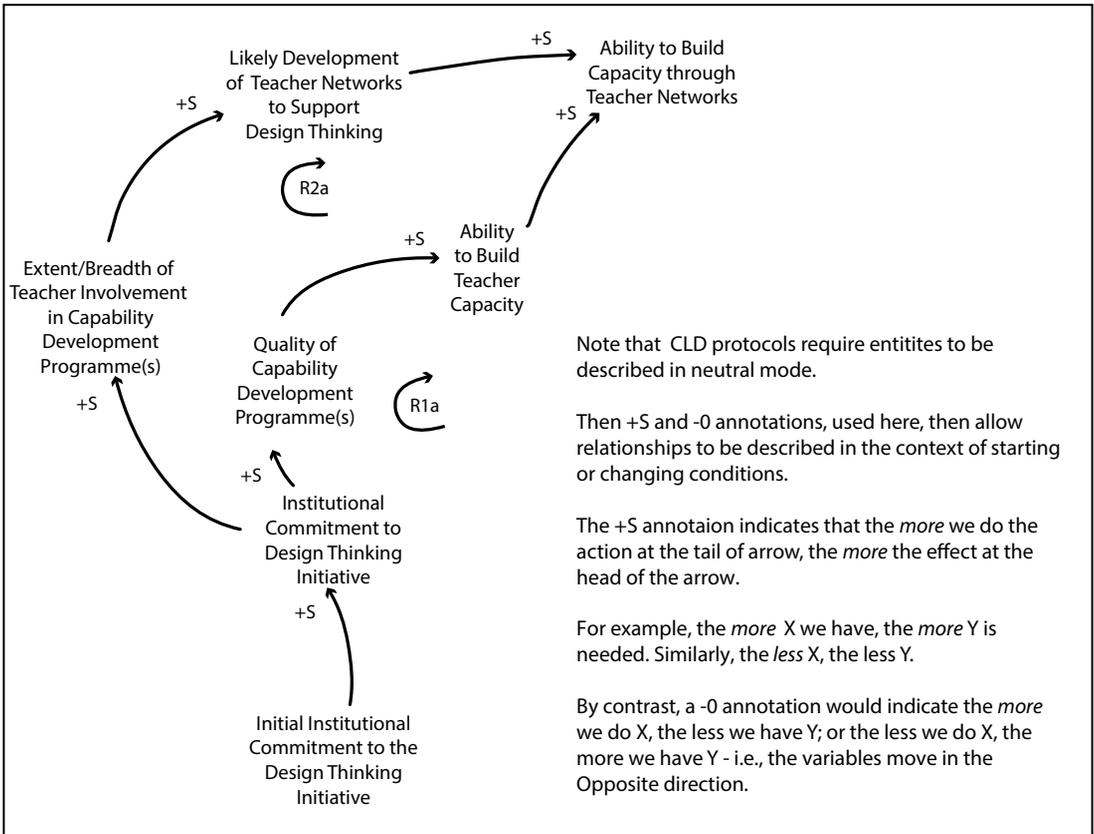


Figure 1. The DT initiative. Capability development & capacity building - A systems representation

Similarly,

*the stronger the institutional commitment to the design thinking initiative, the greater the breadth of teacher involvement in the capability development programme, boosting the development of teacher networks to support design thinking, and enhancing the ability to build capacity through teacher networks.*

Whilst Figure 1 presents a set of cause-effect relationships as a linear sequence, purely for illustrative purposes, Figures 2 and 3 successively extend the diagrammatic representation of the causal relationships as a set of mutually dependent variables, causal relationships and causal loops to form a causal loop diagram (CLD). The intent of such a CLD is not only to reveal the overall systemic structure, as a patterned set of dynamic feedback loops, but to facilitate interpretation of how individual and systems behaviour and outcomes evolve as emergent properties of that systemic structure. We illustrate such intent below by narration and interpretation of Figures 2 and 3.



Loop R2a thus comprises a set of seven positive causal relationships contributing to a positive or virtuous Reinforcing Loop, and aiming to build a strong *Teacher Hub*, as a guiding coalition, to promote change.

