

## Managing information in education

### Introduction

The origins of this special edition of the *Journal of Enterprise Information Management* can be traced back to a study undertaken in South Africa in 2010, which found that there was little published work that investigated the way that information is managed in education, from strategic and operational perspectives. The work that was then available tended to be anecdotal and based on specific information technologies such as the “clicker” system, early learning management systems or “intelligent whiteboards” (once just known as “dry marker boards”) in classrooms. There was little inclination to stand back and think about the bigger picture.

Today it is necessary to stand well back and think carefully. Education comprises very many different activities, at different levels, involving different things, all of which are actually or potentially impacted by the availability of information technologies. Trying to manage information well in education leads to many questions, for example:

- (1) Which subjects are most amenable to the application of new technology and systems?
- (2) Which areas of educational activity are the most problematic because of poor information management?
- (3) Is it only about the technology, or is it about the changing way that we work as educators?

As this special issue shows, there are clear pressures to change the way we educate that derive from the opportunities and the problems that new technologies present. Mobile devices, data analytics, business intelligence (BI), learning objects, repositories, MOOCs and enterprise-wide systems all figure in the opportunities list. The list of problems includes intransigence, organisational capability, reliance on external sources, cultural differences and a general unwillingness to accept change, all of which mitigate against success and lead to real problems. At the strategic level, quality management, internationalisation and competition are all affecting senior management thinking in the institutions that are represented in the work presented here. There are various research methods that have been adopted, detailed analysis of recent experiences, and a good deal of forward thinking. To a significant extent, education institutions are trying to catch-up with practice in business and industry, seeing advantages in the “Enterprise Resource Planning” (ERP) systems that are now common in business; elsewhere there is concern to establish new ways of thinking about the information resources that we use in teaching and learning (and research) and the way these systems are managed. BI, activity and agency theory, mobile devices, national strategies for quality management, formal reasoning, repositories, MOOCs and culture are all to be found in what follows; the immediate question therefore is this – how shall we make sense of all this recent research?

This editorial review looks at the contributions that follow in two ways. First, what do we learn about the bumpy journey from information technology investments to organisational benefits? Second, out of all the different areas of activity in education, which are the most interesting in this new information age?



## Delivering value is difficult

*Technology drives cost, does it really also drive opportunity?*

Harpur provides us with a careful and interesting treatment of a topic that many educators are facing: what are the real attitudes to and perceptions of mobile technologies? She worked

---

with a small group of lecturers and students studying architecture, and it soon becomes obvious that in the building industry mobility is an absolute requirement (reminding us that the benefits of a new idea will always depend on the context). Harpur deals straightforwardly with two separate questions: What technologies are in use? With what educational activities are they useful?

It is found that the attitudes and expectations of lecturers and students are very different, and it becomes clear that the pressure from students to move with the times has to be heard by institutional management. But will management understand the importance of this movement, when the argument is couched in a technological vocabulary? It is well established by other research that senior management needs to be spoken to as senior management, using a vocabulary with which they are comfortable.

Adam reports on a very different situation, where a whole institution has decided to “virtualise” the working environment (Adam uses the word “virtualise” here to indicate what many of us would traditionally call “automation”). Senior management were certainly involved, but in West Africa there are particular problems: an unreliable electricity supply, intermittent internet access, and a lack of institutional capacity to undertake such a large project. The introduction of external consultants (from a different continent, even) did not really help, rather it confounded efforts to deal with the technical work, the development of new systems, and the management of business change. Management signed up to this project but failed to ensure the kind of commitment and leadership that would have inculcated real change.

Koutsomitropoulos brings something quite different to the discussion of technological opportunity. Seeing a burgeoning of learning repositories, and increasing difficulty for teachers to find the learning resources that they need, this study embarked upon something new: a scheme to bring together the content of different repositories by means of formal reasoning and extended queries. While the majority of educators might not be able to read “formal reasoning” notations easily, this work has shown that it is possible to federate searches across repositories, with multiple thesauri, and that there is a trade-off between the depth and intensity of queries and simple performance. This is one of those studies that we will appreciate better in the future, when we are all working with a fully semantic web and we are all wondering how we used to manage “in the old days”, not only with Google and Google Scholar, but all the other tools of today (Harpur’s paper provides some examples).

There seems to be a universal agreement amongst the contributors that the new technologies are inexorably driving things forwards. This is evident in all the papers included here. But, in any case where we move on and look at issues of systems development and implementation, the road-bumps become very clear.

