Effective implementation of new technologies: Legitimising change strategies in schools

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Schools are commonly viewed as resistant to change. Research suggests that attempts to implement innovations in schools often fail due to the ineffective management of the innovation attempt (Fullan, 1991). This paper suggests a framework for the more effective management of change attempts in schools, drawing on research on innovation in education and on managing change in organisations.

As organisations, schools can be compared with large established companies. Large established companies or "big old firms" (Dougherty & Heller, 1994) are characterised by their institutionalised practices, a quality which can be seen as producing rigidity or inertia. Schools are similarly characterised by institutionalised beliefs and behaviours. Writing within the context of product innovation, Dougherty and Heller (1994) classified the requisite activities of effective product innovation into three categories: (1) making links between the market and technological possibilities in the design, (2) making links between the expertise of different functions within the firm and (3) making links between the new product and the firm's strategy and resources. Making these links is difficult in big old firms because the links are seen as illegitimate within the institutional practices that characterise their organisation.

This paper explores the degree to which Dougherty and Heller's framework can be applied to schools, and the implication of this application for managing innovation and change in schools.

Introduction

Although instructional innovations, such as new methods and new materials, do reach individual classrooms via the initiative of individual teachers, they are not usually implemented in a coordinated way or actively supported by the larger school organisation. This type of innovation process is usually short-lived, with new technologies coming into, and going out of, fashion rapidly. This paper examines a model for successful change management in big old firms, which was developed in a business context, to see how it might be productively applied to the school context for the better management of instructional innovation and change. The rationale for the use of the proposed model lies in the similarities between the object of the model - the big old firm - and the school. The paper concludes that successful management of changes to the instructional environment of schooling requires the re-positioning of teachers as the innovators and, therefore, as central to the production, implementation and evaluation of new instructional technologies. However, this re-positioning needs to be complemented by other changes to the way schools operate and by a reconceptualisation of what schools *are all about*. Before the model is introduced, I will explicate the ways in which big old firms, or large established businesses, can be compared to schools.

Schools as "big old firms"

Schools can be compared with big old firms on two bases. First, both are generally seen to be resistant to innovation and change. Second, both are characterised by institutionalised practices.

Schools and change: The centrality of teachers. Schools are notoriously resistant to change. Early studies (eg., Carlson, 1965; Gross, Giacquinta & Bernstein, 1971; Miles, 1964; Mort, 1964; Ross, 1958) of attempts to implement change in schools focused on teachers as a source of resistance to change. Teachers were often painted in a negative light as insecure, conservative and irrational. On coordinated attempts to implement technical innovations in schools, Hodas (1998) wrote,

> each battle is essentially the same battle. The technologists' rhetoric is remarkably consistent regardless of the specifics of the machine at issue. So too is their response when the technologies in question meet with only a lukewarm response: to blame the stubborn backwardness of teachers or the inflexibility and insularity of school culture. (Online Document: The culture of refusal)

More recently, however, studies of attempts at educational change have focussed on teachers in the context of schooling. In their review of the literature on computing innovations in schools, Grunberg and Summers (1992) concluded that,

> in the last two decades [70s and 80s] a number of increasingly convergent insights into the process of change have developed. The need to study the teacher in the context of the social organisation of the school, rather than as an isolated agent, has been emphasised ... [and] the previous emphasis on the technical characteristics of the proposed innovation has evolved into a more context-sensitive approach focussing on how the proposed innovation fits with the teachers' working conditions and value systems. (p.272)

Studies of educational innovation which consider the context of schooling have highlighted two main factors as the source of resistance and failure: (1) the incongruence of many innovations with existing practices, and (2) the use of poor change strategies. These two factors are related in that change strategies are often ineffective because they fail to anticipate incongruence and its significance and, therefore, fail to facilitate teacher change.