A narration of the six causal relationships in Loop R1a would relate, by contrast, to *Individual Teachers*, such that:

an enhanced *institutional commitment to the design thinking initiative*, boosts access to *quality capability development programmes*, leading to a growing *ability to build individual teacher capability* that may first strengthen *teacher perceptions of individual benefits*, lifting the *enthusiasm and commitment of individual teachers*, leading to an increase in *individual preparedness to invest in design thinking*, further contributing to the *institutional commitment to the design thinking initiative ...* that we started with.

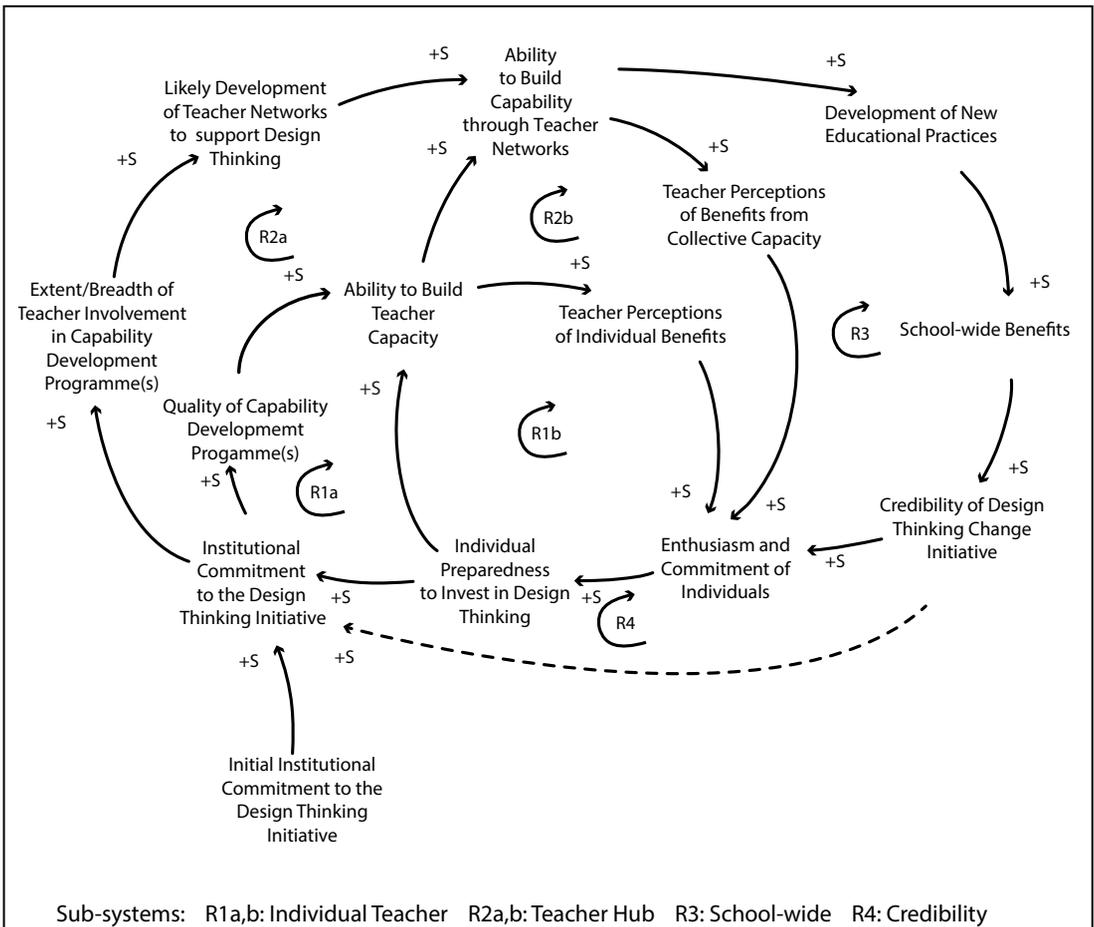


Figure 3. The design thinking initiative. An extended school-wide CLD.

Loop R1a similarly comprises another set of causal relationships that can be described as a virtuous Reinforcing Loop.

