

## A structural analysis of how course management systems are used in practice

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An understanding of the role of e-learning needs to be accompanied by a realisation of the variety of social dimensions in the innovation process. As most studies in this domain are typically context-independent, this research, building on structuration theory, seeks to investigate different interpretations and uses of course management systems (CMSs) in an academic context. For the purpose of this research, a case study has been conducted on the introduction of a CMS in a higher education institution. Findings from this empirical study have been drawn on to illuminate how this system is employed in disparate manners by different groups of academics and what are the reasons behind this discrepancy. The study also demonstrates that the practice lens (Orlikowski, W.J., 2000. Using technology and constituting structures: a practice lens for studying technology in organizations. *Organization Science*, 11 (4), 404–428), viewing the use of technology as a process of enactment, presents a useful insight for explanation and synthesis of the variations in usage patterns.

**Keywords:** course management systems; WebCT; structuration theory; emergent change

### 1. Introduction

Higher education institutions are increasingly embracing e-learning systems that incorporate IT into the long-established and traditional academic practices. Although e-learning may be considered as a global or general concept in higher education, course management systems (CMSs) have recently emerged to define a particular set of characteristics or features. CMSs have become standard components in higher education. Many institutions are encouraged to deploy CMSs to gain competitive advantage in the education market, and to exploit the benefits of IT for teaching and learning activities.

A CMS generally comprises two basic functions: (1) content distribution, including management and retrieval of course materials, and (2) facilitating interaction between academic staff and students. Common CMSs in higher education context consist of, but are not restricted to, WebCT, Blackboard, Angel, Learning-Space, e-College, Moodle and On-course. These systems are collections of related web-based tools (i.e. content presentation features, assignment management facilities and chat and discussion areas) that offer much promise in the way of efficiency and effectiveness in both delivery and management of courses.

CMSs tend to be among the most rapidly diffusing e-learning technologies throughout the world (Dutton *et al.* 2004). Many institutions are increasingly investing hundreds of thousands of dollars in these technologies. Because of these huge investments, the

consequences of this kind of system within social and organisational structures become more significant to managers, as they want to know what happens when these technologies start to be used (Cornford 2003). However, little attention has been given to the outcomes of their implementation, although much has been said about their utility (Charbonneau 2004). The emphasis on the technical facets and promising business models rather than on social aspects has been manifested in the majority of the development and implementation processes (Tavangarian *et al.* 2003).

Appealing to the social side of these technologies seems pivotal, because the substantial barriers to the adoption of new technologies at many academic institutions are not the lack of funds or robust technological infrastructures but individuals who are reluctant to use the technologies made available to them. In this context, although 73% of surveyed institutions have invested in a single and standard CMS to harvest cost effectiveness rewards (Gartner Group 2003), in many cases various academic staff have used CMSs in ways which are different from the ones sanctioned by institutions.

As university professors are among the most significant decision makers on the integration of educational technologies in the academic arena, this research is intended to develop an empirically anchored and theoretically informed perspective on faculty members' divergent interpretations and uses of new

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CMSs. The study is structured as follows. The members' next section places this research within the relevant literature. In light of this literature, the next section further suggests a theoretical framework for probing the research questions. The third section introduces the research methodology and the case study's overview. A summary of the observations and the research findings is then given in the fourth section. Thereafter, based on the theoretical framework, an analysis of the findings is presented. Finally, some conclusions are drawn which summarise the core arguments and put forward a number of practical implications.

## 2. Literature review

Upon reviewing the current state of literature on CMSs and their use, one can conclude that these technologies have been utilised differently by different organisational actors, even in the same organisation setting. A body of literature raises an awareness of disparate manners in which university professors embark on CMSs. It also explicates a couple of reasons behind this differential use of CMSs. What follows is a brief review of the relevant literature and its implications for this study. Subsequently, in the last part of this section, an emerging gap in the current state of literature will be highlighted.

### 2.1. Divergent types of CMS adoption

CMS technologies usually offer a wide range of features which can be leveraged for a variety of academic purposes. Although they provide such benefits, various researchers have discovered that these features are used to different degrees by different professors. Aiming at categorising the evidence from the literature, this paper draws on a typology suggested by Dutton *et al.* (2004).

#### 2.1.1. E-copier

E-Copier is where professors rely upon the CMSs to have most functions of a copy machine. They use the CMS's capabilities to present their lecture notes, reading lists and online assignments. Some studies conclude that content presentation modules (including content module, student presentation module and assignment submission module), which basically carry out the E-copier functions, are considered to be the most practical ones by most professors (Holm *et al.* 2003, Yohon *et al.* 2004).

#### 2.1.2. E-publisher

This is where CMSs' capabilities are used to complement and to augment the course materials, in addition

to 'E-copying' them. For instance, some professors employ these technologies to supply their students with new types of materials like multimedia. Generally speaking, these materials have not been available in traditional lectures. To exemplify, a professor in art history, building on a CMS, has associated a number of high-quality images of historical sites with his traditional classes. These kinds of practices might go beyond the conventional pedagogy styles. Nonetheless, Morgan (2003) contends that very few people tend to employ CMSs in this fashion.

#### 2.1.3. E-communication

In some cases, a number of communication features of CMSs (e.g. discussion boards, chat tools and mailing lists) are used to mediate the traditional interactions. For example, some professors have used discussion boards to make their students involved in an online problem-solving programme such that each student must comment on a subject as a part of the assessment process (Dutton *et al.* 2004). Some other studies report discussion boards of CMSs as one of the most widely used features (Piguet and Peraya 2000, Ansonge and Bendus 2004).

#### 2.1.4. E-classroom

E-classroom is where conventional teaching and learning practices through the adoption of a CMS are totally transformed into a 'remote' or 'virtual' manner. For instance, in order to establish a 'semi-distant' way of teaching, a course has been rearranged by its instructor, using a CMS. Currently, the students of this course are required to be present only a few times in the campus whereas the main activities are directed and handled through the CMS. The CMS also has added 'virtual office hours' to the professor's physical office hours. This new practice indeed capitalises on distinct CMS tools like quizzes (Dutton *et al.* 2004). But, most studies report that such an engagement with these technologies is very rare (Piguet and Peraya 2000, Ansonge and Bendus 2004, Wingard 2004).

## 2.2. Why CMS technologies are used differently

Although a set of literature argues that no noticeable distinction between CMS users and non-users has been observed (Yohon *et al.* 2004), some other studies propose a number of reasons for these emerging differences. In this regard, they suggest issues like technical experience, the impact of other technologies, discipline of the course and personal concerns about copyright. These issues are examined as follows.

### 2.2.1. Technical experience

The most argued factor in the relevant literature would be the professors' technical skills. On one hand, a group of studies proposes the lack of training and technical knowledge to be the main barrier to using CMSs (Mann 2001). Kofler (2005), reinforcing this, suggests this sort of technology is an 'intuitive application' which cannot simply be 'picked up' by most of the academic staff; rather, it requires a minimal technical proficiency. Hence, this body of literature believes training courses to be an efficient way to increase adoption of CMSs among academics (Mann 2001). On the other hand, a number of researchers hold a different view. Some contend that common CMSs (e.g. WebCT) do not require considerable technical skills (Goldberg and Salari 1997, Yohon *et al.* 2004). Similarly, Dutton *et al.* (2004) suggest a 'weak positive relation' between the adoption of CMS and the issues traditionally considered to be important in e-learning like the degree of IT expertise or the academic discipline, which are addressed in the following sections.