### *Project management is not always easy – is it actually necessary?*

The reports from Rao and Adam bring further issues to our attention.

In the first case Rao presents a step-by-step, exploratory investigation of the potential for agile systems development; the key attributes of agility are seen as: rapid assessment of capability and maturity, alignment with the business, engagement with all parties involved, and then proof-of-concept implementations that either confirm the merits of an idea through demonstration, or reveal the sorts of problem that will occur. Open-source software is seen as a feature of the agile regime – an interesting idea that might warrant further careful study. There is a temptation now to tell stories about the differences between Microsoft Windows and (say) Ubuntu, but this is not the place to do that.

Rather move on to Adam’s report of what was clearly a difficult investment of time, money and effort that has not yet brought the hoped-for benefits. Given the evident shortage of capability in Ghana, and the decision to work with a contracted implementation consultancy from India, this case study demonstrates the overheads and additional dependencies that arise from contractual (rather than agile, exploratory) arrangements.

These two cases from Rao and Adam are very different in context, and they give us the first signs that there are very significant differences between different information systems projects. Working on large, complex, and critical operational systems represents a threat to the whole organisation and raises challenges at the individual, departmental and organisational level; exploring a specific idea about BI that is to be super-imposed on existing operational systems is less threatening and carries more of a risk to the reputation of the champion of the idea than it does to the whole institution.

Harpur's examination of mobile devices and their potential throws yet another light on the issues of implementation. It seems that this was more a case of serendipity than a deliberate and strategic attempt to change the way things were done. The students led in many respects, being motivated by the technology and seeing it as a natural extension to their way-of-life, while the lecturers were far more cautious, preferring their laptops to smart phones and seeing benefits in the lecture theatre rather than in all the other places where they might find themselves at work. Mourad takes us back in the other direction, with an interesting narrative about quality assurance and quality management as determinants of information management strategy, but at the same time providing further evidence that students are a primary factor in setting the targets for future quality management practice because of their strong personal interest in the quality of their education. However, Mourad shows that higher education is just as susceptible to negative attitudes arising from the cost and effort involved in quality assurance, and perceptions of new layers of bureaucracy.

Koutsomitropoulos illustrates yet another perspective on implementation, one that is atypical for several reasons. The paper presents formal reasoning algorithms that indicate the design of the heart of a new system, one that we might be tempted to park on one side as being too specialist, and not part of our world. But we should remind ourselves that many experts believe that we are on the verge of a new era of artificial intelligence and there can be no doubt that this is going to affect dramatically the world of education. What Koutsomitropoulos gives us is one insight into one aspect of future education practice.

The paper by Skoumpopoulou brings us back to issues in the management of large, time-consuming projects that change the way we work, but this study actually moves on to the question of managing consequential changes after the event – when new information systems and new information management practice are in place and we find ourselves empowered (in the best case) or constrained (in others). Constraint is possibly the main feature of Skoumpopoulou's experiences with a long-term, institution-wide, system project. It took a long time for "centralism" to significantly affect the way that this institution worked, but it happened and it has led to some discomfort for those working there.

#### *Why do people so often resent changes to their patterns of work?*

In the papers reviewed so far there is plenty of evidence that implementation of new information management practice can be difficult, and Skoumpopoulou digs more deeply into the reasons than the others: the theme of this analysis is culture, and it begins with the interesting idea that there are three perspectives that dominate research on organisational culture: integration, differentiation and fragmentation.

The analysis is a qualitative examination of experiences in different roles in the project (and in the institution at large) and it presumes that enterprise-wide systems in higher education are still in their infancy. It is interesting that this special issue of *JEIM* attracted several candidate papers focussed on ERP implementation; Skoumpopoulou's is particularly interesting because of the way that qualitative content analysis (within the three given perspectives of culture) breath real life into our understanding of this one case. The analysis reveals the differences between the early and late stages of the project and contains important messages for any institution that is considering this kind of investment of time, money and effort.

