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Implementing education system reform: Local adaptation in school reform of teaching and learning

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Abstract

This paper has two purposes: first, to investigate centre-periphery, and within-school relationships and processes by which Vietnam schools undertake system reform implementation; second, to develop the explanatory power and complementarity of two theories – complex adaptive system theory and loose-tight coupling. Main findings - schools' internal enablers driving reforms were shaped by external enablers; a plethora of internal enablers then worked in concert to implement the intended reforms (eg. the take-up of student-centred teaching and learning); in the local adaptation process, school culture and professional development were pre-eminent. Conclusions – complex adaptive system theory was validated in how Vietnam schools locally adapted policy.

Key words/phrases: education system reform, school adaptation, complex adaptive system, Vietnam

Introduction

Policy makers in both developed and developing countries increasingly target whole system transformation in attempting school system improvement (Fuller and Stevenson, 2018). For politicians and other advocates, the perceived rewards of undertaking system transformation are potentially high – nothing less than a better prepared future workforce equipped with the knowledge, skills and dispositions fit for a progressive modern-day economy, ready to compete in the competitive global world (Tan, 2017). Other benefits, too – such as a more educated and worldly citizenry – should not be forgotten (Sahlberg, 2006).

There is nothing new about government policy initiatives aimed at reforming school systems. From the 1970s onwards, scholars have mapped the difficulties and failures of systemically changing practices and behaviours in large numbers of schools – whether these are by top-down initiatives from centre to periphery, bottom-up strategies, or a combination of both (Fullan, 1990; Levin, 2010). After decades of research, the knowledge base has improved. We are now clearer about the factors making for successful school system reform - including, for example – clear policy guidance and close multi-directional communication between centre and periphery (buy-in and engagement) (Schleicher, 2018); high performing leadership, especially at school level (Pont, Nusche and Moorman, 2008); and a well-qualified teaching force with continuous professional development based on teacher knowledge and skills needed for successful implementation (Stoll, Harris and Handscomb, 2012).

We also know that of the three stages of policy making – formulation, adoption and implementation – it is the implementation stage – largely executed at school level, that is the most challenging (Holmes, 1965; Schleicher, 2018). Over the past decade, as governments increasingly become convinced of the economic, social and political benefits from educational transformation of schools - rather than smaller scale innovations - the challenge for schools in implementing such complex reforms has grown exponentially (Sahlberg, 2006). Whereas in past decades, governments often seemed to adopt a more sequenced rather than comprehensive approach to reform – for example, first school-based management and governance, followed subsequently by curriculum reform, as in Hong Kong, or vice versa, as in Singapore) more recent examples indicate that governments are turning to comprehensive

transformations characterized by multiple, connected and simultaneous changes to curriculum, pedagogy, assessment, teacher professional development, school leadership and autonomy (author, 2016). Vietnam's most recent government reform initiatives are illustrative of this, as are numerous other examples from Asia eg. China (see OECD, 2016) and the Middle East (eg. Kuwait and Bahrain).

Despite decades of research and resultant progress about what we know and what works for school system reform (Hattie, 2009), there are still many important gaps in our knowledge base. These gaps form the aims, research questions and thus focus for this paper – with Vietnam as the context. First, when schools are faced with multiple, connected and simultaneous system reforms, a key element of which is changing pedagogy from teacher-centred to student-centred (or vice versa) methods, what are the relative roles and influences of the centre (ministry) as policy formulator, and individual schools as implementers, in deciding schools' future developmental paths? Second, do schools tend to follow recognisable pathways for change when implementing multiple system reforms, given - as argued in this paper - that schools are agentic organisations (to variable degrees, depending on for example, their socio-political cultures), and possess many of the characteristics of complex adaptive systems? Third, if there are recognizable patterns or pathways to which schools lock-in, what are their features or characteristics? The research reported in this study attempts to throw light on these questions, thereby contributing to and extending the knowledge base on school implementation of education system reform to a developing South-East Asian context.

Vietnam is justified as the context for the study for the following reasons. First, it represents an example of whole system transformation characterised by multiple, connected, simultaneous and continuous (ie on-going, long term) 'renovations' (the Vietnamese synonym for 'reform' of schools). Second, as a South-East Asian case study of a fast-developing society and economy it has aroused international interest for its impressive performance on international achievement tests (notably PISA). Third, by researching a South-East Asian system the knowledge base on school implementation of whole system reform is widened beyond an Anglo-American focus.

The paper is structured as follows. Following the introduction, the second part outlines the fundamental problem facing the Vietnam government, and the programme of

renovations designed to bring about system transformation. This is followed, third, by a brief section on Vietnam society and the education system. Fourth, the conceptual framework adopted by the researchers – namely, schools (and systems) as complex adaptive systems, and tight-loose coupling, is sketched. A fifth part reviews relevant literature on school implementation of whole system reform. Then follows the sixth and seventh parts describing the methodology and findings, respectively followed by an eighth section providing a discussion and implications, and lastly, a conclusion.

Vietnam's education system

As a communist/socialist state, the governance of public services such as education is typically centralized and top-down, controlled by the central MOET (Ministry of Education and Training) – as part of the central government in Hanoi, cascading to the provinces (responsible for secondary education) and districts (responsible for primary education). At each tier or layer are Party officials and education officers, known as DOETs – district officers of education and training, whose task is to relay government education policy to, and in turn supervise, the schools. Particular emphasis is placed by the bureaucracy on observance and transmission of communist ideology in the curriculum. The government spends 20% of its budget on education, and nearly 6% of its GDP (Financial Times, 2019) - high by international comparison.

School enrolment and size of school system

According to the General Statistics of Vietnam (2017), there were 7.8 million elementary pupils in 15,254 schools, 5.14 million lower secondary students in 10,321 schools, and 2.4 million students enrolled in 2,399 upper secondary schools. There are a further 1000 mixed schools. Hence in 2017, there were just under thirty thousand schools. Vietnam has a young demographic profile, with resultant high pressure on schools and class sizes, especially in those newly populated suburbs where no new schools have been built. Although the government has an official target of maximum 35 students per class, it is commonplace, especially in primary schools, and to a lesser extent, lower secondary, to find classes of 50 or 60.

Theoretical framework and assumptions – schools and school systems as tightly-loosely coupled and as complex adaptive systems

As heuristic devices for analyzing school and school system reform, two conceptual and theoretical frameworks seemed apposite: tight-loose coupling (Weick, 1976; Orton and Weick, 1990) and complex adaptive system theory (CAST) (Mason, 2016). Both share a common derivation in system theory, which may explain why they have previously been considered in tandem (Hawkins and James, 2016). Both theories accommodate the notion that schools are micro systems in their own right at the same time as they are part of larger national eco-systems. As part of larger public systems, they are regulated and subject to policies administered centrally by national ministries; however, they can also be considered as micro-systems with their own organizational and developmental paths (Stacey, 2011). We explored the assumptions, strengths and weaknesses of each theory for our purposes in understanding school reform in Vietnam in terms of the relationships at two levels - between the centre (Ministry of Education, MOE) and periphery (schools), and within schools *per se*.

Tight-loose coupling

As a national education system, Vietnam is acclaimed as centralized – where power is heavily concentrated at the centre, with support from a large bureaucracy of rules, regulations, and political cadres at provincial, district and local levels. Typically, such centralized systems are seen as allowing relatively little discretion to schools at the periphery. This scenario complies with Weick's (1976) idealized notion of tight coupling at both levels – between centre and school, and within school (although Weick described schools as 'loosely coupled', he was basing his evidence on Anglo-Western systems). Tight coupling relationships imply standardization, strong interdependence and centralized authority, top-down initiated reform, risk averseness and prescribed procedures and processes (Weick, 1976). Loose coupling, on the other hand, offers the antitheses of tight coupling – while some interdependence is featured, each element of a system has its own identity and enjoys considerable discretion and autonomy (between centre and schools, and within schools), and may facilitate risk taking, innovativeness and bottom-up reform and change. Despite its relative popularity among organisation theorists since the 1970s, as a heuristic for analyzing education system reform, the tight-loose coupling theory has limitations, as observed below. While we highlight these limitations (for purposes of a future research agenda to address them), we acknowledge the efficacy of tight-loose coupling theory as a useful complementary framework to CAST – as evidence later in the paper. Indeed we claim that coupling theory through its emphasis on relationships complements and strengthens explanations of how

systems achieve adapative functioning e.g. achieving desired changes in teaching and learning.