For Figure 2, we note again that the reinforcing loops R2a & R2b relate to groups of teachers manifesting as *teacher hubs* or *teacher collectives*, whilst the various reinforcing loops R1a & R1b encompass relationships that relate to and impact on *individual teachers*. In Figure 3, we extend the systems representation beyond, say, teacher perceptions of individual benefits and of benefits from an enhanced collective capacity, to include the development of *new design thinking-related educational practices* that contribute to *school-wide benefits*.

#### *Reinforcing loops as virtuous and vicious cycles*

A notable feature of Figures 2 and 3 is that all relationships are identified as *positive* cause-effect relationships, and that all causal loops (R1a - R4) are positive reinforcing loops, each creating a sense of virtuous cycles of continual improvement in benefits, outcomes etc. However, as implied above, an interpretation that once the *institutional commitment to the design thinking initiative* is put in place – leading to an increased *involvement of potential teacher leaders in quality capability development programmes* – and that all will be well, would be misdirected and naive, as Kotter (1995) and Senge (1990) would suggest. Indeed, we again caution about situations where specific influences could result in a virtuous reinforcing cycle becoming a vicious reinforcing cycle, either needing pre-emptive action or quick response to manage those negative causal influences or mitigate their effects.

In this respect, the research findings that indicate the emergence amongst teachers of concerns or doubts about the adequacy of resources available to support the change initiative, and that signal reservations about the motives of school leaders, mirror other research findings (Kotter, 1995, 1996; Senge et al., 1999) of problematic matters whose existence are likely to inhibit or undermine change.

For instance, early *teacher perceptions of benefits* arising from the initiative may give momentum to the initiative but, otherwise, the systems representations of Figures 2 and 3 provide no indication of other matters that may arise over time, which could then inhibit, stop or reverse that momentum. Such latter dynamics are redolent of the systems behaviour associated with the systemic structure labelled by Senge (1990) as a *Limits to Growth* (LtG) archetype, and are shown below as Figure 4a and 4b.

Figure 4a depicts how perceptions of *resource inadequacy*, especially time, which develop later in the implementation phase, contribute to the systemic balancing loop B1 that adversely impact, counter or even reverse the seemingly virtuous reinforcing loops.

Here, we find that if:

teacher *perceptions* of what constitutes *appropriate resourcing* are not being met, the *frustration* resulting from a *resource shortfall* or *gap* would adversely impact the

*enthusiasm and commitment of individual teachers, reducing individual preparedness to invest in design thinking, and subsequently limiting the prevailing benefits.*

Indeed, any of the interacting virtuous reinforcing loops, R1a-R3, could become vicious reinforcing loops, generating self-feeding spirals of negative systemic consequences – such as harming *the development of new educational practices*, and undermining the *credibility of the design thinking initiative*.

However, the CLD also shows how an intervention rethinking the nature of *institutional commitment* could lead to a cycle of events manifest as:

improving *resource availability*, thus reversing *teacher perceptions of inadequate resourcing*, mitigating the *frustration resulting from a resource shortfall* and thus