### 2.2.2. Discipline of the courses

The differences in the nature of disciplines are considered to be a factor for explaining why CMSs are used differently (Li 2004). Kofler (2005) argues that individuals from maths and science departments are more likely to embrace CMSs as opposed to their counterparts in social sciences. He indicates that the former are more involved in using problem sets and quizzes and hence CMSs serve their disciplines more effectively.

### 2.2.3. Personal concern about copyright

A body of case studies puts forward personal concerns regarding copyright as one of the main reasons for professors' reluctance to embark on online environments. Some professors have a great deal of doubt about ownership of their course materials when they are put on a CMS (Schifter 2002). Dutton *et al.* (2004) report on one of these professors who explicitly regarded copyright as his primary concern in adopting a CMS.

### 2.2.4. The impacts of other technologies

The preceding technological context of institutions has been proposed as a key factor which affects the use of new technologies like CMSs. Applying the diffusion model of Roger (1995), Bennett and Bennett (2003) argue that the degree to which faculty members assume the new technology (like CMS) is superior to current

alternatives considerably shapes their interpretations and consequently their adoptions. Likewise, Holm *et al.* (2003) state that some professors have been reluctant in adopting a CMS because the current groupware tools seemed more convenient to them.

### 2.3. The gap in the literature

Although the discussed literature examines the reasons behind the phenomenon, most relevant empirical studies employ a functional view of technology to expose the cause and effect correlations, hence they seem to have overlooked the complex social implications of online learning technologies and meanings that individuals attach to them (Hsu 2003, Halperin 2005). This lack of interpretive approaches, which recognise reality to be socially constructed, is particularly the case in studies of CMSs, because most of them (e.g. Charbonneau 2004) tend to discount the socio-organisational contexts where these technologies are interpreted and used by the social actors. To this end, Yohon *et al.* (2004) articulate that more enquiries are needed to elucidate the social and cognitive differences between those professors who use and those who do not use CMSs. As such, drawing on interpretive approaches and structuration theory (ST), the primary objective of this study is to reassess the results of previous studies and to reveal how assumptions, expectations and norms of distinct groups of professors shape divergent types of CMS adoption in a given context. The investigation would also address the following questions: Why do professors who have access to a CMS choose not to adopt some of its features, or completely abandon it? What are the contextual factors that influence the adoption and further use of a CMS by academic staff? What are the social, cultural and epistemological issues which facilitate or constrain the uses to which CMSs are put in a specific context?

## 3. The theoretical framework

The theoretical backdrop of this study is one of the extensions of ST (Giddens 1979, 1984). ST is not specific to the information system (IS) discipline, but a general theory which describes the nature of human action and social organisation (Walsham 2002). Giddens puts forward the notion of structure as a set of enacted rules and resources that facilitate or constrain social actions. In this sense 'action' and 'structure' are in a recursive relationship, each iteratively shaping the other, and this is the meaning conveyed by the term 'structuration'. (Giddens 1984).

Several structurational models of IS have been developed in order to explore the role of IT in

organisations (i.e. Barley 1986, Walsham and Han 1991, Walsham 1993, DeSanctis and Poole 1994). Breaking away from technology deterministic conceptions, they advance the concept of technology as constructed by human agents and at the same time as having properties which mediate human actions.

One of the ‘most prolific writers’, Orlikowski has approached ST in a number of papers (Orlikowski *et al.* 1991, Orlikowski 1992, Yates and Orlikowski 1992). She has sought to conceptualise the role of technology through the proposition of a practice lens (Orlikowski 2000).

This practice lens makes an analytic distinction between the artefactual character of a technology and use of it. On one hand, technology as artefact is ‘a bundle of material properties packaged in some socially recognisable forms, e.g. hardware’ whereas these material properties are inscribed by the designer. On the other hand, technology-in-practice, as the structure of technology use, is enacted by social actors when they interact with material properties of the technology artefact. In turn, the technology-in-practice as a set of rules and resources serves to shape their interactions.

In enacting technologies-in-practice, each user draws on his or her interpretive schemes, norms and the facilities available to him or her (see Figure 1). Therefore, these technologies-in-practice are not embodied within the technology; rather, ‘they emerge from the ongoing and situated interactions that users have with the technology at hand’ (Orlikowski 2000). The practice lens, hence, questions the perception of technology as an embodying structure. Seen through the ‘practice lens’, technology is ‘enacted’ and ‘emergent’ rather being ‘embodied’ and ‘appropriated’ (Jones *et al.* 2004). Furthermore, this model points

out that people do not enact technology-in-practice in a vacuum because they are influenced by existing social structures enacted through previous actions.

This study seeks to investigate the reasons behind situated and different uses of a CMS by members of faculty as well as their particular perceptions and assumptions. ST appears useful for this purpose as it could accommodate the emergent effects of actions and structure. More adherent to Giddens’s intentions (Rose *et al.* 2005), the practice lens (Orlikowski 2000) seems particularly helpful as it can explicate the emergent and situated nature of different ‘technologies-in-practice’ which are enacted by different groups of faculty members in their engagement with CMS technologies.

#### 4. Research design and methodology

##### 4.1. The case study background

The following section presents the case chosen for this research and offers background information on the empirical setting. The case chosen for research involves the introduction of a CMS into the IS department of an academic institution (herein called the institution).

Several different e-learning projects have been implemented in the institution. The centre for learning technology (CLT) has been founded in the interest of integrating new technologies into the teaching and learning practices of the institution. Through a primary group of projects, the centre has been looking for various approaches to provide added learning value for the conventionally taught courses.

The CMS selected by the institution is claimed to be a complete set of tools for course preparation, delivery and management whereas it has been built on a strong technical foundation. The developer of the CMS maintains that the system offers the depth of pedagogical flexibility necessary to support a wide range of pedagogical principles (WebCT Website 2006). This brings together a range of resources and tools such as content modules, assignment submission modules, discussion areas, chat tools and quizzes as well as an online course pack (the details of these tools are explained in Appendix 1).

The development model used for the CMS is on the basis of the institution’s departmental structure. Funds are allocated against a set of criteria by a steering group and some research students are paid to work on the content in collaboration with the professors and the CLT. Like other departments of the institution, the IS department has adopted the CMS for some years. In parallel with the CMS, the professors have also employed other technologies for course teaching and delivery. In some courses, ‘public folders’ of Microsoft Outlook have been used for information retrieval

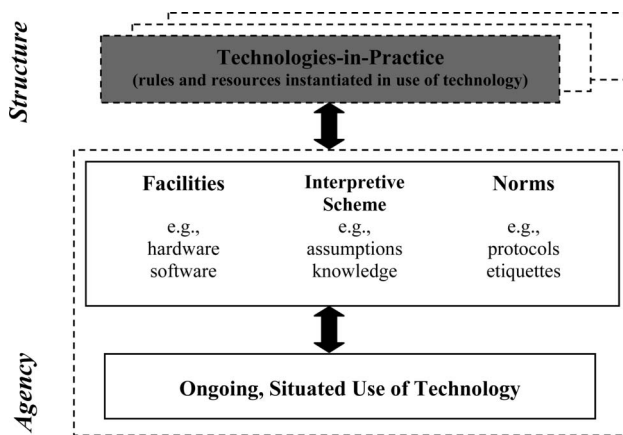


Figure 1. Enactment of technologies-in-practice (Orlikowski 2000).

function. In this context, the professor could post the lecture slides, handouts and reading materials into each course's folder. A few courses also employ Moodle (a free and open source CMS) or the professors' personal websites.