First, the tight-loose coupling notion is reductionist in that it offers a polarity between two extreme ends of a hypothetical scale. It does not easily accommodate situations somewhere in between, which are neither very tight nor very loose. A second concern is that while 'tight' and 'loose' concepts appear valid, they are hard (if not impossible) to measure in intensiveness or extensiveness. A third is the problem of attributing tightness – looseness to the different elements of education systems and schools, which may not all be aligned as tight or loose. For example, many centres (governments) champion devolution to schools in leadership and management, giving them more autonomy –ie. loose coupling, yet at the same time, the centres establish greater accountability over schools for student outcomes and standards –ie. tight coupling. Such simultaneous loose-tight coupling (Hautala, Helander and Korhonen, 2018) is also evident in system reforms that maintain tight central control over the mainstream curriculum structure and content, while allowing discretion to teachers as to how they teach. A fourth concern is that loose-tight coupling offers a static description of relationships at a given moment in time, thus encountering difficulty in accommodating dynamic relationships during reform periods. Fifth, the static nature of coupling theory seems to offer little help in understanding and clarifying what are the key relationships between centre and schools and within schools *per se*, in making change happen. Sixth, contemporary educational reforms are more complex and challenging than in the past. Government reforms are often multiple, simultaneous and connected (eg. such as management and devolution, curriculum, pedagogy) presenting major challenges to implementation by schools. A premium is thus placed on understanding the changes in structures, processes and cultures required for implementation. Loose-tight coupling appears unable to address the fine grain detail of such changes. Finally, there is some confusion among scholars of educational reform as to whether it is best for schools and school systems to be tightly or loosely coupled. Some argue that schools are too loosely coupled, and that through managerialist reforms and stronger leadership, greater standardization and equity can be achieved (Shen, Gao and Xia, 2016). Others argue that where tight coupling has existed, top-down change and managerialism have failed, and that as schools are by nature loosely coupled, reforms should embolden 'looseness' through developing more lateral coupling, that is, professional development of teachers, collaborative professional practices and culture building (author, 2013; Goldspink, 2007).

Overall, given the complexity of 21st century education system reform, tight-loose coupling theory has considerable limitations as an explanatory device.

Complex adaptive system theory

Conceptually, Holland (2014) reminds us that complex adaptive systems theory (CAST) is still in its infancy. It derives from complexity theory, which in turn originates from system theory in the 1960s (Grobman, 2005). Complexity theory emphasizes the interactions, accompanying feedback, and resultant change that takes place within and between the parts of systems. Education systems are complex structures and possess dynamic networks of interactions, which are paralleled at school level. Complexity theory proposes that although systems are unpredictable, they are constrained to varying degrees by order-generating rules (Burns, 2005). CAST is distinguishable from complexity theory by its emphasis on the realities and possibilities of schools being adaptive, agentic organisations with the ability to mediate whole system change at the local level.

As a heuristic for analyzing educational reform, what are the main features of complex adaptive system theory (CAST), and to what extent does it overcome the weaknesses of tight-loose coupling theory? The basis of CAST is that schools are agentic in responding and adapting to the national policy reform environment; how they do so, coping with the uncertainty involved, makes them complex adaptive systems. Specifically, individual behaviour and practice as well as the school's collective practices are agentic in adapting and responding to change-initiating reform environments. Evidence suggests that agentic schools and individuals tend to adapt or change to varying degrees – albeit within the same eco-system (Hawkins and James, 2016) – especially in large systems like Vietnam where central ministries are unable to exercise control over the inner workings of all schools. Scholars have realized that education system reform is characterized by non-linear cause-and-effect scenarios, where school adaptions to whole system reform are unpredictable, confirming schools as complex adaptive systems (Hawkins and James, 2016). Selected key themes of CAS (complex adaptive systems) include:

1. Non-linearity and unpredictability of change (local units are less constrained by the centre and hence results are often unpredictable);
2. The hierarchical form of order is less dependent on hierarchical control, but is distributed and local in its operation;

3. Interaction and interdependence among subsystems result in units acting semi-independently and unpredictably in responding to local eco-systems;
4. In responding to local contexts and cultures, the operational units (ie schools) of a system display some variety and heterogeneity across the whole system;
5. The operational units (schools) may display a tendency to self-organise in order to create more stability;
6. Emergence is often a key characteristic (organizational features emerge through the interactions of organizational actors); individuals and groups develop new properties and features as a result of interaction over time; in schools, learning new ideas and practices is emergent but unpredictable, and may expectedly vary from school to school (Snyder, 2013);
7. Patterns emerge over time; in schools, these may take the form of innovations and new forms of working that hold the promise of improving performance eg through better teaching, learning, professional development and leadership; in due course these may become established ways of working in the school. A school's ability and willingness to capacity build – especially in providing relevant and continuous professional development for its teachers and leaders - is likely to be a key determinant of its agentic adaption to whole system reform (author, 2012);
8. An embryonic conceptual framework for understanding emergent patterns involves three notions - lock-in, path dependence and inertial momentum; Mason (2016) argues that schools as complex adaptive systems with emerging properties and behaviours adhere much more to Foucault's emphasis on "polymorphous correlations……(than)…… simple or complex causality (cited in Harvey, 1990, p.9). Mason (2016, p.52) goes on to claim that these "emergent phenomena form a critical mass, associated with notions of lock-in, path dependence and inertial momentum, and contribute to a perspective on continuity and change that indicates what conditions might need to be in place for the emergence of sustainable, positive, system-wide change and development." In other words, according to CAST, schools facing the challenges of implementing multiple and simultaneous reforms need the capacity to seek and then gradually establish emergent patterns of routines that support more effective practices and processes, structures and cultures.

In contrasting with loose-tight coupling, CAST avoids the bi-polarity of coupling; and in not polarizing, it by-passes the measurement problem. CAST also avoids debates about

which state or combination (loose and/or tight) is more effective. CAST also offers a more dynamic view of emergent patterns of practices over time that offer possibilities of improved effectiveness. However, herein lies the present vulnerabilities of CAST: potentially powerful concepts of schools locking-in to new practices, evolving path dependence (routine ways of working) and inertial momentum (gathering critical mass) to sustain and scale up, require further conceptualisation and remain relatively untested empirically in contexts of educational reform.

Literature Review – 'Enablers' of school reform of teachers' pedagogical practices

Navigating and implementing ambitious education reforms, as is the case of Vietnam, requires schools to orchestrate a plethora of 'enablers' such as external policy guidance, external and internal teachers' professional development, and adaptation of the school culture to enable changes in teachers' instructional practices.

External policy guidance and external professional development

In the context of centralized educational reforms, schools need to respond to emerging imperatives by understanding the aims and expectations of the reforms, and then developing school capacity to implement the reforms in a viable way. In this regard, sending teachers to attend external professional development courses, especially those organized by the reform-enacting bodies of authorities or teacher training colleges, represent perhaps the most efficient, though not necessarily effective way, for this sense-making process. Teachers may also obtain external professional development by learning from experienced colleagues from other schools on how to implement the reforms, or from teachers in other countries whose schools had successfully implemented similar reforms (e.g., via online resources). External professional development enables teachers to obtain fresh perspectives and novel ideas (Hallinger and Heck, 2002). Schechter (2015) claims that teachers experiencing external professional development can also learn about power relationships, build rapport with external stakeholders, and connect with the external environment.

However, such external professional learning opportunities are usually generic. They are designed to promulgate the overarching reform agenda, and do not prioritize addressing the realities at the ground level of individual schools. For example, they may not cater to the existing knowledge and skill levels of teachers or students' needs in schools, or align well with individual schools' goals and cultures (Ganon-Shilon and Schechter, 2019). This

incongruence may eventuate in implementation challenges at the school level. Consequently, after schools have understood the goals and expectations of the reforms, they may need to engage in "boundary spanning" – complementing external with internal professional development for teachers - to effectively implement education reforms at the school level (Cohen and Levinthal, 1990; Druskat and Wheeler, 2003; Zaccaro, Heinen, and Shuffler, 2009).

Internal professional development

Internal (i.e., within-school) professional development is exemplified by induction training for new teachers, customized professional development for teachers at the school level, in-house training sessions conducted by more senior teachers from the same school, and collaborative action research by teachers of present and new practices (Education Scotland, 2015). Teachers experiencing internal professional development activities can identify schools' needs in the context of system education reforms and be better persuaded to integrate the education reforms into school goals and to achieve the shared school vision (Ganon-Shilon and Schechter, 2019).

Internal professional development is also important because it is more susceptible to fulfilling four critical attributes needed for effective, coherent teachers' professional development (Desimone, 2009; Penuel, Fishman, Yamaguchi, and Gallagher, 2007; Russell, Kleiman, Carey, and Douglas, 2009). These attributes include: teachers collectively participate in their learning and work with colleagues; professional development is distributed across a longer period of time; teachers are given opportunities to actively relate their learning to their classroom work; and the content of the professional development addresses subject specificity and pedagogy. These attributes address Tatto's (1996) concern that there must be a shared understanding on teaching-learning among teachers in coherent professional development programs. They also support O'Day and Smith's (1993) argument for aligning professional development with curricular frameworks and assessment. Incidentally, they may be more easily incorporated in internal (vis-à-vis external) professional development. Indeed, teachers learn more effectively when professional learning activities require them to use practice materials, when they are integrated into teachers' classroom work, and when they employ active pedagogy that reflects how teachers should teach their own students (Darling-Hammond and McLaughlin, 1999; Hawley and Valli, 1999; Putnam and Borko, 2000). The plethora of considerations for achieving effective teacher

learning is important as demonstrated by Ganon-Shilon and Schechter's (2019) study showing that high school principals in Israel prioritized their teachers' needs, their leadership discretion, and the need to adapt to school realities as they made sense of a national education reform. To summarize, as Hallinger and Heck (2002) conclude, there are convincing reasons for claiming that internal professional development is conducive to school capacity building and is more supportive of effective implementation of education reforms at the school level.