There are a variety of messages about organisational change elsewhere. Jain provides a detailed review of the history that led to the MOOC phenomenon and tries to project into the future with a close eye on likely technology innovations (but a rather lesser eye on human behaviour). She deploys the interesting (knowledge management) ideas of Nonaka and Takeuchi to bring some structure to our understanding of trends and anticipates ten stages through which education will evolve; this gives us some insight into the change management issues that lie on the horizon. At a more basic level Rao reminds us of the student lifecycle as a means to organise thoughts about benefit hot spots and likely change management road bumps. Adam's detailed narrative about experiences in Ghana make very clear that when managing change is either not done well, or fails in the face of intransigence and inertia, there will be problems; principally, at the boundaries of the different functional areas of an institution, or between the different roles that people play. Mourad's analysis of quality management initiatives in Poland does not focus on change management issues as such – it gives just a hint that there is some reluctance and a belief that the financial and operational costs of quality management will not be offset by the benefits; this is another area where more research is clearly needed – balancing the costs and benefits is always a challenge and often it is not well managed.

*The illusory benefits – do we understand why we are doing this?*

Long experience has taught some of us that the search for benefits is difficult. At the start of a proposed investment project concerning information management, there is uncritical presumption that it is a good thing to do with guaranteed benefits; the practice tells us differently. Adam's project faced significant challenges in achieving take-up of a new enterprise-wide system; Rao finds that even though education is an information-intensive business, the prospective benefits are "less than satisfactory"; Harpur dwells on the differences in the expectations of students and lecturers; Jain's detailed review of MOOCs and their origins presumes a beneficial future but offers no certainty; Skoumpopoulou reveals through the conversations with different role players that a search for efficiency led to a loss of effectiveness, at least in terms of individual scope and freedom of choice in the approach to work.

An important message coming from this evidence of difficulty, in delivering the hoped-for or expected benefits, is that everyone who is affected must be involved. The idea of stakeholder analysis is not new, but perhaps its introduction in education is long overdue. At one end, the influence of students is shown to be much more important than it used to be (Harpur and Mourad); at the other the inability of senior management to manage effectively is always going to be a problem, but this is probably a matter of communication rather than competence (Adam, Skoumpopoulou); early in the cycle of new thinking about new systems it is very important to understand and acknowledge the expectations of all stakeholders so that conflicting or competing interests can be resolved, or attenuated (Rao, Mourad, Skoumpopoulou).

This need for a clear understanding of stakeholder expectations relates back to the need for adequate project management. In education, as elsewhere, success does not come from a project that is completed on time and within budget – that is just success for the project manager. Real success comes from the outcome of the investment as seen by all those who are involved with or impacted by the system – the stakeholders. It is interesting to see the phenomenon of the MOOC in that light (see Jain's review), because this has been a potentially disruptive phenomenon that has delighted two stakeholder groups: the students (who can register on world-class courses at little or no cost) and the teachers (who have the opportunity to make themselves a world-class reputation). Other stakeholders whose future is vested in the status quo are not so delighted, of course, but the typical MOOC is still to demonstrate success at the level of throughput, and so those who are threatened by the phenomenon in some way do not need to worry just yet.

Mourad's account of quality management in Poland as a driver for better information management holds the most promise of wide-scale benefits; coupled with economic growth and a tendency for the Polish diaspora to consider returning home, improved education in that country will be a major contributor to sustained national achievement, international status, and future success. Koutsomitropoulos, in laying out ideas for federated access to academic resources through formal reasoning and thesauri (just one important component of a future, intelligent, semantic web) probably provides the most important long-term indication of benefits. Even though artificial intelligence systems already encroach on our daily work and play, perhaps this is still a distant horizon that needs time to significantly affect the way that most people are taught, and learn. It is not yet a feature of the typical strategic thinking of institutional management.

Which raises the question: do education institutions actually have strategies?

#### *How do we align our technology and educational strategies?*

The work that is presented here makes clear the increasing complexity of our lives as educators. We hear talk of analytics (Rao), difficulty with complex contracts (Adam), multiple personal devices (Harpur) and activist students (Mourad) – all contributing to complexity. The realisation that culture is a fundamental factor that needs active management (Skoumpopoulou) in a future involving multiple layers of change (Jain) is obvious (is it not?), but who is actually managing the cultural aspects of our changing circumstances as new technology and new thinking drives change?

A key feature of modern education management is internationalisation, and therefore competition (Mourad, Rao). It can be argued that in the future there will be large-scale consolidation of higher education and any university that wants to survive as a distinct entity will have to have a theme or specialisation that makes it distinct. Dealing with external service providers on the one hand (Adam), activist students on the other (Mourad), complexity in the nature of the business (Rao, Jain, Koutsomitropoulos) and concerned staff at the heart of it (Harpur, Skoumpopoulou) make for a real management challenge. Strategic management will be a key differentiator as the pace of change and competition ramps up, and the challenge is to align credible education strategies with achievable information management (and information systems, and information technology) strategies.