Most educational innovations involve teacher change. Fullan (1982a) identified three major dimensions of teacher change involved in educational innovations - teaching materials, teaching strategies and teaching beliefs. He warned that implementation must occur in all three dimensions for the desired outcomes to be achieved. Describing the types of change that took place in schools when innovations were successfully implemented, Huberman and Miles (1984) also noted areas of teacher change:

> changes in everyday classroom routines and expansion of instructional repertoires, changes in interpersonal ties, cognitive growth, shifts in attitudes toward pupils or peers, shifts in professional self-image, and transfers of innovation-specific skills to other parts of the user's practice. (p.274)

Researchers generally describe change as a process. Fullan (1991) identified three broad phases of the change process: *initiation* (also known as adoption or mobilisation), *implementation* (or initial use) and *continuation* (or institutionalisation, incorporation, or routinisation). Fullan describes these phases in the following way:

- initiation: consists of the process which leads up to and includes a decision to adopt or proceed with change.
- implementation: involves the first experiences of attempting to put an idea or program into practice.
- continuation: refers to whether the change gets built in as an ongoing part of the system or disappears by way of a decision to discard or through attrition.

The implementation phase is frequently teachers' first point of involvement in the change process. Despite the centrality of teacher change to educational innovation, teachers seldom participate in the initiation phase of the change process. Policy decisions on the initiation of innovations are generally made at the level of government and school administration. In his investigation of the classroom use of film, radio, television and computers in the twentieth century, Cuban (1986) observed that, "the most common direction for school change is, and has been, top-down" (p.54-55). When describing the approach taken to the adoption of instructional technologies in US schools, he wrote,

> Television was hurled at teachers. The technology and its initial applications to the classroom were conceived, planned, and adopted by nonteachers, just as radio and film had captured the imaginations of an earlier generation of reformers interested in improving instructional productivity. School boards and superintendents initiated efforts for using the new technology; only later were teachers involved in discussions of how to install it into the classroom ... This pattern of bringing teachers in at the tail end of the hoopla surrounding an innovation targeted upon altering classroom practice was common in school organizations. (Cuban, 1986, p.36)

Not surprisingly, the implementation phase is most often the point at which resistance to change is encountered and attempts at change fail. Fullan (1982a) wrote that it is relatively easy for schools to *initiate* innovations. Problems arise when they try to *implement* them. Fullan (1982b, p.249) criticised past attempts at educational change that concentrated on "paper" changes (regulations and policies) to the neglect of people changes. Similarly, Hart (1995) made the following observation about the introduction of computer technology:

> Despite the promise of increased learning that computers seem to offer, when research and development models for the use of computer technology in education are imposed on schools with no attention to their impact on the work structures of adults and children and the social systems of schools, they have an abysmal success rate. (p.157)

The most recent studies of school change focus on ways of maximising teachers' receptivity to change (eg., Moroz & Waugh, 2000; Waugh, 1994; Waugh & Godfrey, 1995). Some studies go even further than recommending the work of teachers be considered in change management. Researchers are now beginning to investigate the role of teachers as agents of change (eg., Crow & Pounder, 2000; Louis & Marks, 1998; Marks & Louis, 1999; Scribner, Cockrell, Cockrell & Valentine, 1999). When teachers are agents of change, they are no longer sources of resistance but, instead, work together to push the innovation into the continuation phase.

Schools and institutions

The nature of institutionalised environments. Institutionalism is a relatively new approach to the analysis of organisations, with the first influential publications appearing in the 1950s and 1960s (eg., Berger & Luckman, 1967; Selznick, 1957). As a new discipline, discussions of definition are common (eg., Jepperson, 1991; Powell & DiMaggio, 1991; Scott, 1987). In this

paper, an institution is taken to be an established system of practices or beliefs that is taken for granted by practitioners regardless of its technical merits. The distinction between the *technical* environment and the *institutional* environment of an organisation is central to both earlier and more recent studies of institutions in organisation. Selznick (1957) wrote that, "'to institutionalize' is to *infuse with value* beyond the technical requirements of the task at hand" (p.17). In this way, a practice or structure that may have been initially adopted due to its effectiveness in the work of the organisation, once institutionalised, maintains its place in the organisation even after its technical value has diminished.