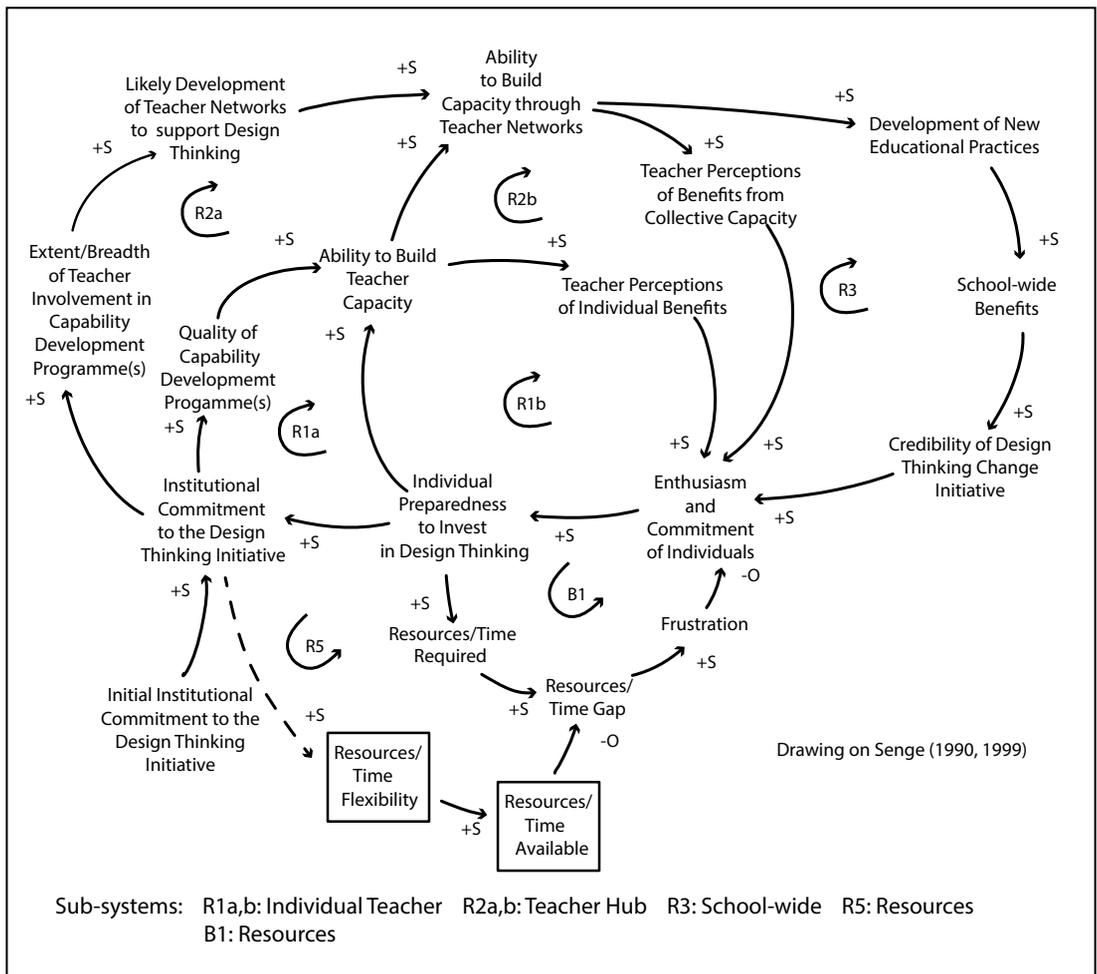


Figure 4a. The DT initiative. Resource inadequacy - The Limits to Growth (LtG) archetype

positively impacting *the enthusiasm and commitment of individual teachers*, increasing *individual preparedness to invest in design thinking*, further improving *resource availability ... etc.*

These relationships contribute to the reinforcing loop R5, which not only accentuates the systemic nature and effect of the intervention, but also provides a systemic justification for rethinking the nature of *institutional commitment* and improving *resource availability*.

Figure 4b reflects teacher comments and perceptions relating to *trust*. It provides a truncated CLD showing only those relationships that represent the emergence and impact of a *lack of trust* (or *trust gap*) and how the change initiative is managed and led.

We note for reinforcing loop R6:

individual teacher *lack of trust* may undermine the *credibility of the design thinking initiative*, then depleting *enthusiasm and commitment of individuals*, limiting *individual preparedness to invest in design thinking*, limiting *institutional commitment to the design thinking initiative*, undermining the *clarity and credibility of management values*, further cultivating *lack of trust*.