School culture

Overall, schools benefit from a combination of external and internal professional development for teachers (Hallinger and Heck, 2002). The provision of effective professional development may then shape the school culture. Culture has often been touted as an important, fundamental aspect of schools that underpins and gives meaning to schools' myriad activities. It is, as Deal and Peterson (1990) described, an "invisible, taken-for-granted flow of beliefs and assumptions" that

> "gives meaning to what people say and do. It shapes how they interpret hundreds of daily transactions. The deeper structure of life in organizations is reflected and transmitted through symbolic language and expressive action. Culture consists of the stable, underlying social meanings that shape beliefs and behaviour over time" (p. 7)."

Culture quintessentially comprises shared beliefs and values that gives a school community its common identity (Deal and Kennedy, 1982). In the context of education reforms promulgating new initiatives to be implemented, culture can also be conceived as

> "a pattern of basic assumptions – invented, discovered, or developed by a given group as it learns to cope with problems…that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems." (Schein, 1985, p. 9).

The role of school culture in implementing education reforms is evident when we realize that principals may reinforce existing school practices or implement only surface-level aspects of initiatives in the implementation of externally mandated education reforms (Coburn, Hill, and Spillane, 2016). For example, schools differ in the manner they implement the same education reform according to policy content, focus, and intensity (Koyama, 2014;

Louis and Robinson, 2012). If schools were to authentically implement specified education reforms, they have to find ways to integrate the reforms into schools' existing organization and, more importantly, culture, failing which there may be only superficial implementation at the school level (Hopfenbeck, Flórez-Petour and Tolo, 2015; Murphy and Torre, 2013). This is consistent with Ball, Maguire, and Braun's (2012) assertion that policy enactment "translates the creative processes of interpretation of the abstractions of policy ideas into contextualized practices" (p. 586).

The effective implementation of education reforms requires, among other conditions, a collaborative school culture that is underpinned by shared goals, mutual trust, and an academic focus (Reed, 2013; Tschannen-Moran, 2014). Such a school culture may gradually emerge following teachers' internal professional development. When professional development is conducted within the school, teachers can learn with their colleagues. This collaborative learning may influence teachers' attitudes, beliefs, and practices and hence, shapes school culture (Cordingley, Bell, Evans and Firth, 2005; Wayne, Yoon, Zhu, Cronen and Garet, 2008). When school culture is shaped by teachers' collective learning it is more likely to support teachers' need for collaborative inquiry premised on self-regulated learning principles (Timperley, 2011). For example, teachers can collaboratively frame their own learning goals to support their students' learning (Guskey, 2001), work with others to achieve these goals, challenge their current perceptions, monitor their progress, and evaluate the impact arising from their professional development.

Changes in teachers' instructional practices

As the school culture re-aligns to support the reforms, the school obtains a more holistic picture of the new initiatives characterizing the reforms (Weick, 2009). This understanding of the aims and expectations of the reforms is premised on teachers getting their first impressions of the reforms from their external professional development, organizing these impressions and contextualizing them in their school context through internal professional development and culture-building, and then operationalizing the reforms in teaching-learning activities. As education reforms initiated by central education authorities are largely top-down in conception (as in Vietnam), the integration of the new initiatives into school organisation and culture take into account the experiences of teachers who are involved in the change and therefore improves the sustainability of the changes needed (Petko, Egger, Cantieni and Wespi, 2015).

In arguing that teachers' learning must first change the school culture before impacting their professional practice, we agree with Opfer and Pedder (2011) in eschewing the decontextualized process-product model of teacher influence on student learning (i.e., professional development influencing teachers' practices which in turn benefit student learning). Our conceptualization recognizes the nested nature of teachers' professional learning (Davis and Sumara, 2006), namely that teachers' learning needs are constituted in their individual activities, proximal collectivities (e.g., grade levels or subject departments), and subsystems within larger units (e.g., schools within education systems situated in socio-political educational contexts).

A school culture shaped through teachers' within-school professional development may be more propitious to the formation of communities of practice. In these professional communities, teachers are more likely to assume a collective responsibility in discussing problems, strategies, and solutions (Opfer and Pedder, 2011; Thomas, Wineburg, Grossman, Myhre and Woolworth, 1998). School-level beliefs about learning and corresponding norms of action constituting school culture can shape teachers' instructional practices (Sampson, Morenoff and Earls, 1999). For example, Coleman's (1990) study found that teachers would sanction an individual teacher's practices if the latter was incongruent with collective pedagogical beliefs. Similarly, new or inexperienced teachers had to adapt their practices to fit existing collective pedagogical beliefs (Woolfolk, Hoy and Burke-Spero, 2005). It follows that teachers in schools with a culture emphasizing professional norms are more likely to implement changes in their instructional practices. This can be inferred from Hollingsworth's (1999) study of primary mathematics teachers' professional development which showed that teachers found it difficult to implement new practices in their classrooms when school conditions were unsupportive, when there was little coordination, when there was little collaboration, and when there was no professional development. School culture can also include beliefs about the school's collective efficacy. This efficacy influences teachers' determination and perseverance in realizing desired changes in teaching-learning (Bandura, 1997; Goddard, 2003).

School leadership adapting to school culture

The preceding discussion has covered the different enablers influencing the implementation of education reforms except for school leadership. Recent research studies

have characterized school leaders in Vietnam as carrying more of a politico-symbolic than professional (e.g., instructional) role. For example, Truong and Hallinger's (2017) qualitative study of Vietnam schools found that principal leadership, influenced by Confucian sociocultural values and institutional-political structures, was characterized by strong autocratic and moral leadership. Truong, Hallinger, and Sanga (2016) also documented that school principals in Vietnam were influenced by cultural notions of power distance and collectivism in their decision-making. Vietnam school principals represent the cascading of central authority to the school level and therefore, prioritize their political and bureaucratic roles over a professional instructional leadership role. Hence, it is not unreasonable to assume that school leader (principal) roles in Vietnam underplay - and in some cases minimize, instructional leadership, in comparison with their Anglo-American peers.

This position is informed by Hao, Hallinger, and Chen's (2018) study of leadership in Vietnam schools indicating that system leaders needed to pro-actively emphasize instructional leadership as a key role for principals, that leadership preparation and development programs were needed to prepare principals for instructional leadership, that successful principals could share their effective instructional leadership practices with colleagues, and that instructional leadership had to be distributed among more people in schools. A consequence of weak principal instructional leadership is that teachers - comprising the professional core of the school - then assume the mantle of instructional leadership to influence teaching-learning activities. Significantly, school leadership (principalship) then adapts to the culture of the school that is developed during education reforms to support the core business of teaching-learning in the school. When the direction of school leadership is influenced by school variables such as teachers' learning and school culture, it may eventuate in an interesting situation whereby local school practice achieves "coherence" with policy goals in what Honig and Hatch (2004) termed "coherence as a craft". This form of coherence is bottom-up in nature. It encompasses schools designing their own improvement frameworks and aligning these frameworks to a greater or lesser extent with external policies – thereby endorsing the notion of schools as complex adaptive systems. It contrasts with the naïve assumption that externally-driven policies can be simply mandated top-down and that schools will inexorably achieve alignment between these policies and their school contexts (i.e., objective alignment; Honig and Hatch, 2004).

Present study

Framed largely using complexity theory (complemented by tight loose coupling theory), the present study conceived schools in Vietnam as complex adaptative systems, adapting to the exigencies of centrally mandated education reforms. It recognizes the limitations of the education system and school principals in providing effective leadership for the implementation of the reforms in schools and argues that teachers may, therefore, rely on school internal resources (in-house professional development and building school culture) to complement external provisions (external policy guidance and professional development). The theoretical model in Figure 1 summarizes the hypothesized paths of influence among the different enablers (external policy guidance, external professional development, internal professional development, school culture, and school leadership) and the outcome variable of interest, changes in teaching-learning in schools. Structural equation modelling (SEM) is used to examine if this model can explain the variation in the data collected.