Institutional analyses link the macro level characteristics of organisations to the micro level, day-to-day practices of individuals. Utilitarian, "rational actor" models are rejected in favour of an understanding that individuals' actions are constrained by organisational institutions, that is by shared, taken-for-granted understandings about what is appropriate. Jepperson (1991) described institutions as "vehicle[s] for activity within constraint ... all institutions are frameworks of programs and rules establishing identities and activity scripts for such identities" (p.146). Similarly, DiMaggio and Powell (1991) wrote, "Institutional arrangements constrain individual behavior by rendering some choices unviable, precluding particular courses of action, and restraining certain patterns of resource allocation" (p.10). Because institutions encourage some practices while limiting others, they are reproduced. DiMaggio and Powell (1991) wrote,

> Institutionalized arrangements are reproduced because individuals often cannot even conceive of appropriate alternatives (or because they regard as unrealistic the alternatives they can imagine). Institutions do not just constrain options: they establish the very criteria by which people discover their preferences. (p.11)

Highly institutionalised environments inhibit change because of the reproductive power of institutions. This power is such that behaving in a way that is consistent with the institutional environment, and therefore with others' expectations, is not considered to be action. Only when behaviour is contrary to the institutionalised behaviour is action evident to those operating within that environment. Jepperson (1991) wrote,

> If one participates conventionally in a highly institutionalized social pattern, one does not take action, that is intervene in a sequence, make a statement. If shaking hands is an institutionalized form of greeting, one takes action only by refusing to offer one's hand. If attending college has become an institutionalized stage of the life course, a young person takes action more by forgoing college than by enrolling in it. The point is a general one: one enacts institutions; one takes action by departing from them, not by participating in them. (p.148-9)

Big old firms are recognised as having a high level of institutionalised practices. Dougherty and Heller (1994) argued that the activities required for innovation do not fit into the institutional practices of big old firms, so any activities of innovation either violate existing institutions or "fall into a vacuum where no shared understandings exist to make them meaningful" (p.201). They wrote that, "while managers may support 'innovation' in general, product innovation is in fact illegitimate at the level of everyday thought and action" (p.201).

The institutional environment of schooling. Dougherty and Heller (1994) explained that "organizations with a long history of stability are crisscrossed with institutionalized practices" (p.202). Schools have a long history of stability; the structure and roles that characterise schools have been generally stable over the last hundred years or so. Characteristics of modern schooling, such as the fragmentation of the curriculum into categories of knowledge

or *subjects*, age grouping of students, the classroom, expected teacher and student roles, and the autonomy of teachers, owe their longevity to their institutionalisation. Meyer, Scott and Deal (1981), reporting on a study of US schools, argued that the survival of schools over time is due to the centrality of the institutional environment to school organisation. However, they also explained that not all areas of practice in the school environment are institutionalised, arguing that the technical environment of schooling (that is the details of teaching and learning activities) is rarely monitored or coordinated.

> A school, to survive, must conform to institutional rules - including community understandings - that define teacher categories and credentials, pupil selection and definition, proper topics of instruction, and appropriate facilities. It is less essential that a school's teaching and learning activities are efficiently coordinated or even that they are in close conformity with institutional rules. (Meyer et al., 1981, pp.152)

Therefore, while some areas of the school environment are heavily institutionalised, the nuts and bolts of instruction (the technical environment of schools) are not. The failure of instructional innovations to reach the continuation phase in the change process can be explained on two counts based on this decoupling of the institutional and the technical environments of schools. First, although the details of instructional practices are not institutionalised, these micro level practices are inhibited by macro level understandings about the roles of teachers and students, the autonomy of teachers and the knowledge domains of particular subjects. Many instructional innovations violate these taken-for-granted understandings. Second, change efforts that target instruction are attempting to manipulate a domain of schooling that has not previously been subject to scrutiny or policy control. Meyer, Scott and Deal (1981) observed that, "classrooms are sufficiently decoupled from school and district structures that a good deal of innovation is possible, but by the same token, such innovations are unlikely to persist in the absence of organizational supports" (p.170).

These institutional barriers to instructional innovation are revisited below when the activities of successful innovation are described and discussed in relation to school organisation.

Sources of barriers to product innovation

The literature on innovation and organisational change, both within and without education, tends to focus on barriers. The model described here is one of many, chosen for attention here because of the parallels described earlier that can be drawn between the organisation of large established firms and that of schools.