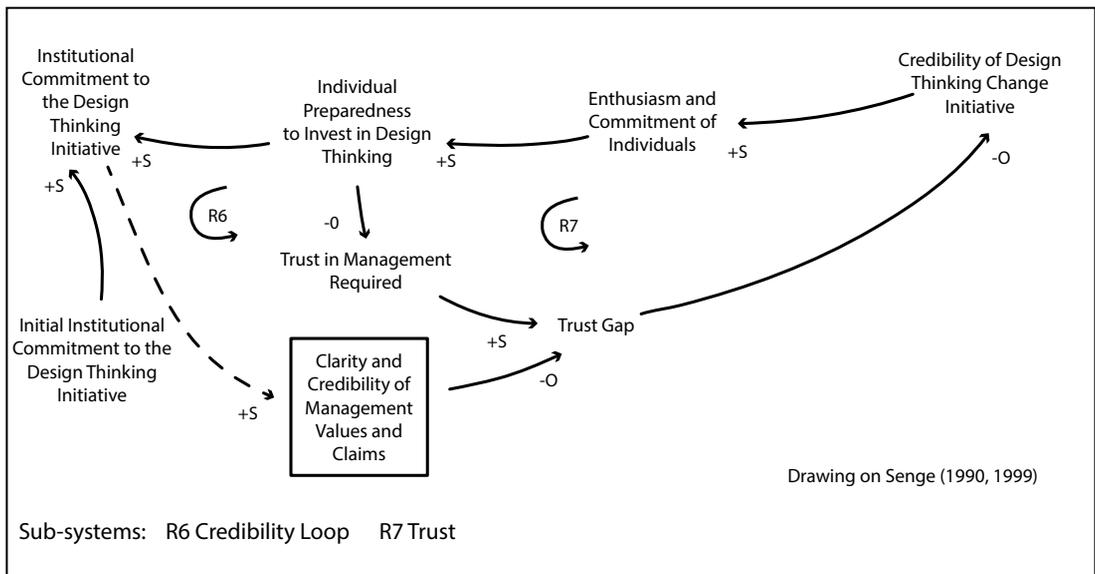


Figure 4b. Lack of trust as an inhibiting factor. The *Limits to Growth* (LtG) archetype

In this case, the reinforcing loop R6 is interpreted as a vicious cycle (as would be R7). However, in both cases, any management action that seeks, for example, to boost the *credibility of the design thinking initiative*, or boost *enthusiasm and commitment of individuals*, or boost *trust* will create a virtuous reinforcing cycle rather than a vicious cycle. The analysis can thus be used to inform management about appropriate points of intervention.

In both Figures 4a and 4b, we represent how unexpected or unforeseen factors that initially manifest amongst individuals may emerge to have unintended wider system consequence. In this case, those factors – such as teacher perceptions of *resource inadequacy* or *lack of trust* - may not only impact subsequent individual teacher behaviour, but also contribute to the emergence of balancing loops within a similarly emergent *Limits to Growth* systemic structure.

Of course, there are many other factors that could begin to undermine the DT initiative, and we suggest that effective leadership and change management behaviours would benefit from the complementary development of a systems perspective, and identification of appropriate systemic intervention.

### **Discussion and summary**

This paper has used a systems approach to examine the implementation of a change initiative in a specific organisational case setting – a Singapore secondary school. In doing so, we suggest our case-based analysis has provided insights that are meaningful beyond the immediate setting.

The organisational commitment to the adoption of a design thinking pedagogy-related initiative was initially evident in the considerable investment in a Teacher Development programme which included participation in the SU-DS teacher development workshops. Such investment was a signal of intent, purpose and the values driving the school to extend the pedagogical repertoire, capability and skill base of its teachers. The investment, itself, was a manifestation of leadership at school level. The involvement of a significant number of teachers in the SU-DS workshops can be viewed as an attempt both to build individual capability and develop a critical mass of capacity akin to the guiding coalition (Kotter, 1996) that would also provide leadership within the school.

However, we recognised that as the design thinking initiative unfolded beyond its promising beginnings, so did teacher perceptions of *excessive workload*, *lack of time*, *lack of physical and financial resources*, *inadequate ongoing investment*, and as did an accompanying emerging *lack of trust* in the change leaders etc. Such perceptions align with a wider failure to meet the expectations of stakeholders, for instance, ongoing benefits for teachers, for pupils, or for the school, and they surface concerns about the effectiveness of the “sustaining change” phase.

Our systems representations (i.e. CLDs) demonstrate the value of recognising that such perceptions and contingent relationships be understood in terms of their system-wide and systemic consequences, and in the context of the wider systemic structure of which they are a constituent part rather than as episodic elements. Our analysis suggests that such perceptions have consequential impacts on morale, enthusiasm and commitment amongst teachers and other stakeholders, consequently undermining the ongoing initiative.