Figure 1

Method

Sample

504 school personnel (overall response rate 89 percent), comprising 107 generalist teachers (21.2%), 320 specialist teachers (63.5%), 53 department/subject/level heads (10.5%), 10 vice-principals (2%), and 5 principals (1%) from 12 schools in Central and South Vietnam participated in the study (9 missing values on position; 1.8%). The majority of the participants had worked in their current position for at least 10 years (279 participants; 55.4%), while 52 participants (10.3%), 75 participants (14.9%), and 90 participants (17.9%) had worked in their current position for at most 2 years, 3-5 years, and 6-9 years respectively (8 missing values; 1.6%). There were more female (389 participants; 77.2%) than male (108 participants; 21.4%) participants (7 missing values; 1.4%). Participants were distributed across the age range: 149 participants (29.6%) were 34 years old or younger, 249 participants (49.4%) were between 35 and 49 years old, and 98 participants (19.4%) were 50 years or older; 8 missing values (1.6%). Most of the participants had a Bachelor's degree (439 participants; 87.1%), with the rest having a certificate/diploma (33 participants; 6.5%),

postgraduate diploma (5 participants; 1%), Master's degree (16 participants; 3.2%), or doctoral degree (1 participant; 0.2%); 10 missing values (2%). The participants varied in their years of teaching experience: 94 participants (18.7%) had taught for up to 5 years, 89 participants (17.7%) had taught for 6-10 years, 169 participants (33.5%) had taught for 11-20 years, and 142 participants (28.2%) had taught for at least 21 years; 10 missing values (2%).

The majority of participants were from lower secondary schools (326 participants; 64.7%) while the rest were from primary schools (173 participants; 34.3%); 5 missing values (1%). In terms of school locality, 309 participants were from urban schools (61.3%), while 188 were from rural schools (37.3%); 7 missing values (1.4%).

Variables

Enablers of change. Participants indicated their perceptions of the influence of five enablers (two external to the school - policy guidance, external teachers' professional development, and three internal to the school - school leadership, internal teachers' professional development, and school culture) on the successful implementation of the education reform in their schools using a five-point scale
(1 = *Strongly disagree* to 5 = *Strongly agree*).

- First, the provision of external policy guidance (ExtPolicy) was measured by two items asking respondents if the Ministry of Education had clearly explained the aims and goals of the renovation and whether it had given clear guidance on what schools should do in the renovation.
- Next, the provision of external professional development for teachers (ExtTrPD) was measured by three items asking respondents if they were able to learn new skills and knowledge needed for the renovation by attending courses provided by the government and universities, by learning from more experienced colleagues from other schools, and by searching for resources (e.g., from online or books) on how teachers from other countries implemented educational renovations effectively.
- Third, the provision of internal professional development (IntTrPD) was measured by three items asking respondents if new teachers received induction training for the renovation and if existing teachers were given training in new knowledge and skills required for the renovation within the school.
- Fourth, school culture (Culture), was measured by eight items asking respondents if there was shared understanding of the purpose of the renovation, if new values and

norms had been established in the school's day-to-day activities, if there was greater willingness among staff to embrace the changes required for the renovation, if school meetings included discussions of the renovation, if teachers were collaborating more since the renovation began, if teachers felt more empowered to make decisions since the renovation began, if teachers' work changed to reflect the implementation of the renovation, and if relationships between school leaders and teachers had become more supportive since the renovation began.

- The last enabler, school leadership (Leadership) was measured by eight items asking respondents if their school leaders had aligned the school vision to support implementation of the renovation, explained the importance of the renovation to the school community, received training on how to implement and manage the renovation, possessed the knowledge and skills to make important decisions that were previously made centrally and to improve the quality of teaching-learning in the school, committed resources to improve the quality of teaching-learning in the school in line with the renovation, and changed school structures to implement the renovation.

Implementation of changes. Participants responded to 17 items asking them about their perceptions of the degree of implementation of policy reforms using a four-point scale (1 = *No changes* to 4 = *Many major changes*). 8 of these items pertained to changes in teaching-learning (e.g., 'Changes to teaching materials'), 5 items pertained to changes in school structure (e.g., 'Changes to teacher supervision by school leaders'), and 4 items pertained to changes in school autonomy (e.g., 'more decision making to parents'). Only the items measuring participants' perceptions of the degree of implementation of policy reforms pertaining to changes in teaching-learning were used in the present analysis. These items covered different aspects of teaching-learning such as changes to textbooks and teaching materials, curriculum content, pedagogy, assessment, and teacher expectations of students as learners.

Instrumentation, procedure and administration

The data reported in this paper is from stage 1 of a larger three-stage project. Stage 1 was purposed to provide an understanding of school (principals' and teachers') perspectives of their present and future capacities to undertake implementation of the government's renovations. Stages 2 and 3 were designed to build capacity through training workshops, and to subsequently trial new practices.

Instrumentation

An 85-item questionnaire was compiled based on a literature review of school implementation of education system reform that included Asian and Western studies. Items were clustered into the following dimensions – demographics and details of school and respondent; the extent to which the school had already embarked on reform; the factors thought by school personnel to have influenced the school's implementation of reform in the recent past, including policy guidance and the nature of reform, resources, teacher professional development, management and leadership, and school culture; the effectiveness of the reforms in changing teaching and learning; the importance of a range of factors to successful future implementation of reforms; and lastly, the knowledge and skills thought necessary to promote future successful implementation of reforms.

A draft was then circulated to four Vietnam academic partners in different regions of Vietnam for their modification and adaptation to the Vietnam context. All were competent bi-lingually and were invited to agree a Vietnam version of the questionnaire for both content validity and accuracy of wording. Once the four partners had agreed the final Vietnamese version of the questionnaire, respondents were given the choice of completing either the English or Vietnamese version.

Schools sampled and administration

The project team consisted of the lead UK researcher, with four HE partners in Vietnam – two in the South and two in the Central region. Each of the VN partners took responsibility for administering the questionnaire survey to two or three schools in their region. Questionnaires were administered to 6 schools in each region, three of which were primary, and three secondary. Sampling also secured equal representation between schools in urban and semi-urban/rural locations. After initial contact was made with each school to explain the purpose of the project and to engage their agreement to participate, the VN partner visited each school to administer the questionnaire in person. Where possible questionnaires were completed in a staff meeting and immediately collected, but in some cases (eg absentee teachers) questionnaires were later returned by post or email. All teachers, principals and vice principals of the schools were invited to participate. After repeated follow-ups to encourage participation, a total of 504 school personnel responded to the

survey (response rate of 89%). All questionnaires from the VN partners were then sent to the lead research team for analysis.

Findings

CFA

Results of confirmatory factor analysis or CFA for the five-factor model for enablers of change (Figure 2) comprising external policy guidance (ExtPolicy), external teacher professional development (ExtTrPD), internal teacher professional development (IntTrPD), school culture (Culture), and school leadership (Leadership) showed that the model fit was unsatisfactory (χ^2 = 992.86, df = 242, p < .001; RMSEA = 0.089; CFI = 0.894; TLI = 0.879; SRMR = 0.044). After allowing six pairs of error terms to covary freely with each other, the fit of the revised model (Figure 1) was satisfactory (χ^2 = 737.21, df = 236, p < .001; RMSEA = 0.074; CFI = 0.929; TLI = 0.917; SRMR = 0.044). All items loaded on their intended factors, and the factors exhibited satisfactory internal reliability (α = .81 for ExtPolicy; α = .78 for ExtTrPD; α = .89 for IntTrPD; α = .92 for Culture; α = .94 for Leadership).

Figure 2

Results of CFA for the three-factor model (Figure 3) comprising changes in teaching-learning (ChgTL), school structure (ChgStructure), and school autonomy (ChgAutonomy) showed that the model fit was unsatisfactory (χ^2 = 473.10, df = 116, p < .001; RMSEA = 0.089; CFI = 0.874; TLI = 0.853; SRMR = 0.066). All items loaded on their intended factors except Q1 and Q9 which were therefore deleted. After allowing two pairs of error terms to covary freely with each other, the fit of the revised model (Figure 2) was satisfactory (χ^2 = 253.15, df = 85, p < .001; RMSEA = 0.071; CFI = 0.934; TLI = 0.918; SRMR = 0.048). The present study only analyzed the factor measuring changes in teaching-learning (ChgTL) which exhibited satisfactory internal reliability (α = .83).

Figure 3

SEM

The hypothesized SEM model was fitted to the data to examine how external and internal enablers influenced schools' implementation of changes in teaching and learning. Results (Figure 4) showed that the model fitted the data satisfactorily (χ^2 = 1,017.59, df = 390, $p < .001$; RMSEA = 0.064; CFI = 0.922; TLI = 0.913; SRMR = 0.048). The results provided support for all the hypothesized relationships. More specifically, external policy guidance influenced the provision of external teacher professional development ($\beta = 0.53$, $p < .01$). External policy guidance ($\beta = .49$) and external teacher professional development ($\beta = 0.56$) influenced schools' internal provision of teacher professional development, $p < .01$. The direct influence of external policy guidance, indirect influence of external policy guidance via external teacher professional development ($\beta = 0.30$), and direct influence of external teacher professional development explained 84.4% of the variance in internal teacher professional development. Teachers' internal professional development then influenced the development of school culture ($\beta = 0.83$, $p < .01$). The direct influence of internal teacher professional development, indirect influence of external teacher professional development via internal teacher professional development ($\beta = 0.46$, $p < .01$), and indirect influence of external policy guidance via internal teacher professional development ($\beta = 0.41$, $p < .01$) collectively explained 68.8% of the levels of school culture.