In their discussion of the source of problems for product innovation, Dougherty and Heller (1994) identify three main types of barriers that have been described in the literature on organisations and innovation. These types of barriers are shown in Box 1.

Box 1. Dougherty and Heller's sources of problems for product innovation

1. Barriers to linking the market with technological possibilities in design
2. Barriers to linking the expertise of different functions within the firm
3. Barriers to linking the new product with the firm's strategy and resources

The links listed in Box 1 are seen as necessary activities for successful product innovation. Links between the market and technological possibilities are necessary if the new product is to meet users' needs, to be seen as superior to other products and to be successfully marketed. Links between different functions in the firm, or interdepartmental links, are necessary for creating a comprehensive understanding of the new product. These links also speed up learning and enhance implementation. Finally, links between the product and the firm's strategy and resources are necessary so the innovation process can draw on resources and so the new product can be incorporated into the management's understanding of what the firm *is all about* (Dougherty & Heller, 1994).

The links that Dougherty and Heller identify are particularly hard to make in big old firms because they conflict with the institutional environment of the organisation. The degree to which the elements involved in each type of link can be applied to schools is discussed next, along with the degree to which making these links might be difficult in schools and how the complementary nature of these links might overcome these difficulties.

Schools as sites of innovation

To apply Dougherty and Heller's (1994) framework to schools, we first need to establish what the key terms used might mean in an educational context. What might*product innovation* mean in schools? Educators have long considered students to be the products of their work. However, the term *product innovation* comes from the language of business and the market economy, and in this language, the student is the consumer and the product is what the school provides to the student. The product of schooling is, generally speaking, education. However, in this paper, the new product is seen more specifically as a teaching and learning technology (eg. a method or technique, possibly but not necessarily involving the use of an artefact). What Dougherty and Heller's terminology might mean in schools is further explored with reference to each type of link below and summarised in Table 1.

Table 1. Terminology of market economy transposed onto school organisation.

Dougherty and Heller's language	**Equivalent in school organisation**
New product	• Teaching and learning technology, where technology is defined broadly as a set of practices designed to meet a particular end
Market	• Students and also teachers
Different functions within firm	• Different teachers within school • Teachers from different disciplines within school
Firm's strategy and resources	• School's strategy and resources • Wider policy and funding environment

(1) Making links between the market and technological possibilities in design.

This link is about meeting the needs of the consumer within what is technically possible, rather than allowing what is technically possible to drive the design process. When we consider technologies of teaching and learning, both the teacher and the student can be seen as users of the new product. Making links between the needs of students and the particular practices used to help students learn is not a foreign concept to teachers. However, the developers of new educational technology have not historically been teachers. Teachers do innovate. Meyer, Scott and Deal (1981) found a high level of teacher innovation in their study of US schools. They wrote,

> There does appear to be a high level of innovation within individual classrooms ... new materials and methods are quite routinely introduced into classrooms, as individual teachers discover or invent instructional changes. However, little of this activity is systematically organized at the school or district level; rather, diffusion is random as new devices sweep through the educational world and die out only to be replaced by others. (p.169)

However, as described earlier, innovation in schools has more often involved the implementation of a technology that has been developed outside the classroom and school, with little consultation with teachers, and many product developers have in the past failed to consider the needs of teachers and students.

Making links between the market and the design of innovations puts the needs of students and teachers at the centre of the innovation process: when put into practice, teachers as innovators would work closely with students and, if involved, outside designers would also work closely with teachers and students. This approach to product innovation in schools is consistent with contemporary student-centred theories of learning and with pushes for teachers to become reflective, life-long learners themselves. It also answers the common charge that the educational value of new technologies that are promoted in schools is secondary in the design.

Perhaps the most significant barrier to making users central to the design of new technologies in schools is the institution of the autonomous teacher and the historical lack of scrutiny of classroom practice. The next two types of links to be discussed (link 2 and link 3) are crucial if this barrier is to be overcome. In fact, all three types of links support each other. Dougherty and Heller's model recognises that change efforts in organisations need to accommodate the fact that organisations are systems and for change to be enduring it must be systemic.

(2) Links between the expertise of different functions within the firm.