The systems representation in Figure 3 goes well beyond the diagramming of a seemingly complicated set of episodic elements. Indeed, in developing a systems perspective to the

introduction of the design thinking initiative, we see that the change process may be conceptualised as the interaction of a small number of common and recognised systemic structures or archetypes, or as the interaction of six causal loops, rather than the complex interaction of a multiplicity of 14 variables and 19 relationships. Indeed, at a higher level of conceptualisation, we may view the change process as involving the systemic interaction of what may be called Individual Teacher or Teacher Hub sub-systems embedded within a School-wide system. Nevertheless, the CLDs capture the individual relationships which facilitate more nuanced understanding. Together, these views help build understanding of the change process, and whether and why it is successful or not – and if not, where to intervene to create beneficial change.

For example, one such common systemic structure, the *LtG* archetype, recognises how seeming initial success may not be sustainable as benefits become too difficult to generate, or as opportunities for improvement diminish. The CLD in Figure 4 reveals such a systemic structure at play, and also facilitates recognition of other competing systems structures and causal loops at play. Relevant systems insights point to the need to appropriately manage factors contributing to the constraining or balancing loops of Figure 4a, rather than just focus effort on factors that contribute to maximising the “beneficial” cause-effect relationships and virtuous reinforcing loops. These former factors should then become the intervention points or targets of proactive beneficial intervention.

In this respect, we restate that situations where such *lack of trust* exists, where teachers consider the initiative to be a “*waste of time*” or where they believe they are inadequately supported, are often manifestations of inadequate or dysfunctional interaction between the school-level leader(s), the guiding coalition of designated teacher leaders and other classroom teachers. They may also be a manifestation of leader failings to acknowledge, empathise with or respond to teachers’ feelings or views.

Such failings in ongoing interaction suggest the importance of a softer behavioural side of leadership that seeks out alternative perspectives that underpin empathy and empathetic relationships (Goleman, 2000). It may also reflect the necessary alignment of operational aspects of the change initiative with teacher needs and organisational goals. Furthermore, such empathetic interaction would also provide insight about whether too much responsibility may have been devolved to teacher leaders, who whilst having benefited from the SU-DS workshops, may not have the authority that the cultural system demands, nor access to resources or the technical and behavioural interpersonal skills to lead change.

Taken as a whole, the sensitive, empathetic interaction that characterises such leadership behaviour would contribute evidence, or not, of the role modelling that is described as “walking the talk”, and that serves to reaffirm prevailing values, aspirations and commitment within the school to the school community, and to the change initiative. It also provides evidence, or not, of relevant support for teachers, as well as a harder-nosed focus on goals. Collectively, these interactions

indicate and convey leader commitment, empathetic understanding and an over-riding sense of purpose.

The understanding of systemic structure, as reflected in the CLDs, highlights, in particular, the dangerous nature of reinforcing loops – especially how a virtuous reinforcing loop can become a vicious spiral of decline if the constraining factors and balancing loops encompassing matters such as *lack of trust* or *lack of resources* are not identified, and managed with appropriate intervention. However, as a corollary, the nature of reinforcing loops also gives hope to reversing any vicious spirals of decline with appropriate intervention.

More generally, the systems perspective helps develop recognition that some outcomes are not merely the consequences of individual behaviour or a single cause. They may be unintended, unexpected or unwanted, and they may be the consequence of systems behaviour, systemic interaction. Such outcomes may therefore be described as the emergent properties of the wider system. As such, the systems perspective validates a view that a “system” cannot be managed just as a collection of individual entities but as a set of interacting entities, causal loops or systemic structures. If so, points of intervention to pre-empt or mitigate unwanted consequences can be identified from our systems representations. Such insight about relevant points of intervention located within a balancing loop, and the system-wide leverage that can sustain beneficial change, would not be so readily apparent without the CLD representation demonstrating the nature of systemic structure.

### **Summary and conclusions**

The paper demonstrates how, in the context of a change initiative, a complex of individual actions and initiatives, cause-effect relationships, and mutual dependencies can not only impact the behaviour of individuals/teachers and groups, but effect behaviours and outcomes at the level of the wider system in unintended and unanticipated ways that may be described as the emergent properties of the system.

The paper has shown how recognition and understanding of systemic structure may elevate anecdotal observation to insight, and also convey insight and meaning. It has done so by demonstrating how the recognition of embedded causal loops and also common systems structures, that is systems archetypes, such as Senge’s *Limits to Growth*, may elevate understanding to a meta-level involving interacting systemic structures rather than the interaction of multiple individual variables.