#### **Education is a complicated endeavour**

It is time to reflect on what education actually is. Taking teaching and learning as one thing, there are three primary domains (Adam): teaching and learning, research and administration; to this we can add management, of course. Quality management and service management initiatives (Mourad) have the potential to address all spheres of activity and can take the focus away from information technology opportunity and put it back on educational outcomes; however, quality management only really works when there is a culture amenable to it (Skoumpopoulou). With these issues of culture and quality management in mind, the final paragraphs that follow summarise what is found from the papers published here.

#### *What information management means for teaching and learning*

The student population is generally young, of course, and well embedded in the world of information access; they have their own ways of managing their information and an instinct for the serendipitous use of information technology in all aspects of their lives.

Teachers (and administrators) have to catch-up, and management must inculcate waves of managed change that will give the students what they expect whilst still delivering the education that they need. We should expect that the waves of change anticipated by Jain, will eventuate and successful institutions will ride those waves pro-actively.

---

*What information management means for administration*

If your South African guest editors can be permitted a comment from their own recent experiences, the state of administration in most universities in South Africa is parlous. We do not presume that this is the case all around the world (not even in every university in South Africa) but administration sits at the heart of what we can achieve with good information management.

In the modern world, we know that certain applications of information technology can be highly disruptive, and that this occurs in the way that things are administered. Amazon, Uber and AirBnB are all famous examples of disruptive change that we do not need to rehearse in any detail here, but consider what might be the equivalent in education? The MOOC model is just one example, when we extend the boundaries of an education system to embrace everything, not just the teaching and learning, the possibilities for optimised administration are awesome. We must recognise that services like those of Amazon, Uber and AirBnB are delivered to extremely large numbers of people, most of whom see the service as highly personalised. Why should education not follow the same route? It is certain that examples of potentially disruptive education are all around us, but in the papers presented here only Jain attempts to look that far into the future (but still with a technology-push rather than a society-pull viewpoint).

*What information management means for research*

Your guest editors are surprised, and somewhat disappointed, that what we offer you here fails to address the momentous changes that are taking place in academic research.

There are heated arguments to be heard about the role of academic publishers (of research papers), there are burgeoning repositories that are changing the way we view our resource, and there is a degree of international co-operation in some large research projects challenges our ability to consolidate, store, and curate very large volumes of research data.

In education, research can be seen as merely the seedbed of all the ideas that we can teach and learn. Of course, for society it is much more than that but our focus here is on education. There is a clear chain of value that originates in seminal research, is developed in the various streams of research that emanate, and is then published as a research record; that record of research is then re-worked and re-published as learning material that can be continually replenished from further research. The duration and extent of this cycle will surely change, as the analysis of research data becomes more reliable, publication becomes quicker, and teaching and learning becomes more tightly engaged with the outputs of research work.

This must be left as a future project for another special issue of a journal.

*What information management means for management*

For all that we can anticipate optimised teaching and learning, improved administration of educational processes, and better research to inform and stimulate education, and for all the disruption that might impact on present practices, there will still be a need for management.

There is little evidence in the papers presented here that helps us to anticipate the future form and function of education management. However, at the heart of it management needs information to manage and we have plenty evidence that management need the capability to manage information (Adam), they need the tools to work with (Rao, Harpur, Mourad, Skoumpopoulou), and they need the flexibility and agility to respond to change as it happens (Rao, Jain, Koutsomitropoulos) – on these things our contributors seem to have unanimity.

**Final word**

In a sense this whole project (this special issue of *JEIM*, the idea for which originated in an early study in South Africa) is really directed at management; it is time to clear the way at all levels and inculcate a willingness to embrace change, for the benefit of all key stakeholders, especially our students. Interesting research is being done, but a much clearer focus on the management of information in education is needed in the research that we do next.

**Andy Bytheway**

*Department of Computer Science, University of the Western Cape,  
Bellville, South Africa*

**Johannes Cronje**

*Faculty of Informatics and Design, Cape Peninsula University of Technology,  
Cape Town, South Africa, and*

**Robert Maribe Branch**

*Career and Information Studies, University of Georgia, Athens, Georgia, USA*