Figure 4

Lastly, the implementation of changes in teaching and learning was directly influenced by school culture ($\beta = 0.38$, $p < .01$) and directly influenced by internal teacher professional development via school culture indirectly ($\beta = 0.32$, $p < .01$). The model explained 14.5% of the variance in the implementation of changes in teaching and learning. The results also showed that school leadership did not influence schools' implementation of teaching and learning. Instead, external policy guidance, external teacher professional development, internal teacher professional development, and school culture collectively influenced levels of school leadership, accounting for 85.8% of its variance. Table 1 summarizes the parameter estimates for the direct and indirect effects in the model.

Table 1

Limitations of the study

Since the sample size is small in terms of the number of schools and participants, we decided to aggregate the data from all schools in order to perform SEM. Ideally, future studies – assuming large samples from each school community - should adopt the school as the unit of analysis, which would enable differences in take-up and patterns of emergent pathways among schools to be recorded. However, principals' and teachers' perceptions used in this study are valid, and our study points the way forward for future studies to examine the perceptions of more stakeholders (eg local authorities, parents, students) of educational reforms that affect teaching and learning experiences of different groups and individuals in the education system. Additionally, quantitative analysis would be well supported by qualitative data in investigating in-depth patterns of influence and emergent pathways of dependence. Data were collected in two of the three regions of Vietnam – the South and Central - and excluded North Vietnam. Our study uses cross-sectional, correlational data – with attendant common method bias, which limits the scope for analytical possibilities. Data are based on participants' perceptions garnered from a questionnaire. It would therefore be misleading to draw any generalisations from our data to schools across Vietnam. Equally, no generalisation is possible to other systems since our data is derived from the specific context of a South-East Asian, centralised, socialist system. However, our purpose in this study is not to draw generalisations. Rather, it is to generate new ways and perspectives to further our understanding of how school implementation of systemic reform of education systems can be better understood. In so doing our intent centred on adopting a theoretical framework - namely, complex adaptive system theory, with tight-loose coupling as a supportive and complementary theory - with the aim of exploring and testing their potential as heuristic devices. In this respect we acknowledge a further limitation that we did not systematically test each of the theories before arriving at our conclusion that CAST seems to possess more explanatory power. Rather, we tested data framed in one of the theories (CAST) and then inferred that while coupling theory has limitations (as does CAST), it is nonetheless useful in a supportive capacity. In exploring, developing and applying CAST to education system reform, this paper refers to institutions and enablers as systems and sub-systems (ie practices

such as professional development, leadership, culture building) rather than to human agents, such as teachers and school leaders. At this early stage in the development of CAST, we consider that either interpretation is plausible, and that to some extent there may be overlap, as when teachers assume the role of professional developers.

Discussion and implications

Evidence from previous studies suggests that schools typically display one of three responses to system policy reform – adoption, adaptation, or rejection (Viennet and Pont, 2017). Among our project schools in Vietnam, all were considered to be adapting their range of teaching and learning strategies by introducing more student-centred methods (alongside their traditional teacher-centred approaches), but to different degrees, depending on their capacities to respond. This study throws light on the relationships between the Vietnam central Ministry and district education officers (MOET and DOETs) on one hand, and the schools as they undertake the adaptation process, on the other.

With due consideration to these limitations, we present our findings with the customary caution of indicative rather than definitive conclusions. Our findings indicate three interrelated elements characterise the adaptation process:

(a) *Schools' internal enablers were shaped by external enablers*. For example, schools' internal professional development was influenced by external (Ministry) policy guidance and external professional development provided by or on behalf of the central Ministry (see Figure 4).

(b) *The plethora of internal enablers then worked in concert in a complex nomological network of influences to enable schools to implement the intended reform (in this case, the take-up of more student-centred methods of teaching and learning) (Figure 4).*

(c) *In the local adaptation process, some functions assumed primacy over others to achieve overall coherence needed for the effective implementation of reforms*. For example, school culture especially, and to a slightly lesser extent internal professional development, together shaped the school leadership trajectory rather than the converse (Figure 4).

At least three major implications follow from these findings.

1. *Paradoxically, the connection between external and internal enablers of change is reflective of schools' adaptability*

Our findings challenge the hitherto assumed organisational boundary between what are deemed 'external' and 'internal' enablers in the implementation of system-initiated educational reforms. More specifically, our results indicate that the two sets of enablers share a close, nuanced relationship. On the one hand, reform appears to emanate from external influences (e.g. policy mandates, guidance, and externally provided professional development). On the other hand, schools undertook local adaptations contingent on the external influences. This could be due to perceived inadequacy of external support in enabling schools to effectively implement the reforms, or it could be due to schools' perceived need to reinforce external mandates. In either case, the schools exercised considerable latitude and discretion in how they responded to external enablers. This implication refines the distinction between top-down and bottom-up change initiatives recognised by Fullan (1994), who advocated that internal school reform is most likely when change forces operate from both system centre, top-down and from within schools, bottom-up. Our findings support this notion, adding that the two sets of forces may not necessarily be independent of each other, and indeed, where they are aligned and connected, one set may either reinforce the other, or counter and compensate for, the other's deficiencies.

Indeed, assuming a systemic policy of school transformation, the relationship between system centre and schools may change over time, as Hopkins (2007, 2012) and Hargreaves and Shirley (2009) suggest. These authors argue that there are times – especially initially, when top-down leadership from the centre needs to be foremost – such as when pedagogy is generally too reliant on traditional methods, or standards across the system are too low. However, the initial impact of such central initiatives is usually short-lived and needs strong support from other parts of the system (eg. middle level, as espoused by Hargreaves and Ainscow, 2015) and especially school level, for sustainability and scaling up. The requirement is to switch from prescription to professionalism, implying improved capacity building in regard to professional development of teachers and school leaders (Hopkins, 2012). Such a switch is particularly apt given the contemporary complex nature of system reform in Vietnam (multiple, connected and simultaneous) focusing on curriculum change, pedagogy and student learning thus penetrating into the classrooms of every school.

2. *Loose coupling complements complex adaptive system theory in providing a convincing explanatory description of the emergent patterns of responses generated in Vietnam schools by centre-initiated reforms*

Second, although our study was primarily conceptualised using complex adaptive system theory, we found an inevitability about referencing tight-loose coupling theory in describing centre-periphery relationships. Our results add to the evidence regarding the on-going debate on loose coupling characterizing education organisations (Dimmock and Tan, 2013; Firestone, 2015; Shen, Gao and Xia, 2017; Weick, 1976; Orton and Weick, 1990). More specifically, our results show that in regard to the schools sampled, their responses to external influence in terms of the government's renovation policy displayed a degree of inter-institutional coupling between policy centre and schools. However, the connectivity between centre and school was based on the former's explanation of policy aims and general guidance, which tended to lack specific contextualised and technical information such as advice on the range of student-centred pedagogies to be promoted, and little guidance on appropriate forms of professional training regarding new professional knowledge, skills and methods required by teachers and principals for successful implementation. In this sense, the inter-institutional coupling between centre and school was 'loose' because it only provided general guidance and information related to the reforms - lacking definition and process. It left the onus on schools to take whatever initiatives they were willing and able to take, dependent on their variable capacities to respond. This finding – that the nexus between policy centre and schools is characterised by relatively loose coupling - may seem somewhat surprising given the general political and bureaucratic context of Vietnam. However, it may be explicable by the geo-cultural complexity of Vietnam – a large system of thirty thousand schools distributed over a distance of one thousand miles north-south and a population with more than fifty ethnic minorities. It may also be due to the lack of high quality professional developers at national, provincial and district levels - a consequence of which is to place even greater emphasis on the importance of the school and its resources, especially the quality of teachers, principals and within-school professional development for successful implementation of system reform.

Scholars have generally referred to the intractability of the technical core – teaching and learning – to reform initiatives (Shen, Gao and Xia, 2017). Teachers tend to continue their practices regardless of the aims and rhetoric of the reforms. Bryk et al. (2009, pp.264-265) noted that if the technical core is not well articulated for all teachers, they are inclined 'to

determine their own objective and enact instruction accordingly, leading to variation within the same school.' There are broadly two approaches to the loose coupling that explain the failure to penetrate the technical core: either attempt to tighten coupling by managerialist means such as supervision by, and accountability to, senior managers or leaders, or recognise and develop the professionalism of teachers and leaders through agencies of professional development, cultural change and professional learning communities (Shen, Gao and Xia, 2017). It was this latter path that led Goldspink (2007) to propose a model of school improvement that worked with rather than against loose coupling. Somewhat paradoxically, it was the latter path, too, that appeared to be the prevailing practice in the case of the Vietnam schools we sampled.

In the schools included in the present study, emergent patterns of practices and processes began to emanate. In the absence of 'hands-on' principal instructional leadership and the direction of influence of enablers, as indicated in Figure 4, these patterns were driven mostly by subject leaders and skilled teachers who forged collaborative relationships to advance the skills and trial lessons necessary to explore new pedagogical and assessment methods in their classes. This is consistent with CAST, which anticipates the emergence over time of new properties and features as a result of interaction by individuals and groups in schools learning new ideas and practices, which expectedly may vary in detail from school to school.