We suggest that understanding the systemic structures embedded within a change initiative is a pre-requisite of effective leadership and attendant leadership behaviour. Our analysis indicates, for example, that leadership cannot just reside at the system or school level. Neither can it just manifest as leadership responsibilities devolved to a guiding coalition or hub of teacher leaders. Reflecting the underlying systemic structures, leadership must involve

more than setting the initial goals at the school level; more than top-down technical operational planning and resourcing; and more than getting the initial buy-in from others in the system. It must also encompass those “soft” leadership behaviours and skills, variously described as emotional intelligence (Goleman, 2000), and comprising self-awareness, self-management, social awareness and social skills that complement and foster empathetic interaction between school leaders, the guiding coalition or teacher hub, and individual teachers. Such empathetic interaction, displaying a genuine interest in other people and an ability to sense other people’s emotions, provides the feedback necessary to ascertain the perceptions and views of those within the embedded sub-systems, to ascertain the capabilities of individuals and the capacity of groups to lead and deliver. Such understanding then underpins decisions to provide the physical resources, training and psychological support to sustain effective change operations and effective school-wide change outcomes.

In essence, our systems representation and analysis affirm the importance of the softer leadership behaviours that foster empathetic interaction and provide valuable feedback. These constitute a form of preventive intervention, allowing the school to address matters that would otherwise undermine the change initiative or future initiatives.

As such, the paper contributes to the literature on educational leadership, systems thinking and design thinking, in general, and its extension to a specific educational and cultural setting – the Singaporean school system, in particular.

## References

- Anderson, N. (2012). Design thinking: Employing an effective multidisciplinary pedagogical framework to foster creativity and innovation in rural and remote education. *Australian and International Journal of Rural Education*, 22(2), 43–52.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84(2), 191–215.
- Bass, B. M., & Bass, R. (2008). *The Bass handbook of leadership* (4<sup>th</sup> Ed.). New York, NY: Free Press.
- Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544–559.
- Boni, A.A., Weingart, L. R., & Evenson, S. (2009). Innovation in an academic setting: Designing and leading a business through market-focussed, interdisciplinary teams. *Academy of Management Learning & Education*, 8(3), 407–417.
- Boyle, T. (2014). 21<sup>st</sup> century knowledge, skills, and abilities and entrepreneurial competencies: A model for undergraduate entrepreneurship education. *Journal of Entrepreneurship Education*, 15, 41–55.
- Brown, T. (2008). Design thinking. *Harvard Business Review*, June, 86(6), 84–92.

- Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.
- Constas, M. A. (1992). Qualitative analysis as a public event: The documentation of category development procedures. *American Educational Research Journal*, 2(2), 253–66.
- Denzin, N. K., & Lincoln, Y. S. (2011). *Handbook of qualitative research*. (4<sup>th</sup> Ed.). Thousand Oaks, CA: Sage.
- DeRue, D. S., Nahrgand, J., Wellman, N., & Humphrey, S. (2011). Trait and behavioural theories of leadership: An integration and meta-analytic test of their relative validity. *Personnel Psychology*, 64(1), 7–52.
- Dimmock, C., & Tan, C.Y. (2013). Educational leadership in Singapore. *Journal of Educational Administration*, 51(3), 320–340.
- Estrada, C., & Goldman, S. (2017). A Praxis model for design thinking – catalysing life readiness. In S. Goldman, & Z. Kabayadondo (Eds.), *Taking design thinking to school: How the technology of design can transform teachers, learners and classrooms*. New York, NY: Routledge. 37–49.
- Fullan, M. (2001). *Leading in a culture of change*. San Francisco, CA: Jossey-Bass.
- Fullan, M. (2006). *Turnaround leadership*. San Francisco, CA: Jossey-Bass.
- Gardner, H. (2006). *Five minds for the future*. Boston, MA: Harvard Business School Press.
- Goldman, S. (2018). Design thinking for kids? How teachers can bring this creative problem-solving process into the classroom. *Stanford University*, February 5, 2018.
- Goleman, D. (2000). Leadership that gets results. *Harvard Business Review*, March-April, 78(2), 4–17.
- Hallinger, P. (2011). Leadership for learning: Lessons from 40 years of empirical research. *Journal of Educational Administration*, 49(2), 125–142.
- Hargreaves, A., & Fink, D. (2003). Sustaining leadership. In B. Davies and J. West-Burham (Eds.), *Handbook of educational leadership and management*. London, UK: Pearson Education.
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviours, institutions, and organisations across nation* (2<sup>nd</sup> Ed.). Thousand Oaks, CA: Sage.
- Kelley, D., & Kelley, T. (2013). *Creative confidence: Unlocking the creative potential within us all*. New York, NY: Crown.
- Kok, J.H.L., Chai, S.C., Wong, B., & Hong, H.Y. (2015). *Design thinking for education: conceptions and applications in teaching and learning*. Singapore: Springer.
- Kotter, J. P. (1995). Leading change: Why transformation efforts fail. *Harvard Business Review*, March-April, 59–67.
- Kotter, J. P. (1996). *Leading change*. Boston, MA: Harvard Business Review Press.
- Lee, K. (2011). Beyond blueprints and basics: A service design conference report. *Design Issues*, 27(4), 95–100.