#### 4.2. Research strategy

This study adopts an interpretive research approach, which acknowledges situatedness and subjectiveness of the object of enquiry and attempts to understand it through the meaning that people assign to it (Boland 1985). An interpretive approach helps to illuminate different perspectives of participants (on the technology) which influence their resulting actions. The 'context' in this study is also of great importance, so this approach is appropriate as interpretive studies 'aim at producing an understanding of the context of IS and the process whereby the IS influences and is influenced by its context' (Walsham 1993).

This study chooses a single case study method. This is seen as a plausible strategy for a situation where, 'when', 'how' and 'why' questions are being explored. In addition, it provides an insight into a contemporary phenomenon within its real-life setting, particularly when the boundaries between the phenomenon and its context are blurred (Yin 1994). The in-depth case study is also viewed to be the most appropriate way of conducting empirical research in interpretive traditions (Montealegre 1995). In addition, the qualitative approach can facilitate an analysis of different interpretations of social actors on the technology as well as their actions around it (Orlikowski 1992).

#### 4.3. Data collection and analysis

For the purpose of this research, multiple data collection methods were employed, as Yin (2003) believes this technique to be the main strength of case study's data collection. These sources of evidence included semi-structured interviews, direct observation and document analysis. The main emphasis was put on semi-structured interviews (the interview questions can be found in Appendix 2) as they allow interviewees to convey their experiences and assumptions in a way that is not permitted by completely structured questions. The themes and questions of main interviews were designed based on a number of pilot interviews. In addition to pilot interviewees, 20 members of the department were interviewed. Semi-structured interviews conducted with 14 academic staff of the IS department revealed their assumptions, expectations and norms regarding different aspects of the CMS. In addition, three class teachers and the course support administrator who had been involved in running the

CMS for some courses were interviewed. Finally, the director of the CLT and the department managers were also interviewed to grasp the main policies of the institution and the department.

Through 'the process of triangulation', the interview results were complemented by direct observation of the field study and the documents that 'afford deeper purchase on actions and assumptions of actors' (Orlikowski and Yates 2006). The uses of the CMS for all courses also were observed through assessing their home page on the CMS.

The qualitative data analysis began before the data collection finished because overlapping of data collection and analysis enables the researcher to address questions raised while still in the field (Glaser and Strauss 1967). For analysis purposes, the thematic coding technique (Flick 2002) was employed. This is particularly useful when the researcher deals with a set of semi-structured interviews. This technique assumes that the initial grouping of interviewees and the questions asked relate to a formulated research question or theory. In this way, open and selective coding was carried out for each interviewee so that themes and categories could be developed. As such, it was possible to compare these themes (about assumptions and interpretations) across interviewees as well as against the research questions and the theoretical framework.

### 5. Research findings

It has been observed that there are variations in the patterns of CMS adoption within the IS department. An attempt has been made in this paper to categorise these technology usages in light of the feature-centric view of technology (Jasperson *et al.* 2005). Most of previous IS studies were perhaps aimed at studying IT applications as black boxes rather than as a set of particular features. However, in the social constructivist tradition (i.e. Weick 1990, Walsham 1993), individuals interpret technology's features so as to form a 'technology-in-use' framework. A feature-centric approach, hence, seems valuable because it is the specific features in use that influence the work outcomes (DeSanctis and Poole 1994, Goodhue and Thompson 1995). In this study, the features are defined as building blocks of the CMS. Therefore, the patterns of use are categorised based on components of the CMS which are used by the faculty members.

However, the number of features which are utilised is not the only principle for discerning different patterns of use. A simple increase in the number of features which are used by the users might not necessarily lead to an improvement of work practices (Todd and Benbasat 2000). As such, the classification in this paper has been conducted on the grounds of not

only the number of the features but also the manner in which these tools are utilised.

### 5.1. How the system is being used

#### 5.1.1. The first group

The most important characteristic of these individuals is that most of them have not seriously integrated the CMS into their teaching practices. They either do not use it or approach it like an E-copier. A number of them completely have ignored the CMS and have continued using the Microsoft Outlook public folders for their courses. A number of the professors have utilised the CMS, but in a minimal way in that only the presentation tools as well as the assignments submission tools are used. The material presentation tools are also used in a fashion quite similar to the way in which they put material on the public folders. For instance, one professor puts it: 'the public folder is fairly easy; but it's just a publishing (tools); and that is how we use the CMS as a publishing system; it operates like a photocopy'.

A specific budget is provided by the CLT for handling the CMS, which gives most of the faculty members the opportunity to have class teachers or research students for running and supporting the CMS. However, most of the aforementioned professors prefer not to make use of this opportunity. In effect, these individuals draw only on the public folders, or they use the CMS like the public folders, and hence do not utilise its extra features.

#### 5.1.2. The second group

Contrary to the first group, they want to use more capabilities of the CMS. They view it as E-copier, E-publisher and E-communication. They go beyond the material presentation features and submission tools. Some of them have attempted to employ extra features like the audio/video facilities and online course packs. Noticeably, discussion board facilities of the CMS are also employed. As a matter of fact, the difference between the first group and the second group is three-fold: the degree to which they use the tools; the attitude towards employing teacher assistants and their intention with respect to the extension of use. Firstly, even the tools that are common between two groups are utilised differently; for instance, the supplementary readings and categorisation of materials are pursued by the first group. Secondly, although the first group do not tend to employ the teacher assistants, the other group often have teacher assistants involved. Thirdly, most of the first group's members do not currently intend to extend their usage of the CMS. In contrast, some of the professors in the second group are likely to use more features.

### 5.2. The different interpretations on various aspects of the system

This section presents the interpretations of the various professors who were encouraged to incorporate the CMS into their teaching practices. The role of the CMS in the IS department is subject to different interpretations by the two groups of professors.

#### 5.2.1. The first group's perceptions about the system

Some professors believe that teaching is formed around the teacher and the classroom and technologies like CMSs would introduce bureaucracy and standardisation into the teaching system. The CMS is regarded as something that imposes order, to classify and to manage the whole process of education.

They think that each course has a set of requirements that are specific to it; therefore, it is almost impossible to use a standard system for all courses. Some professors in this group assert that the features of the CMS are not geared towards their teaching style. A professor remarks:

The CMS is designed around the numerical mode of teaching; it is designed to promote the use of multiple choice quizzes (through the quiz tool). We have different ways of assessment (with qualitative aspects), I do not even know how to design multiple choice quizzes.

Most of the professors in this category might not be completely familiar with the CMS and its functionality. Even though they attended the introductory session held by the CLT, they have not been involved in any other training programme. Moreover, copyright is mentioned as another major concern. Some professors are doubtful about the ownership of their materials when they publish it on an online environment like the CMS.

In addition, some limitations in the interface and the design of the system have exacerbated the situation. Some professors in this group who have adopted the CMS consider it to be a boring system with a tedious interface which requires too many clicks to do a particular task (as opposed to the public folders where all they need to do is to drag and drop files).

In their view, the CMS has some other limitations like authentication or the impossibility of viewing other courses' material. The CMS has not been integrated with other information systems of the university, so a number of interviewees stressed that they do not want to have another user name and password. Besides, the CMS does not let professors find out what material is being used in other courses (through their regular account); some of them state that they would like to be automatically registered for all courses in their department.