Dougherty (1992) found that different departments within a firm comprise distinct *thought worlds* regarding customer needs and how best to meet these needs. Dougherty and Heller (1994) stressed that "each thought world has a vital yet unique piece of the market-technology linkage puzzle" (p.201). In this way, interdepartmental links help to make the link between product and user (link 1). Similarly, in schools, each subject area has a distinct culture (eg., Goodson & Mangan, 1995) and, as with large established firms, collaboration across subject boundaries is rare. Yet this type of collaboration helps to focus product innovation on the needs of learners. Crow and Pounder (2000) suggested that interdisciplinary teacher teams tend to "tighten the connection between teachers' work and student outcomes because work is organized around students rather than academic disciplines" (p.217). They argued that "interdisciplinary instructional teams may hold [the] greatest promise for substantive and significant school reform" (p.220). Marks and Louis

(1999) also found that the fragmented structures for coordinating activities in schools is an impediment to organisational learning in schools. They wrote,

> Creating a professional community enhances a school's capacity for organizational learning. Professional communities depart from the normal practice in schools in that teachers do not work in isolation but collaborate within a professional culture. (Marks & Louis, 1999, p.713)

They identified reflective dialogue, open sharing of classroom practices and the collaborative design of new materials and curricula as some of the hallmarks of a professional community.

Links across curriculum areas are a largely untapped source of creativity in schools, particularly in secondary schools, where the fragmentation of the curriculum is deeply embedded in school organisation. The potential of links between subject areas has long been recognised by proponents of new computer-based technologies, many of whom see the effective implementation of these technologies as a means of tapping this potential. For example, Hawkins (1993) wrote that,

> The infusion of technology into collaborative learning can help to replace the view of learning that composes subject matter into consumable chunks with a view of knowledge as a network of ideas, information, interpretation that must be exercised and revised as an alive and interconnected body through sustained exchange with others. (p.33)

Making links between historically disparate subject areas in schools is the most challenging of the three types of links that Dougherty and Heller (1994) identified as necessary for successful product innovation. Working across subjects, particularly in secondary schools, is inhibited by the institutional environment of schools, conflicting with the way time, space and knowledge are organised (Crow & Pounder, 2000; Lynch, 2000). Because of these basic organisational barriers, this type of link is best made when the whole school resolves to embrace change. Link (3) - between the new product and the organisation's management - is crucial for the implementation of such whole school change.

(3) Links between the new product and the firm's strategy and resources.

This strategy is primarily concerned with resources and symbolic support from management. The latter form of support is crucial for managing change in highly institutionalised organisations. Yet the former is usually most predominant in attempts to garner support. Shared understandings or a vision of the aims of the organisation need to be communicated through the leadership of management. In his reflections of why change efforts fail in business, Kotter (1995) identified lack of vision and failure to communicate the vision as key barriers. He wrote, "In failed transformations, you often find plenty of plans and directives and programs, but no vision" (p.63). However, "in more successful transformation efforts, executives use all existing communication channels to broadcast the vision" (p.64). In schools, links between the product and the organisation's strategy and resources point to active support from school administration and from the larger policy environment. The larger policy environment needs to support school administrators in taking the risks involved in whole school change, and the school administration needs to support risks taken by teacher innovators and to take steps to empower teachers. Many studies of change in schools have identified leadership as a variable affecting the success of the change effort. For example, Scribner *et al*. (1999) found that the principal played an important role, particularly in terms of creating a shared sense of purpose among school leadership and teachers. They argue that this shared sense of purpose helped facilitate organisational learning. Similarly, Moroz and Waugh (2000) found that one of the key roles of administrators in the change process in

schools is the communication of the advantages of the change over the previous system. In terms of instructional innovation, the articulation of such advantages makes links between the new product and the user (link 1). Further, these advantages, if to be developed on a school level in the form of a vision or overall strategy, require input from and communication between teachers (link 2). The combination of a shared vision, broad stakeholder involvement and a communicative culture has been observed in attempts at whole school change that have succeeded (eg., Horn & Carr, 2000).