3. *Within schools, a complex pattern of relationships establishes eventually leading to the enactment of changes to teaching and learning in line with complex adaptive system theory*

Third, a nexus of complex relationships acting in concert leads to the implementation of changes in teaching and learning. For example, the SEM analysis shows that external policy guidance and external professional development influence the shape of internal school professional development; thereafter, internal school professional development has an even stronger influence on school culture (than external enablers), and school culture in turn exerts a strong influence on changing school leadership. This constitutes 'path dependence' – where new practices and structures gradually become established, especially if they are perceived as working effectively. If and when such a pattern of relationships becomes established, the processes of school change achieve lock-in, and critical mass and inertial momentum (snowball effect) of scaling up across the school takes place. These are the conditions

conducive to changing teaching and learning. Our data thus supports Mason's (2008, 2016) conceptual-theoretical ideas on schools as complex adaptive systems. The extent to which teaching and learning actually change in each Vietnam school depends *inter alia* on the strength, direction, scalability and sustainability of these key (complex) relationships highlighted in Figure 1.

This study offers rare insights based on empirical data of how a small sample of schools in Vietnam approach the challenge of system reform (renovation). Three research aims and questions were posed at the beginning of the paper. The first – on the relationship between central Ministry as policy formulator and schools as implementers - throws light on the relationship between the system centre (central government) and schools in a socialist/communist society traditionally seen as centralised and top-down. Our data suggests alignment exists between external enablers in the form of government policy guidance and aims, and the provision of external professional development for schools on one side, and school internal enablers, notably within-school professional development and changing school culture on the other, the combination of which enable changes towards more student-centred teaching and learning. To this extent, the alignment of external and internal enablers suggests loose coupling between system centre (Ministry of Education and Training) and schools. However, our data also indicate that schools' own internal enablers are stronger than the external enablers in leading to changes in teaching and learning. Schools appear to leverage significant latitude and diversity in whether and how they approach within-school professional development and hence the extent to which this re-configures school culture and ultimately teaching and learning. We also found the internal enablers to be shaped by teachers rather than principals or deputy principals – indicating a teacher professionally-led pathway of change.

The second research question focused on whether schools tend to follow pathways for change and possess characteristics of complex adaptive systems. Our evidence again supports the concept of Vietnam schools as complex adaptive systems**.** They are part of a wider national system, but as individual schools they constitute micro-systems. In displaying complex patterns of relationships, they appear characteristically agentic and - to the extent they have capacity – are able to change themselves (eg. teaching and learning) through internal professional development and school culture, even to the point of impacting school leadership. Their adaptation takes into account local conditions, contexts and cultures – albeit

within a bureaucratic, communist society. Schools interpret, mediate and respond to system-wide reform according to their capacity and willingness to do so, based on within-school resources per se, and degree of support or otherwise from local contextual and politico-cultural conditions.

In addressing the third research question - If there are recognizable patterns or pathways to which schools lock-in, what are their features or characteristics? – findings from the Vietnam schools we sampled suggest that given sufficient capacity **(**for example, teacher leaders with professional knowledge and skills, and an evolving school culture receptive and willing to change), there is early evidence of the forging of critical mass and inertial momentum, eventuating in the gradual emergence of, and lock-in to, institutionalised path dependence and the adoption of more student-centred pedagogy.

Conclusion

There are two convincing grounds for arguing the virtue of complex adaptive system theory: modern education systems and their reforms are both *complex* and *adaptive*. First, education system reforms are more *complex* than in the past. System reforms nowadays tend to be multiple (covering many areas such as curriculum, pedagogy, leadership), simultaneous (implemented at the same time) and connected (inter-dependent) with expectations of relatively quick implementation time frames, placing huge challenges on schools as implementation agents. Additionally, education systems are increasingly complex and heterogeneous. Schools are both sub-systems of national systems, and micro-systems with sub-systems of their own, including the external and internal enablers driving change. Each sub-system, for example within the school, comprises various parts eg. professional development (PD), leadership, and school culture.

Second, contemporary education systems are *adaptive*. In explaining the causes of adaptivity tight-loose coupling theory plays a useful complementary role. For example –

- each subsystem can be tightly or loosely coupled within itself (eg external policy and external PD are tightly coupled);
- different aspects within each subsystem can also be coupled in expected or unexpected directions (ie. nuanced coupling) – eg, where school culture influences leadership, rather than vice versa;

- characteristics of each subsystem may elicit responses in another subsystem (ie a subsystem forcing another to adapt) – eg the inadequacy of external PD necessitates schools to provide internal PD;
- the nexus of tight, loose, and nuanced coupling relationships may cohere to explain how the overall system achieves adaptive functioning – eg to achieve desired changes in teaching and learning.

However, complex adaptive system theory takes the process of adaptive change to a more detailed level of analysis – helping to identify in reforming schools emergent patterns of new practices over time that become established ways of working (lock-in), key relationships between sub-systems such as within school professional development functionally related to new pedagogic practices (path dependence), and identity of key actors coalescing and collaborating thereby scaling up and sustaining new ways of working (critical mass or inertial momentum).

We believe Mason (2016, p.52) is right when he claims that similar studies to the present, by adopting complex adaptive system theory, will "contribute to a perspective on continuity and change that indicates what conditions might need to be in place for the emergence of sustainable, positive, system-wide change and development." While the overall findings support the notion of schools as complex adaptive systems, our evidence illuminates our understanding of the process by which adaptation takes place.

Future research implications from our study include the prospect that in understanding the growing complexity of whole system education reform, we may need to rely on more than one theoretical framework. Combining and developing complex adaptive system theory with elements of tight-loose coupling may offer a way forward. Both theories require further conceptual and empirical development. Practical implications of this study centre on developing knowledge and understanding of how schools respond to system change and methodologies and pathways they evolve to assist the implementation process – both of which should enhance the efficacy of both policy makers and school practitioners. Future research is advocated that includes larger more representative samples of schools in all three regions of Vietnam (in order to establish a national data base) and similarly in other systems engaging with whole system education reform. Mixed method studies combining quantitative and qualitative data offer exciting possibilities of triangulating and capturing more penetrating insights into the local adaptation processes and within-school patterns and

pathways of innovation. Introducing longitudinal study design would enable researchers to capture how patterns and pathways emerge and evolve.

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References

Bryk A. S., Sebring P. B., Allensworth E., Luppescu, S., Easton J., 2009. Organizing Schools for Improvement: Lessons from Chicago. Chicago, IL, University of Chicago Press.

Burns, B., 2005. Complexity theories and organizational change. International Journal of Management Reviews 7 (2), 73-90.

Dimmock, C., Tan, C.Y., 2013. Educational leadership in Singapore: tight coupling sustainability, scalability and succession. Journal of Educational Administration 51(3), 320-340.

Education Scotland, (2015). Collaborative action research. Downloaded at https://education.gov.scot/improvement/Documents/sacfi12b-CAR-overview.pdf

Financial Times, 2019. Education in Vietnam: Very Good on Paper. https://www.ft.com/content/da4387d0-aba8-11e8-8253-48106866cd8a

Firestone, W., 2015. Loose coupling: the 'condition'and its solutions? Journal of Organizaitonal Theory and Educaitonal 1(1), 48-57.

Fullan, M.,1994. Coordinating Top-Down and Bottom-Up Strategies for Educational Reform. Systemic Reform: Perspectives on Personalizing Education-September. Downloaded at michaelfullan.ca/wp-content/uploads/2016/06/13396035630.pdf

Fullan, M., 2000. The return of large scale-scale reform. Journal of Educational Change 1(1), 5-27.

Fullan, M., 2006. Change Theory: A Force for School Improvement. Centre for Strategic Education. Victoria, Australia.

Fuller, K., Stevenson, H., 2018. Global education reform: understanding the movement. Educational Review 71 (1), 1-4.

General Statistics Office of Vietnam (2017). Education in Vietnam – Current Trends and Qualifications. https://wenr.wes.org/2017/11/education-in-vietnam

Goldspink, C., 2007. Rethinking educational reform: a loosely coupled and complex systems perspective. Educational Management Administration and Leadership 35(1), 27-50.

Grobman, G., 2005. Complexity theory : a new way to look at organizational change. Public Administration Quarterly 29 (3), 350-382.

Hargreaves, A., Ainscow, M., 2015. The top and bottom of leadership and change. Phi Delta Kappan 97(3), 42-48.

Hargreaves, A., Shirley, D. (2009). The Fourth Way. Thousand Oaks, CA: Corwin.

Harvey, D., 1990. The Condition of Postmodernity. Blackwell Publishing, Oxford.

Hattie, J., 2009. Visible Learning. Abingdon. Routledge, Oxon.