As mentioned, the discussion area of the CMS is underused by this group. This could be partially due to the fact that they are principally interested in direct and face-to-face communication with students and argue that technology would not appropriately mediate this interaction. One professor echoes this view by suggesting:

I insist the students meet me physically; I am very concerned with this wall of technology separating students from teachers ... students have the right of personal access to members of staff, not through the screen, but by knocking the door and expecting access ... I would like to do communication on one-to-one basis, not on one-to-many basis. That is why I do not like the discussion board.

However, the professors in this category may appreciate that the students prefer the CMS. This could be the main incentive for the minimal adoption of the system by some of them.

### 5.2.2. *The second group's perception about the system*

The majority of this group of professors mention the university's standards as one of their motivations for using the CMS. The university has invested a considerable amount of time and money in the CMS and hence they think it seems plausible to conform to the university's standards and what most people are doing. They believe that it might be beneficial for everyone to use the same system rather than every professor using his/her unique way of delivering electronic materials. In addition, the students' convenience is acknowledged as a significant motive because use of the system would enable them to only deal with a single outlet.

Some of the faculty members use the system more extensively partly because they are more eager to try new technologies or they were previously familiar with the web technologies, particularly the web-based CMSs. They are generally more open to technological trends and consequently seek their implications for their teaching practices. As a result, they tend to hold more knowledge on the CMS features, so are more familiar with its capabilities.

Moreover, this group of professors contends that the CMS offers some features and capabilities which are barely provided by the public folders. First, the CMS can provide a better structure for presentation of course materials and brings together all the materials that they want to make available to the students. Supporting this, one professor comments:

The reason I don't like public folder is it's very anonymous; every folder is the same. The CMS does

let you structure it in an interesting way and with a more attractive interface ... It also keeps good order of the administrated thing associated with the readings.

A closer look at the discussion area of the CMS reveals that it is more or less utilised by these individuals. Although some professors have enabled the tool, they have decided not to view it as a formal teaching tool. They think the discussion board is well suited for the students to work among themselves and not as a place where the teacher should be involved as well. On the contrary, some other professors (within this group) view the tools to be valuable for their pedagogical style (i.e. as an interaction hub between the professors and the students).

Furthermore, the CMS modules are deemed valuable for some specific courses. For instance, the CMS supports some professors' methods of presenting the materials. As one of the professors says:

Partly due to Americanization of the styles of teaching, today the students come to me and say: we don't want a big bibliography; tell us which one is important, (so) I need a clear relationship between essential and supplementary readings. I think the CMS gives me an opportunity to provide a big bibliography as supplementary readings.

## 6. Analysis

The theoretical discussion is anchored in the ST of Giddens (1984) and is influenced by one particular extension, namely the practice lens (Orlikowski 2000). In this section, initially, the observed social structures are made explicit, and then two kinds of enactments in light of the findings are analysed. Finally, a discussion regarding the research questions is guaranteed.

### 6.1. *The identified social structures*

In the analysis, the emphasis is only placed on the identified structures which are more salient in the use of the CMS. However, this is not to say that other social structures do not influence the professors' practices. In fact, in any structural analysis, some structures should be foregrounded and others should be backgrounded (Giddens 1979).

#### 6.1.1. *The structure of academic autonomy and authority*

It is evident that the structures of academic freedom are significant and widespread in higher education (Dutton *et al.* 2004). The CMS has been adopted in a way that acknowledges the autonomy of each department as well as the professors. Each professor has been

given the authority to adopt the system or not, as the director of the CLT states:

Some institutions might say everybody should use the technology, but that is not the kind of approach that works in our institution; and the way it works is up to the individual departments and professors to decide whether to use or not.

Although a specific use of the CMS is recommended, the university does not rigidly enforce it, accepting variations and workarounds as well as highlighting the personal choice of the faculty members.

#### 6.1.2. *The incentive structure*

The use of the CMS does not have any important bearing on promotion and tenure of the professors. Generally speaking, they are not also encouraged to extend their use. The CLT rarely sends them emails, pointing out the benefits of the CMS, but most of the professors don't pay that much attention to these messages. In addition, the current departmental leaders have not extensively used the system. Some professors regard this to be a disincentive, as their line managers are not embarking on the technology and hence do not encourage them to put forth any effort in this regard.

#### 6.1.3. *The structure of familiarity with information technologies*

Because of the nature of the discipline, academic staff of the IS department are quite familiar with various aspects of new information technologies. They often judge the CMS against other available technologies (like Weblogs and Wikis) which seem more interesting in some aspects. Furthermore, they have basically developed a lot of use of the public folders before the CMS became available. In this context, the CMS as a newcomer has been interpreted in terms of more familiar technologies like the public folders (Orlikowski 1992).

#### 6.1.4. *The structure of orientation towards research*

The institution places a great emphasis on research and this is reflected in the number of graduate students, who represent more than half of the students. The IS department follows the same trends because a grade of five, representing research excellence, has been awarded to it in the most recent assessment by the Higher Education Funding Council for England. In such a context, people are more involved in research activity. To this end, some interviewees state that research activities, like simultaneously taking care of

different papers, take up a significant portion of their time. Subject to this structure, the professors view time as one of the most critical parameters in adopting any technology for their teaching purposes.

To sum up, in their engagements with the CMS, the professors have drawn upon their interactions with the institutional context and social structures associated with the context. Yet the structures are the results of previous actions of these individuals (Giddens 1984). The aforementioned social structures have had certain effects on the use of technology in general and the CMS in particular at the IS department.

### 6.2. *The enactment of the two distinct CMSs-in-practice*

With regards to this 'technology-in-practice', it can be claimed that disparate CMSs-in-practice are being enacted at the same time within this empirical setting. However, for the purpose of our analysis, the existing individuals' interactions with the CMS are analysed based upon two different enactments, namely the limited-use CMS-in-practice and the process support CMS-in-practice. These CMSs-in-practice should not be viewed as exhaustively characterising what the professors do with the CMS. They are just the kinds of enactment identified at certain times and using specific research techniques. We can be sure that the identified 'technology-in-practice' will change and evolve and will likely be replaced with newer ones.

#### 6.2.1. *The enactment of the limited-use CMS-in-practice*

Although influenced by the social structures, these people enact this 'technology-in-practice' for at least two distinct reasons.

##### 6.2.1.1. *Their interpretive schemes.*

- (1) *Scepticism towards technology for course management purposes.* In this view, technology can fuel bureaucratisation in higher education. This group, therefore, does not welcome an all-encompassing and standard system like the CMS for all courses because it might stimulate 'tidiness' and neglect the unique requirements of each course.
- (2) *Moderate knowledge of the CMS.* The scepticism felt by these professors is intensified by their rather incomplete knowledge of the CMS and its applications. If people have limited knowledge of the unique and different functionality of a new technology then they may be reluctant to use it or may not fully incorporate



it into their work practices (Orlikowski 1992). For instance, in one case, the lack of knowledge about the CMS has influenced the way in which the system is adopted. This professor believes that unlike the public folders, the CMS does not provide access to materials for students who are auditing the course but are not officially registered for it; however, this is not the case as all the graduate students are able to self-register for any course on the CMS.

- (3) *The CMS does not add anything to the public folders.* It is not clear to most of them what additional values they would gain from extra work that the CMS involves whereas it is perceived to make things more complicated. Indeed, the CMS provides them with functionalities which are viewed as irrelevant and worthless and requires considerable amounts of time and energy. They are also disinclined to abandon the previous technology (the public folders) with which they have become comfortable over the years.
- (4) *Technological limitations.* The perception that the CMS's interface is tedious and would constrain their use makes this group of professors more unwilling to adopt it. The structure of the system has also been peculiar to some of them. A professor points out:

It seems to me that the terminology within the CMS is strange. For example, it has a couple of types of users, but in the real world we have professors and students. So it does not match the real world.