A new approach to coordinated instructional innovation in schools

The application of Dougherty and Heller's links to schools requires a change in how innovations have traditionally entered schools. This shift is represented by the move from the situation shown in Figure 1 to that shown in Figure 2, a shift that primarily requires a change in the role played by teachers. Historically, when new technologies have been introduced into schools, teachers have been seen as poor or resistant users. In the approach represented in Figure 2, the teacher is both the innovator and the user of the new technology, which is developed, implemented and evaluated in the classroom.

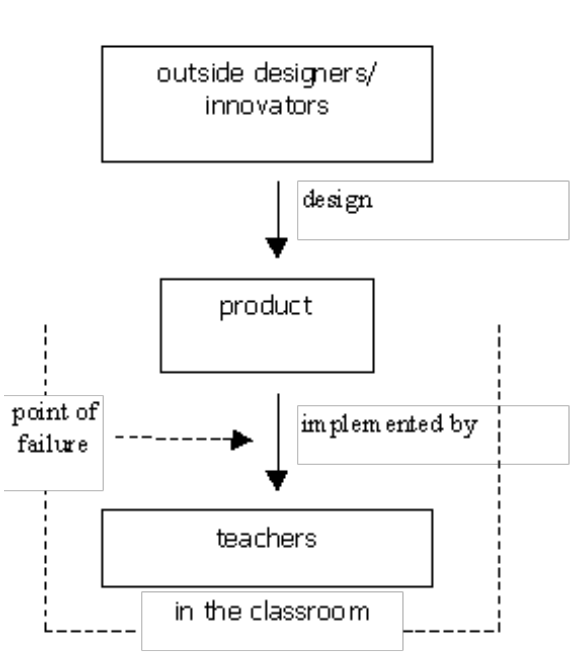

Figure 1. Historical model of innovation in schools

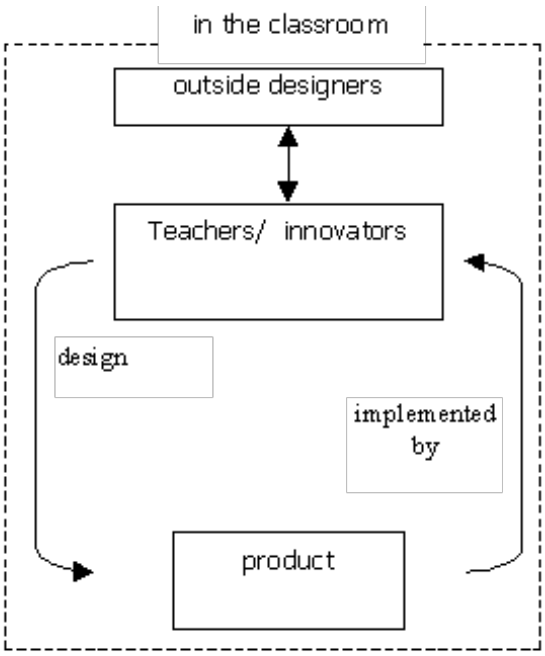

Figure 2. Teachers as innovators

To be successful, this approach needs the support of links between product design and the needs of teachers and students, the support of links between teachers, and the symbolic and resource support of administrators and policy makers. Making these links requires whole school change and poses considerable challenges because the links are counter to the institutional environment of school education.

Conclusion

In this paper I have examined a model developed in the field of business to see what light it might shed on why coordinated technical innovations in schools rarely reach the continuation phase of the change process. The application of Dougherty and Heller's (1994) observations about big old firms supports other literature, found in the field of education, suggesting that organisational change in schools is needed to support coordinated

instructional innovation. While schools and big old firms certainly have their differences, their similarities are such that studies of reform attempts in big old firms can shed some light on the traditional resistance of schools to change, enrich future discussions and perhaps inform future initiatives. The application of Dougherty and Heller's three types of links to schools suggests that the management of change and innovation in teaching methodologies and the classroom environment should position teachers as innovators, that is, as developers of new teaching and learning technologies. Schools need to be reconfigured as environments that encourage and empower communities of teacher innovators to produce, implement and evaluate new learning technologies. Dougherty and Heller (1994) wrote that, "managers must weave the activities of product innovation [links 1, 2 and 3] into their institutionalized system of thought and action" (p.200). That is, these activities need to become taken for granted and part of what the various stakeholders understand to be what schools are all about.

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