- Leithwood, K., & Jantzi, D. (2000). Principal and teacher leadership effects: A replication. *School Leadership and Management, 20*(5), 415–434.
- Liedtka, J. (2011). Learning to use design thinking tools for successful innovation. *Strategy and Leadership, 39*(5), 13–19.
- Maani, K. E., & Cavana, R.Y. (2000) *Systems thinking and modelling*. Auckland, NZ: Pearson Publishing.
- Martin, R. L. (2009). *The design of business: Why design thinking is the next competitive advantage*. Boston, MA: Harvard Business Press.
- McCullagh, K. (2010). Stepping up: Design thinking has uncovered real opportunities. *Design Management Review, 3*, 36–39.
- McDonagh, D. , & Thomas, J. (2010). Rethinking design thinking: Empathy supporting innovation. *Australasian Medical Journal, 3*(8), 458–464.
- Oon-Seng, T. (2012). Singapore’s holistic approach to teacher development. *Phi Delta Kappa, 94*(3), 76–77.
- Peterson, S. J., Walumbwa, F. O., Byron, K., & Myrowitz, J. (2009). CEO positive psychological traits, transformational leadership, and firm performance in high-technology start-up and established firms. *Journal of Management, 35*, 348–368.
- Robinson, V., Lloyd, C., & Rowe, K. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Education Administration Quarterly, 44*(5), 635–674.
- Rowe, P. G. (1987). *Design thinking*. Cambridge, MA: MIT Press.
- Schwab, K. (2011). *The Global Competitiveness Report 2011–2012*. Geneva, Switzerland: World Economic Forum.
- Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Doubleday.
- Senge, P. M., Kleiner, A., Roberts, C., Ross, R., Roth, G., & Smith, B. (1999). *The dance of change: The challenges of sustaining momentum in learning organizations*. London, UK: Nicholas Brealey Publishing.
- Sergiovanni, T. J (2009). *The principalship: A reflective practice perspective*. Boston, MA: Pearson.
- Stake, R. E. (1995). *The art of case study research*. London, UK: Sage.
- Sterman, J. (2000). *Business dynamics: Systems thinking and modelling for a complex world*. New York, NY: McGraw-Hill.
- Tajasom, A., & Ahmad, Z. A. (2011). Principals’ leadership style and school climate: Teachers’ perspectives from Malaysia. *The International Journal of Leadership in Public Services, 7*(4), 314–333.
- Tan, C., & Wong Y. (2012). Promoting spiritual ideals through design thinking in public schools. *International Journal of Children’s Spirituality, 17*(1), 25–37.

- Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *The Academy of Management Journal*, 45(6), 1137–1148.
- Todd, R. (1999). Design and technology yields a new paradigm for elementary schooling. *Journal of Technology Studies*, 25(2), 26–33.
- Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need – and what we can do about it*. New York, NY: Basic Books.
- Yin, R. K. (2014). *Case study research: Design and methods*. Los Angeles, CA: Sage.

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