Furthermore, unlike the public folders, the CMS has some constraints like the need for using another set of username and password to be authenticated.

#### 6.2.1.2. *Their norms.*

- (1) *Specific pedagogical norms for the courses.* Some courses have been taught for several years with specific pedagogical norms. The CMS is sometimes perceived to be at odds with particular pedagogy styles. Features like quizzes, which are in concert with the general perception of its designer (in North America), might be incompatible with taken-for-granted norms of some professors. In addition, some professors reveal their objection to 'spoon feeding of the students'. They believe in mapping the general area of relevant knowledge (through pointing out relevant literature

and major discourses). As such, placing an absolute collection of course materials on the CMS could be treated as counterproductive.

- (2) *View towards time.* The perception about the correlation of the CMS and time has also influenced their way of adoption. As the department has a huge MSc programme and a relatively large PhD programme, teaching and mentoring activities as well as research involvements require a substantial amount of time. To this end, the CMS is considered time-consuming due to its procedural interface. Ironically, these professors find themselves spending more time running the CMS. This is the underlying message of one professor who expresses:

Time is the most important factor, obviously if it takes longer for me to use the CMS, then the time has to be found from somewhere, so shall I reduce my office hours to use the CMS!? My perception is it's not worth using the CMS because it is too time-consuming.

- (3) *Direct and face-to-face communication with the students.* Some professors believe that in this institution there is something to be gained by students through coming to the campus and interacting with the faculty members and other students. In this way, it has been observed that these professors have been more approachable by the students during office hours and even non-office hours. This is because they hold particular beliefs over technology-mediated communication. For instance, they think feedback mechanisms of the technology are futile; things like smiles and occasional shouts are not conveyed via technology. They are not interested in employing teacher assistants for handling discussion boards because some of them argue that the students are paying premium fees to have a professor deal with their issues.
- (4) *Copyright.* There emerges an ambiguity on the ownership of electronic materials published on the CMS. Although the university has contended that putting materials on the CMS does not change their ownership, no clear policy has been declared. This might be unacceptable for those professors who are more concerned about the ownership of their materials.

6.2.1.3. *The limited-use CMS-in-practice.* Influenced by the identified social structure, this group of professors, in their recurrent practice of technology use, draw on their distinct interpretive schemes and

norms, and utilise very few facilities of the CMS (like content and submission modules) to enact a set of minimal rules and resources which has little influence on their existing teaching practices. In turn, such a limited-use technology-in-practice, because it provides minimal value to the professors, reinforces their assumptions and experiences of the CMS as less than useful for their practices (see Figure 2).

The focus on how structures are enacted in recurrent practices would acknowledge that professors have not been able to use the technology as it was designed – either disregarding some properties of the CMS or working around it. In this case, although the CMS has been made available, it is not considerably associated in recurrent social practices, and thus insignificant rules and resources (the CMS-in-practice) are enacted with the technology artefact. With this kind of enactment, the professors reinforce and maintain, ‘the structural status quo, with no discernable change in the work practices’ (Orlikowski 2000).

6.2.2. The enactment of process support CMS-in-practice

Like the first group, these individuals have been subjected to the identified social structures; however, they enact a different CMS-in-practice attributable to the following.

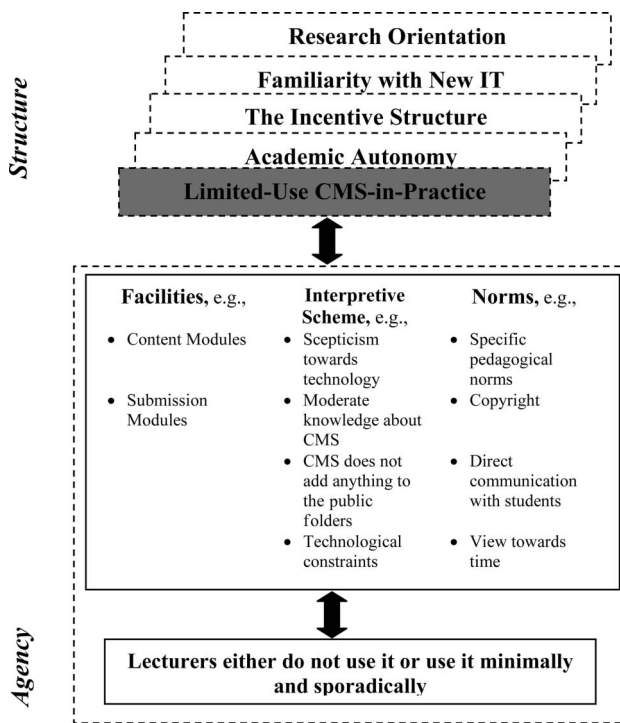


Figure 2. Limited-use CMS-in-practice enacted by the professors.

6.2.2.1. Their interpretive schemes.

- (1) *Eager to try out innovations.* Owing to their technical backgrounds or other reasons, a number of these professors have demonstrated personal interest in trying new technologies. This would induce them to look for more innovative ways of going about course delivery.
- (2) *Previously familiar with web-based CMSs.* A few of them state that they made a homepage almost immediately when the web had become available. In addition, some of them had had positive experiences with web-based system before the introduction of the CMS. These positive exposures to similar technologies would have made them more receptive to web-based CMSs. This happens because the meanings and attachments that they associate with the CMS and its use are partially created by their interactions with previous and current technologies (Orlikowski 2000).
- (3) *The CMS offers more than the public folders do.* Some features of the CMS (which are not provided by the public folders), in addition to better organisation of materials, seem useful to their work practices. For instance, the CMS allows professors to more appropriately present particular URLs. In general, most of the professors within this group wish to do more with the new technology. Therefore, some have employed features like e-coursepack or audio/video facilities.
- (4) *Students prefer a single interface.* Most of the interviewees appreciated the fact that students increasingly expect a common and standard interface for all courses. In this regard, one of the professors suggests:

If everybody uses different sources of technology, then the students should learn for example eight technologies. But the university thinks differently, encouraging everybody to do things in the same way, and this is better for all of us.

In most cases, students and their feedback are mentioned as a significant driving force.

- (5) *The CMS is not the best kind of system.* A more extensive use does not mean that these professors are entirely satisfied with the CMS, as they state that they are completely aware of its limitations. These people as users (who use it more extensively) have discovered extra constraints. Most of these individuals are proficient with new IT; as such, they regularly compare the CMS with more user-friendly technologies like Weblogs. They are not satisfied with all

aspects of the system, particularly when it comes to its usability.

#### 6.2.2.2. Norms.

- (1) *Compliance to the university's preferences and standards.* They are more sensitive to what the university expects. Although nobody has been forced to utilise the CMS, some professors' belief is to value the wishes of the university about a standard system. They might ignore other perceived negative aspects of the CMS, and hence adopt it.
- (2) *Specific pedagogy style for the courses.* The CMS pedagogical implications seem more aligned with specific, 'the teaching style of some professors'. For instance, the CMS facilitates the delivery of a given course by handling the submission and the management of the weekly assignments. In this course, where the professor emphasises the students' and the teacher assistants' collaboration, the students submit the assignment of each seminar and the class teachers consequently could check them via the CMS.
- (3) *Technology-mediated communications can be complementary to direct communications.* Some professors think that in addition to the traditional ways of communications, people can rely on technology-mediated communications. Therefore, capabilities like discussion boards could contribute to the teaching and learning processes. They also believe that these new interactions through technologies do not necessarily reduce face-to-face interactions, but could act as a complementary means. For instance, a professor emphasises the advantage of the discussion board when many students with similar problems may find answers on a discussion-thread.
- (4) *View towards time.* Although using the CMS is conceived to be more difficult and more time-consuming compared with the use of some available technologies, the professors continue using it. They might need to spend more time doing pedantic things to exploit its benefits. Furthermore, some contend that once their course and reading lists are set up, the only thing they need to do is to update, and to tweak them. In this sense, they believe that the CMS wastes nothing at all.