Hautala, T., Helander, J., Korhonen, V., 2018. Loose and tight coupling in educational organizations – an integrative literature review. Journal of Educational Administration 56(2), 236-258.

Hawkins, M., James, C., 2016. Theorising schools as organisations: Isn't it all about complexity? Paper presented at the American Educational Research Association Annual Conference, Washington.
https://researchportal.bath.ac.uk/en/publications/theorising-schools-as-organisations-isnt-it-all-about-complexity

Holland, J.H., 2014. Complexity: A Very Short Introduction. Oxford University Press, New York.

Holmes, B., 1965. Problems in Education: A Comparative Approach. Routledge and Kegan Paul, London.

Hopkins, D., 2007. Every school a great school. Open University/McGraw Hill, Maidenhead.

Hopkins, D., 2012. What we have learned from school improvement about taking educational reform to scale. In Chapman, C., Armstrong, P., A. Harris, Muijs, D., Reynolds, D., Sammons, P. (Eds.), School Effectiveness and Improvement: Research, Policy and Practice. Routledge, London, pp. 163-176.

Lan, H., 2017. Accountability in Vietnam's education: toward effective mechanism in the decentralization context. Country case study prepared for the 2017/18 Global education monitoring report, Accountability in Education: meeting our commitments. UNESCO, Paris. https://en.unesco.org/gem-report/report/2017/accountability-education

Levin, B., 2010. Governments and education reform: some lessons from the last 50 years Journal of Education Policy 25(6), 739-747.

Mason, M., 2008. What is complexity theory and what are its implications for educational change. Education Philosophy and Theory 40(1), 35-49.

Mason, M., 2016. Complexity theory and systemic change in education governance. In Burns, T., Köster, F. (Eds.), Governing Education in a Complex World. OECD Publishing, Paris, pp. 41-53.
https://doi.org/10.1787/9789264255364-4-en.

Nguyen Thi Mai, H., Hall, C., 2016. Changing views of teachers and teaching in Vietnam. Teaching Education 28(3), 244-256.

OECD. (2016). Education in China: A Snapshot.

Downloaded at
https://www.oecd.org/china/Education-in-China-a-snapshot.pdf

Orton, J.D., Weick, K.E., 1990. Loosely coupled systems: a reconceptualization. The Academy of Management Review 15(2), 203-223.

Pont, B., Nusche, D., Moorman, H., 2008. Improving school leadership. Volume 1. Policy and Practice. OECD, Paris.

Sahlberg, P., 2006. Education reform for raising economic competitiveness. Journal of Educational Change 7(4), 259-287.

Schleicher, A., 2018. Making Education Reform Happen. In World Class: How to Build a 21st Century School System. OECD, Paris.

Shen, J., Gao, X., Xia, J., 2017. School as a loosely coupled organization? An empirical examination using national SASS 2003-04 data. Educational Management Administration & Leadership 45(4), 657–681.

Snyder, S., 2013. The simple, the complicated and the complex: Educational reform through the lens of complexity theory. OECD Working Papers, No. 96. OECD Publishing, Paris.

Stacey, R., 2011. Strategic Management and Organizational Dynamics: The Challenge of Complexity, sixth ed. FT Prentice Hall, Harlow.

Stoll, L., Harris, A., Handscomb, G., 2012. Great Professional Development Which Leads to Great Pedagogy: Nine Claims from Research. Nottingham: National College for School Leadership.
https://assets.publishing.service.gov.uk/government/uploads/system/u

Tan, J., Choo, S., Kang, T., Liem, G., 2017. Educating for twenty-first century competencies and future-ready learners: research perspectives from Singapore. Asia Pacific Journal of Education 37(4), 425-436.

The Economist, April 4th 2015. Ethnic minorities in Vietnam: Out of sight. London
https://www.economist.com/asia/2015/04/04/out-of-sight

Viennet, R., Pont, B., 2017. Education Policy Implementation: A Literature Review and Proposed Framework. (OECD Education Working Paper no. 162). OECD Publishing, Paris.
http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP(2017)11&docLanguage=En

Vietnam Government Portal, 2019. About Vietnam.
http://www.chinhphu.vn/portal/page/portal/English/TheSocialistRepublicOfVietnam/AboutVietnam

Weick, K., 1976. Educational organisations as loosely coupled systems. Administrative Science Quarterly 21(1), 1-18.

World Bank, 2018. GDP per capita (current US$)/ data.

https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?

Figure 1. Hypothesized model depicting the Influence of internal and external enablers on schools' implementation of changes in teaching-learning