6.2.2.3. *The process support CMS-in-practice.* In a nutshell, influenced by the social structures, these professors, in their recurrent practices of technology use, draw on their interpretive schemes, the norms and the 'use-specific' properties of the CMS (i.e. the

content modules, the discussion area and the submission system) to enact a set of rules and resources which supports their work practices. In turn, such a CMS-in-practice reinforces their assumption that using the CMS would facilitate their practices (see Figure 3).

Orlikowski (2000) dubs this kind of enactment 'application', where individuals decide to utilise the new technology in order to improve their existing ways of doing things. Such 'technology-in-practice' is enacted by users who have enough understanding of the technology and are motivated to adopt it to augment their work practices. 'Application' would lead to the amplification and improvement of the 'structural status quo', in addition to some improvement of work processes. Therefore, even this group of professors has not transformed their 'taken-for-granted' practices through the enactment of the CMS. In this context, the E-classroom has not been achieved through their engagement with the CMS.

## 7. Discussion

By looking at the findings, two significant and different interpretations could emerge. Weick (1990) suggests, 'technologies are open to many possible and plausible interpretations'. The professors enact two different

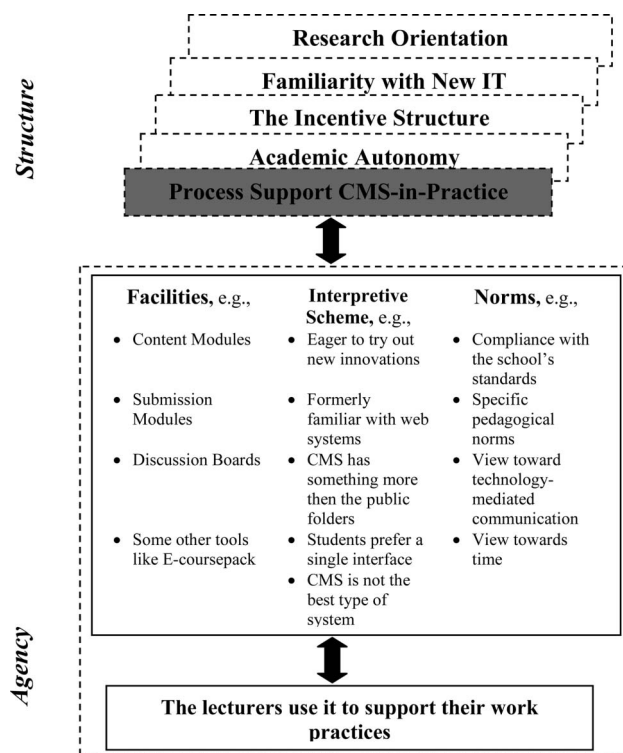


Figure 3. Process support CMS-in-practice enacted by the professors.

'CMSs-in-practice' with the same type of technology. Subject to particular interpretations and specific institutional context, they do so due to a mixture of concerns, technological visions, skills and opportunities. This structuring of technology is shaped by professors' interpretation of their work practices, their university, their access to organisational resources (i.e. teacher assistants), technological resources and the normative structures (i.e. academic autonomy) that conduct their actions in their institutional context (Orlikowski 1995).

As discussed in the theoretical framework section, the CMS (or any other technology) can be considered through two different concepts: the CMS as artefact and the use of the CMS. When the professors use the CMS, they draw on the material properties which constitute the artefact and are inscribed by its designers. However, the intentions and inscriptions of its designer are not able to circumscribe the manners in which the professors utilise it. Even with inflexible technologies, a wide range of enactments may be possible (Boudreau and Robey 2005). How the CMS material properties are used in any instance is not inherent or prearranged; rather, it is contingent upon what the professors actually do with them in specific instances. Hence, use of the CMS emerges from recurrent interactions of individuals with it. They have not been 'embodied in the technology simply waiting to be appropriated'.

These interactions with the CMS occur continuously as the professors attempt to make sense of the world and improvise in order to situate the technological innovation in their work practices (Ciborra 1996). The professors are able to 'deviate creatively from plans' (Weick 1998) and practices local to particular professors can diverge from those practices which are sanctioned by the institution authorities. As argued, the CMS does not reflect some of the local conditions or norms and hence is underutilised in some cases. Although the professors are assumed to be purposive, knowledgeable and creative agents (Orlikowski 2000), they can engage with the CMS in various ways to accomplish diverse aims. When the CMS does not help them to achieve these expectations, it can be abandoned, because after all, technology is a servant of human agents (Kallinikos 2004).

These divergent interpretations of professors prove the existence of the interpretive flexibility which affirms that the use of the CMS is socially constructed (Bijker and Law 1992). The interpretive flexibility illuminates whose interests the CMS supports and whose interests are undermined. The interpretations of the first group are not completely congruent with the CMS, whereas those of the second group are more in concert with it. However, the use of technology is not totally open to all possibilities because of the constraining role of

material properties of technology (Orlikowski 2000, Kallinikos 2004). This is the case with the CMS because it is not infinitely malleable due to its technological inflexibilities mentioned before.

Because people always have the right to 'choose to do otherwise' (Giddens 1993), any typology of CMS-in-practice must remain an open set. The professors always have the potential to change their habits and enact different structures in their recurrent interactions with the CMS. This might take place while they experience modification in knowledge, awareness, time, motivation and conditions. In this regard, it has been evident that some professors have extended their usage of the CMS and some others intend to do so.

## 8. Conclusion

This case study supports the underlying conceptualisation of Orlikowski's practice lens (2000). Informed by her theoretical framework, this study demonstrates how different groups of professors associate different meanings to a CMS and how such meaning influences their ongoing enactment. The framework puts forward that, although their interactions with the CMS are mediated by social structures, the professors enact different CMSs-in-practice due to their different assumptions, expectations, intentions and interpretations. This reinforces the significance of interpretive, technological and institutional conditions. The findings direct attention to the shared meaning constructed by professors to make sense of phenomena including the CMS. Technological conditions refer to the technological properties of the artefact at hand. Finally, institutional conditions reveal social structures (i.e. the academic autonomy) that constitute a portion of the larger social system within which the academics work.

As made explicit earlier in the 'literature review' section, factors like discipline of the course, instructors' technical experience, personal concerns about copyright and the impact of other technologies have been proposed as reasons for differential use of CMSs. This investigation has come up with some implications to revisit these. The emphasis of the discipline on social and qualitative aspects of information systems makes some tools like evaluation modules irrelevant to most of the academic staff. Apart from this factor, these findings suggest that, although the lack of technical know-how has not been a significant barrier to adoption of the CMS, familiarity with new technologies and other sorts of CMSs have had some influence on the method of adoption. Some concerns regarding ownership of material have also made a few professors disinclined to embrace the CMS. In addition, the

substantial influence of the technological context (presence of other technologies, particularly the public folders) has been evident in the enactment of CMS-in-practice.

Much of the previous research has concluded that definite positive effects can be derived from the CMS. For instance, Kofler (2005) reports on a successful implementation of a CMS and claims that technologies like CMSs would finally become standard in the United States. Nevertheless, our study implies that CMS as a technology will not automatically bring about any positive organisational change, and that it is critical to take into account the social environment within which a CMS is used.

In this view, although a CMS can offer a comprehensive set of tools, the distinction made between the CMS technology and CMS-in-practice suggests that a CMS technology *per se* cannot augment teaching practices, only use of it can. In fact, in order to understand the realistic potential of a technological innovation, we must study how that innovation relates to the context within which the technology is implemented and used (Avgerou 2001). As such, this study addresses the formative context comprising both organisational and cognitive aspects which have subtle influences on the way of adoption of the CMS.

### 8.1. Practical implications

Drawing on premises of the structurational approach and the situated perspective, five major practical implications of the featured analysis can be outlined. A CMS has been investigated in this research, but possible generalisations regarding other organisational technologies could be drawn from these conceptual findings. Given the fact that the majority of utilised CMSs in academic contexts and particularly the one studied here are commercial off-the-shelf systems, the emphasis would be placed on this kind of system rather than the ones which are developed in house. The development process of product software, like most CMSs, is different from in-house development in that the designer could be constantly in contact with the end users. In contrast, there exists little communication between the developer in software companies and targeted users in consumer organisations. This is to say that in early stages of system development, the software vendors focus on contingencies of the entire market rather than attending to the needs of a particular user organisation (Sawyer 2001).

This rising design/use gap is an inevitable consequence when technical systems are constructed as commodities that can be taken out of their production site and be exploited in the site of their use.

Hales (1994) states that the very nature of commodity market is, 'to secure objective economic connection with a minimum of cultural (communicative) connection'. This market-oriented trend would engender a rather decontextualised design process which is dubbed 'design in the dark' by Nandhakumar and Jones (1997).

At the heart of structurational analysis rests a due consideration of the context within which the CMS innovation unfolds. The investigation put forth in this article demonstrates how particular social structures specific to an academic context would have an important bearing on the use of a CMS. For instance, the quiz feature of the technology was not used because the nature of the courses taught at the department was at odds with this kind of assessment. In this way, the knowledge of context is tacitly embodied in the work practices and has been gradually formed over time. The users, here the professors, are deemed to be a precious source of contextual knowledge (local knowledge). Fleck (1994) holds that successful suppliers are more likely to appreciate value of local knowledge held by real users, and to maximise what can be learnt through systematic feedback about implementation and operation from real users.

That being said, how would a CMS supplier be able to seize the local knowledge and to inject it into the future development process? Probably post-implementation feedback mechanisms could be an answer to the question. Recall the discussion on the divergent uses of a CMS; the professors appropriate the technology on the grounds of their organisational context and their personal preferences. The tacit knowledge stemming from this appropriation process is crystallised into their technology-in-practice. In other words, different technology-in-practice within the organisational setting could reflect the social structure and specific invisible work practices. The supplier could accrue this local knowledge across sectors through systematic feedback mechanisms. For instance, WebCT holds annual user conferences in North America, Europe and the Asia Pacific where the users from disparate institutions come forward and present their experiences with the CMS. In addition, as Sawyer (2001) contends, the contingencies of the user's workplace could be conveyed to the software producers through help desks and troubleshooting activities where this information can be used to pinpoint what the real requirements are like in customer organisations and what changes in the system must be made to meet them.

However, this is not to say that pre-implementation communication with the user group is of less importance. Grudin (1994) maintains that successful marketed products like Lotus Notes were longer in

development compared with other software, and this prolonged development process was due to an extensive prototyping and iterative design technique which involved more interactions with the end-users. In like manner, the participatory design approaches would be instrumental in filling the gap between the designer and the users, despite the fact that the users involved in experiments might not well represent the divergent contexts which are targeted by the off-the-shelf product (Suchman 2002).

In addition, the producer of CMSs and all other sorts of ready-made systems need to be concerned with the flexibility of their products, facilitating improvisation in different contexts. Our study confirms that the CMS technology has some technological features which would constrain the uses to which the artefact can be put. During improvisation, one uses all resources at hand to perform whatever task is being faced (Weick 1993). Opportunities for improvisation would increase by incorporating more features and repertoire into a system. Malone *et al.* (1995) call these kinds of system 'radically tailorable tools' which can lend themselves to various local needs, as they enable various users to construct or customise a specific version. For instance, applications like Facebook can equip users with numerous templates and tools and let them modify the system according to their preferences and needs. Likewise, open source applications empower users to capitalise on their technical skills and to amend the features of the technology. In this study, it has been observed that a professor, frustrated by the limitations of the CMS regarding his practices, has tried to draw upon Moodle as a free and open source CMS. He believes that given the availability of the source code, either he or his students would be able to add some functionality so that the systems accord with his teaching activities. These capabilities brought about by the flexibility of the technology have two benefits. First, they allow ongoing changes to the technology in use in contrast to more rigid technologies which make change costly and difficult, if not impossible. Second, as an effective use might involve a considerable deal of customisation, respective recurrent learning and organisational improvement would be engendered as a result.

In selecting and implementing CMSs, the managers need to go beyond rational approaches and take into consideration the particularities of the context of their organisation. They have to examine whether a well-promoted technology is in concert with the social structures or work practices of their organisation. This can be formally done through techniques like work process or gap-fit analysis (Sawyer 2001). Work process technique helps to estimate how the software would meet the organisational needs. Gap-fit

technique could also be used to assess the difference between the functionality of a software and various organisational needs and processes. As the technology and work practices have to be integrated and adapted to each other, these techniques would assist managers in identifying both needed technical adjustments and the organisational processes that must be altered wherever the product does not support them. As Kling and Lamb (1999) point out, an organisation can embrace a new technology only if a robust 'supporting infrastructure' is in place. Not only does the supportive infrastructure include physical architecture but also denotes organisational practices, key stakeholder, and technical and social skills. These downsides could be, for example, the unwelcome extra work that the technology puts on some of the organisational actors could result in resistance and negligence (Grudin 1994). As such, managers acquiring a technology like CMS should confer with and seek the support of these actors. Suchman (2002) terms this ongoing additional support 'articulation work'.

As for the implementation, the structural perspectives on technology's role in organisations advance a different view from traditional conceptualisations. Traditional models of technology adoption perceive implementations as 'one shot' with discrete practices taking place after the users are provided with the system. However, the structural approach posits that implementation is an ongoing social process. This societal transformation, though enabled by the technology, is not totally brought about by it. It rather takes place through the ongoing, reciprocal adjustment and improvisation enacted by organisational members. Silverstone and Haddon (1996) call this process 'domestication', through which the users make sense of a technology on the grounds of familiar social structures and integrate it into everyday practices. In this approach, the right of end-users to appropriate a technology alongside existing organisational and technical systems should be recognised by the managers. This also requires a management style which sanctions a dynamic environment of continuous change. The most crucial management effort shifts from the planning to ongoing decision making on the basis of the evolving IS and the user's experience with the new technology tools.

In this respect, the managers can create and nurture an environment which lends itself to improvisation and sense-making process. Weick (1998) contends that such an environment could be characterised, among others, by a well-developed understanding of internal resources at hand, an openness to reassembly of routines and skilfulness at paying attention to the performance of others and building on it. The users can be provided with basic training and a set of resources and then can

be encouraged to be creative. No more should be specified than is absolutely essential. But this essential must be given. This is like ascertaining clear objectives, but leaving them to decide how to reach them. The learning taken place in implementation process is all about 'struggling to get it work', or 'learning by trying'.