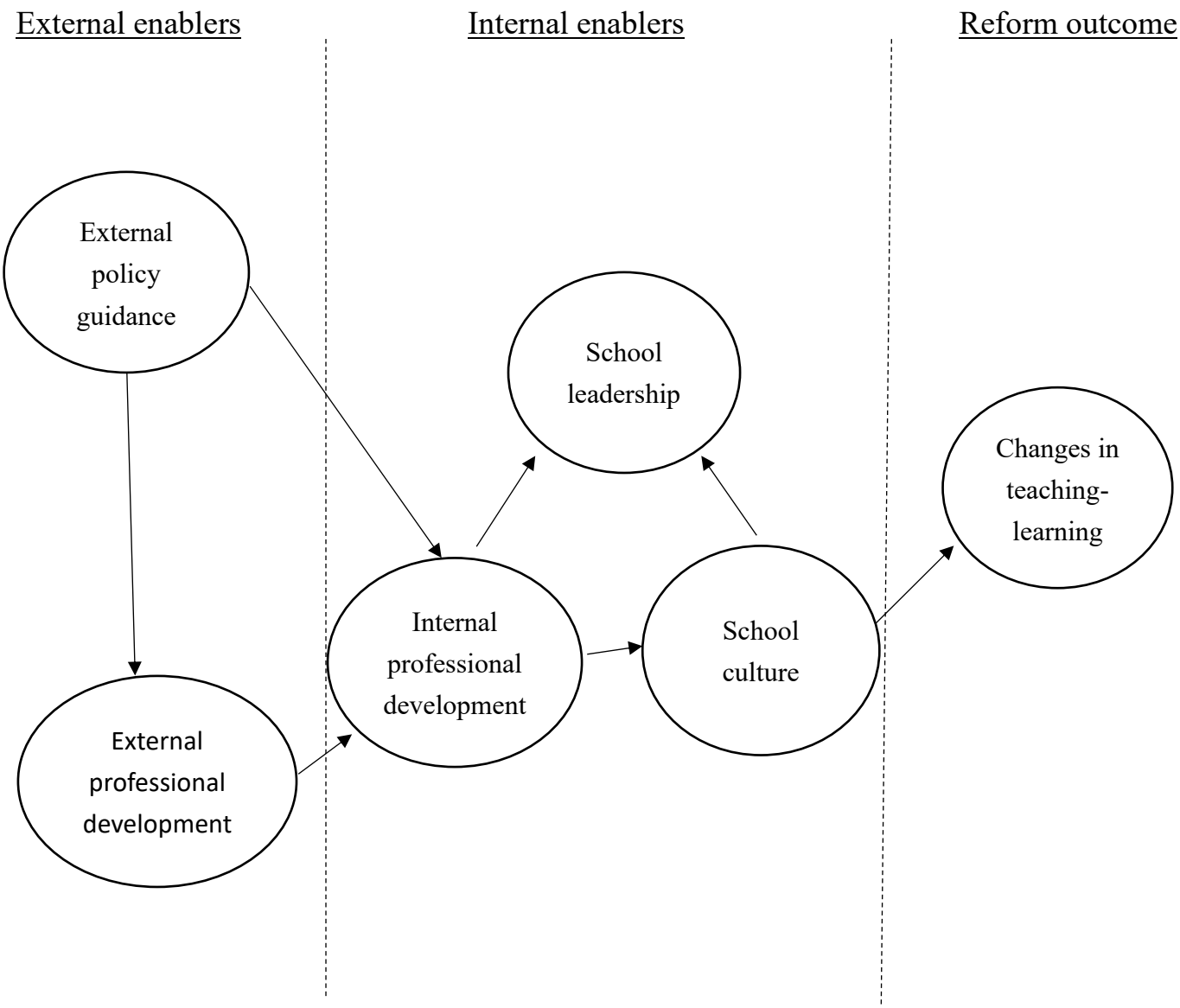
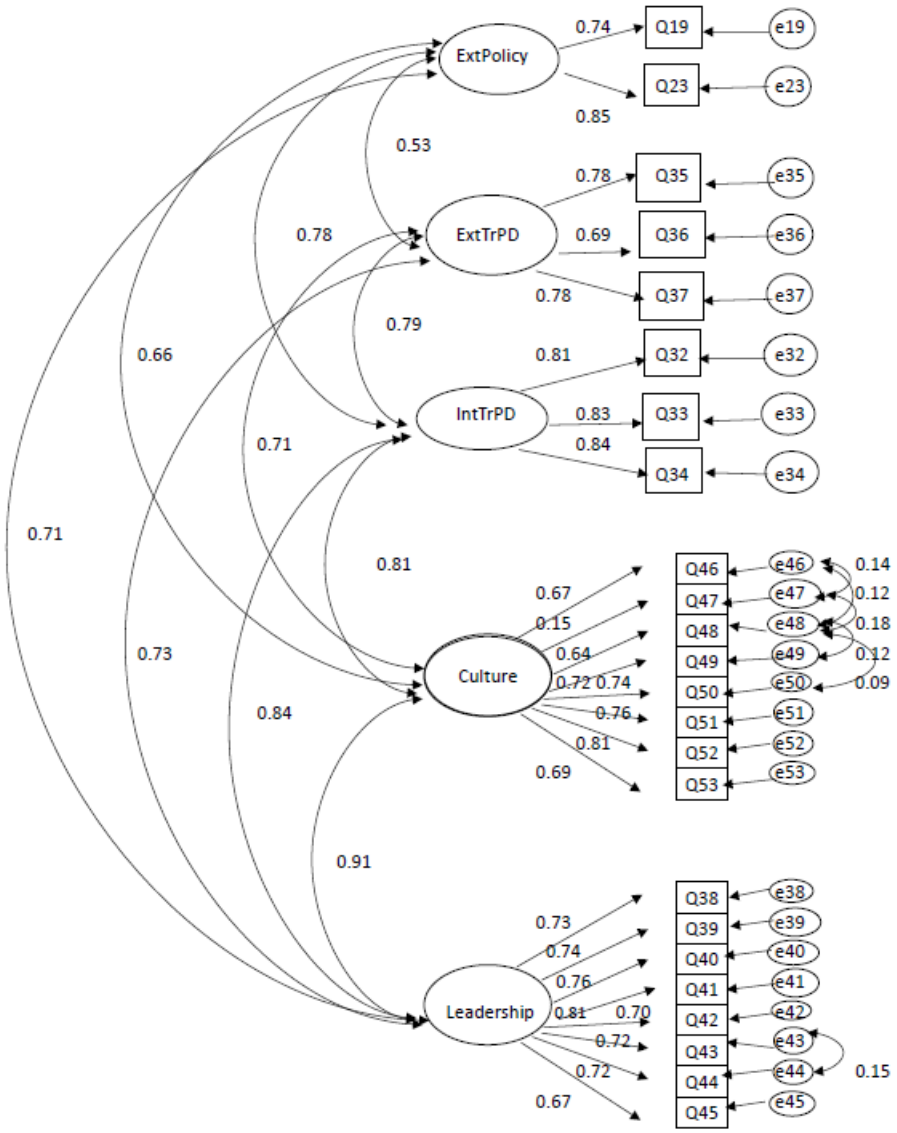
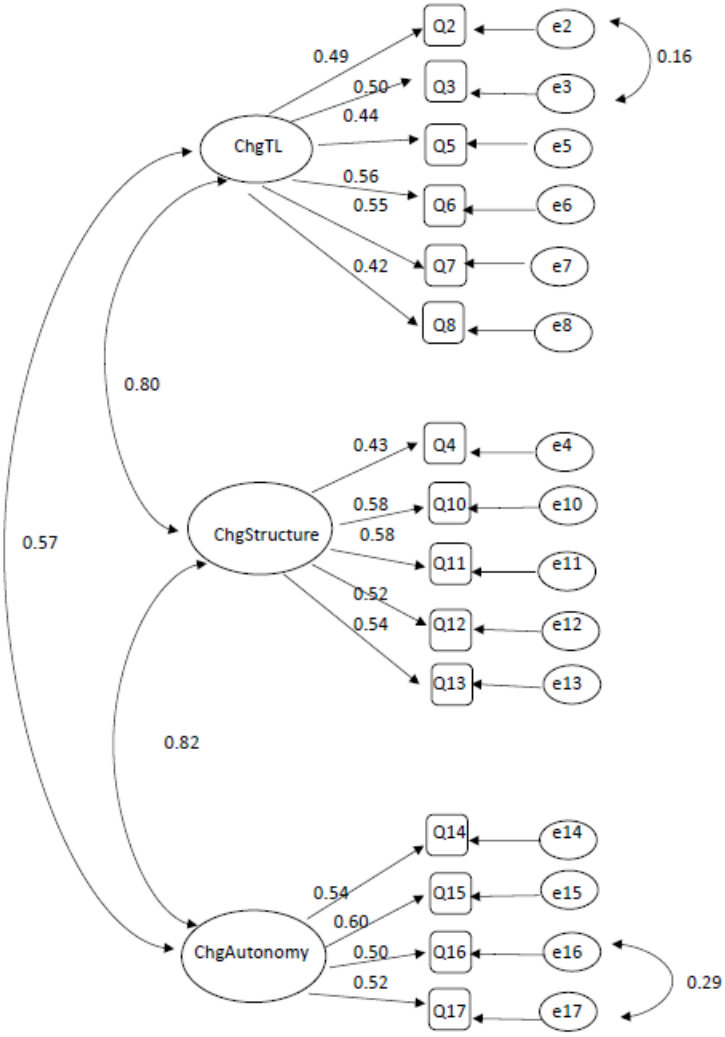


Figure 2. CFA for enablers of changes



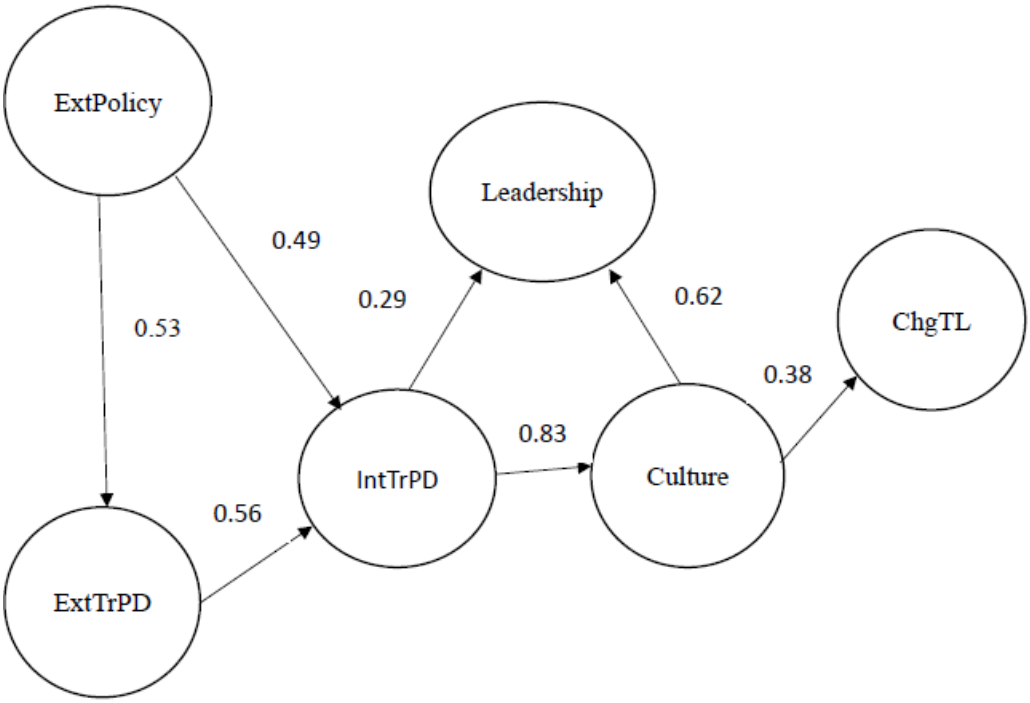
Note. All standardized effects shown significant at $p < .01$

Figure 3. CFA for Implementation of changes in teaching-learning



Note. All standardized effects shown significant at $p < .01$

Figure 4. SEM model



Note. All standardized effects shown significant at $p < .01$

Table 1. Standardized parameter estimates for SEM model

Pathways of influence	Standardized direct effects	Standardized indirect effects
External professional development		
ExtPolicy to ExtTrPD	0.53**(0.05)	
Internal professional development		
ExtPolicy to IntTrPD	0.49**(0.05)	
ExtTrPD to IntTrPD	0.56**(0.05)	
ExtPolicy to ExtTrPD to IntTrPD		0.30**(0.03)
School culture		
ExtPolicy to IntTrPD to Culture		0.41**(0.04)
ExtTrPD to IntTrPD to Culture		0.46**(0.04)
IntTrPD to Culture	0.83**(0.02)	
School leadership		
ExtPolicy to Leadership	0.06(0.06)	
IntTrPD to Leadership	0.29**(0.08)	
Culture to Leadership	0.62**(0.06)	
ExtPolicy to IntTrPD to Leadership		0.14**(0.04)
ExtTrPD to IntTrPD to Leadership		0.16**(0.05)
IntTrPD to Culture to Leadership		0.52**(0.05)
Schools' changes in teaching-learning		
Culture to ChgTL	0.38**(0.05)	
IntTrPD to Culture to ChgTL		0.32**(0.04)

Note. ** $p < .01$