A pivotal premise of structural perspective on technological change is that the innovation cannot be imposed by fiat and in a top-down fashion. This is particularly the case within academia where the best innovation with unambiguous organisational objective could not be imposed from above and could be challenged by subjective actions of professors (Dutton *et al.* 2004). Thus, given the discrepancy in personal expectations, the organisations should also encourage different kinds of technology use and innovative departure from routines. This would fill the gap between routine organisational procedures and actual events in the course of daily flow of work (Suchman 1987). Finally, rather than merely promoting best-practices, which solely reflect the managers' preferences, communication among disparate organisational actors should be facilitated so that they can exchange their impressions of and experience with the new technology.

### 8.2. Limitations of the study and direction for future research

This research would have the common generalisation problem of a single case study as well as time and space limitations (Lee 1989). Interviews, as the major way of data collection, may also suffer from 'common problems of bias, poor recall and poor or inaccurate articulation' (Yin 1994). Nonetheless, the use of multiple sources and methods through the 'the process of triangulation' shall reduce most of the above difficulties like the researcher's bias (Yin 2003).

The abstract level of ST is also deemed difficult to digest and is complicated to link to this case study because ST itself lacks specific theories of technology (Rose and Scheepers 2001). Structural perspectives are also viewed to unduly privilege human actors and hence underestimate the technological agency (Rose *et al.* 2005). In addition, the practice lens has been criticised for ignoring the broader institutional influences, rather focusing on the micro-level interactions of actors. Therefore, the above theoretical limitations shall restrict this analysis, which has been built upon the practice lens approach and ST in general. For instance, in this analysis, focusing on immediate institutional context as well as over-concentration on distinction between the interpretive schemes and the norms of the professors could have

distanced us from the abstract essence of ST as a meta theory.

Furthermore, the use of CMS is mutually enacted by the two distinct groups of users, namely professors and students (see Figure 4). This study might not be able to account for the reciprocal interactions of these two groups of users in the enactment of the CMS.

Because of the generalisation difficulty of a single case study within a particular empirical setting, other studies are needed under parallel circumstances. They could address the interactions of academics with other educational technologies (other than the CMS) to investigate their interpretations about those artefacts. Comparing the results gained from my research and the findings of these studies will enable us to shape a rich understanding of different parameters which motivate or inhibit professors with regard to the use of technologies. Other studies might be required to address the same research questions while applying other theoretical frameworks. Theoretical frameworks like actor network theory (ANT) and institutional theories have the potential to complement ST (particularly the practice lens). For instance, ANT can address some ST limitations like discounting technological agency (Orlikowski 2005), or institutional theories can direct our attention from the micro context of the organisation to broader social context. There is also a need for greater effort towards translating insights gained from the application of theoretical frameworks such as the structuration approach into practical terms to 'broaden the bandwidth' of technology developers and infrastructure and technology-in-use support personnel to better receive (not discard or reject because the information is not within their 'radar screen') and to contextually interpret the feedback from users; and to better inform the practice of designing, developing and deploying the technology. Finally, this article has not included students in its enquiry. Further interpretive

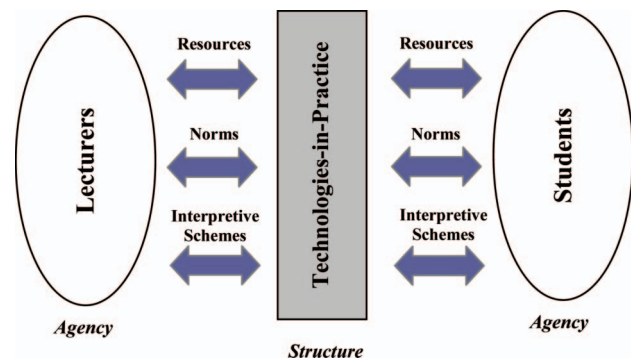


Figure 4. Technologies-in-practice enacted by both professors and students.

investigations are needed to look at the students' perception about the CMSs along with those of the professors.

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## Appendix 1

### WebCT modules

Content representation modules	Content module	Allows the designer to organise a set of documents in a table of contents with built-in navigation links and traditional tools (see below). This is the main area where students view course material.
	Student presentations module	Provides individual students or a group of students with authorising privileges so that they can upload web pages for viewing by the instructor and class.
	Assignments submission modules	Allows the designer to distribute course assignments to students. Features include assignment description, maximum grade value, submission dates and a utility for attaching files that are related to the assignment. File-upload utility is provided for student submission of completed assignments.
	E-course pack	Some templates that help students to distinguish between electronic resources that require a subscription and are only available on the institution campus and those resources that are freely available on the internet. Two icons have been devised which help to give a consistent look to electronic resources pages.
Communication modules, synchronous and asynchronous	Discussion modules	Provides the asynchronous discussion board of the system which allows users to engage in online text-based discussions within a pre-defined topic area (set up by designer). Users post and reply to messages in public, private or anonymous forums.
	Mail	Allows users to send private messages, with or without attachments, to other users within the course.
	Chat	Allows users to have real-time conversation with all users logged onto the same server. It can be used for online interactive sessions such as instructorials and discussions.
	White board	Allows users to communicate with other 'logged in' users by entering text, drawing objects, increasing graphics and making image modifications online in real time.
Evaluation modules	Quizzes/surveys	Allow the designer to create quizzes and surveys that students take online. Depending on the type of questions, a quiz can be graded automatically by the system and the results communicated to the students. Surveys are submitted anonymously and the system compiles the statistics.
	Self-testing	Allows the designer to create multiple-choice review questions with immediate feedback. They are not viewed by the instructor and are not graded.
Administrative modules	Calendar	Allows the designer to indicate dates and times of events within a standard electronic calendar.

## Appendix 2

### The semi-structured interview questions

- Questions for understanding the patterns of use and personal traits
  - How long have you taught in this department?
  - Have you used the CMS for your courses? And for how long have you used it?
  - Have you used it for a course which is taught by two professors?
  - If the answer to above question is 'yes', who has been responsible for handling materials?
  - What features of the CMS have been used and seem beneficial to you:
    - Course material presentation tool
    - Discussion groups
    - Assignments
    - Online course pack
    - Other tools like chat tools, quizzes tools, etc.
  - Have you attended any training programme?
  - How much do you think you are familiar with new information technology? Have you had any technical problem in using the CMS?

- Question for understanding their perceptions on the CMS
  - Positive aspects of the CMS?
    - What are the general advantages of the CMS over existing technologies?
    - What is your motivation for using it?
  - Negative aspects of the CMS?
    - What is the role of other technologies like Microsoft Outlook Public Folder? Are you still using alternative systems?
    - Do you have any special concerns on the material's copyright?
    - Is the time needed to develop content for the course worth?
  - What are your expectations from a CMS technology? (i.e. easy interface, functional features)
  - How much efficiency is brought about and how much effort is needed to handle the system?
  - How much have the current ways of teaching and pedagogy affected the way you adopt the system?
  - How easy is to use the CMS? What are the major difficulties?
  - How flexible is the CMS in providing needed features for your practices?
- Questions regarding the university and the departmental structures
  - What are the influences of the university's or the department's policies?
    - How much are you encouraged to use the system?
    - How much autonomy do you feel you have in accepting or rejecting the policies?
    - Is the use of the CMS applicable toward promotion and tenure?
  - What is the influence of students and their feedback on your decision?
  - What are the general characteristics of the IS department?

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