

TOWARDS AN UNDERSTANDING OF BUILDING ENERGY MANAGEMENT EDUCATION – USERS’ EXPECTATIONS OF A UK DISTANCE LEARNING COURSE

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Recent EU policy and UK governmental guidance highlight the need for improving building managers’ knowledge and competencies on energy issues in order to better manage the operation and use of buildings. Whereas scholarship on building energy management offers insights into potentially helpful tools and techniques for improving energy management practices, it focuses less on educational processes and methods. A study of a distance learning course as run by a professional institution, on building energy management reports on some of the students’, tutors’ and facilitators’ expectations and concerns. The analysis draws on documentary evidence of the course background and content as well as 12 semi structured interviews with different stakeholders. Preliminary findings point to some of the conflicting and competing approaches to what constitutes ‘building energy management’ and more importantly how knowledge on the topic is obtained, assessed and disseminated through distance learning. The contribution of this paper is threefold. First, the study reflects upon some of the conflicting opinions of distance learning curriculum design on emerging topics in evolving vocational fields such as energy management. Second, there are opportunities for developing and connecting knowledge on educational practices to the field of energy management in the built environment. Third, the findings offer valuable insights for a fast developing energy policy agenda in defining the role and responsibilities of future building energy managers in the UK and more widely.

Keywords: building energy management, built environment education, distance learning, energy policy.

INTRODUCTION

There has been growing policy and governmental pressure in the UK on the construction sector to improve practices associated with the operation and management of buildings, in particular associated with energy use (HM Government 2010). In addition, recent UK governmental reports call for improved skills and competencies building managers require in order to contribute to a ‘sustainable economy’ (HM Government 2011). Built environment education increasingly includes building energy management content within various undergraduate and postgraduate degree programmes, however, there is little discussion regarding pedagogical practice, approach or modes of learning on the topic (Gelengis and Harris 2014). Scholarship on the other hand engages with the issue through suggesting ways for improved energy management tools and techniques that building managers could implement into their existing practices (Costa *et al.* 2013; Haji and Lee 2005). While scholarship on

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building energy management offers insights into potentially helpful tools and techniques for improving energy management practices, it focuses less on educational processes and methods.

The purpose of this paper is to reflect upon some of the pedagogical issues for building energy management education by drawing on recent experiences of a distance learning short-course managed by a recognised professional institution. Building upon emerging research on educational practices associated with energy management and discussions in distance education scholarship, the paper examines the ways students and tutors discuss their expectations of 'energy management' distance education. Distance learning research argues that a greater appreciation of students' expectations would provide a better understanding of curriculum requirements (Baxter 2012; Stevenson *et al.* 2006). Yet, despite the high importance placed in pedagogical research on understanding expectations, the nature and potential of such expectations remains unclear in built environment education in general and energy management in particular.

In addition, most studies focus on students' expectations, overlooking the role of educators and course facilitators. Few studies examine the role educators' expectations have for instance on the content or mode or delivery of distance education particularly in the built environment context on developing topics such as energy management.

The authors examine students' and tutors' expectations of building energy management in a distance learning professional development course curriculum development. The analysis focuses on the content, mode of delivery and perceived competencies building energy managers need. The next section defines 'expectations' in the context of distance education and discusses recent research on building energy management education. The following section discusses the research methods, followed by an outline of key findings. The conclusion reflects upon some of the practical and analytical challenges educators and practitioners are faced with when teaching and working against conflicting expectations within industry and education on an increasingly important topic of building energy management.

LITERATURE REVIEW

Definitions of the term expectations in distance education literature are mainly taken from business and marketing research and are seen as "*desires or wants of consumers*" (Parasuraman *et al.* 1988). Within the distance learning education much of the research focuses on analysing expectations of students in order to best determine the gap between their initial expectations and the reality of the course (Gilroy *et al.* 2001). Scholars report on attributes that influence students expectations such as prior experience, interest in the chosen subject, perceptions of an institution and self-perception (Byrne and Flood 2005). Expectations are mainly studied in relation to a distance course mode of study (Baxter 2012) or quality of output (Gilroy *et al.* 2001) and relevance of curriculum. It is known that students hold variable expectations regarding distance education courses regarding the levels of service and support they will receive from their tutors for instance (Stevenson *et al.* 2006). Also, the cultural context within which a distance education system operates affects students' expectations and learning styles (Howland and Moore 2002; Morgan 2014).

Research in built environment education has largely failed to examine pedagogical aspects such as 'expectations' students might hold prior to embarking on a course

specifically related to the issue of curricula content or required competencies. Also, despite the growing number of distance and blended types of learning in the built environment, there is a lack of research examining the development of their curricula, pedagogical challenges or required student competencies (HM Government 2011). An emerging research agenda highlights the need to better understand the developing ‘expected’ roles and competencies of building managers as well as improved techniques and tools for improved energy management of buildings. However, discussions overlook educational needs or pedagogical techniques required to develop necessary competencies. Instead discussions emphasise the evolving nature of expected roles building managers are required to fulfil at various organisational levels (Aune *et al.* 2009). Building managers are expected to take up multiple overlapping roles at ‘strategic, tactical and operational’ levels of decision making in order that energy efficiency and wider sustainability measures can “*materialise*” (Elmualim *et al.* 2010). In addition to increasing multiple roles and related competencies, Shah (Shah 2007) emphasises the growing expectations regarding complex knowledge and skills building managers are required to possess in order to manage energy sustainably within buildings. The expectations suggested in the literature relate to changing industry and increasing regulatory demands. There is also a wider recognition of the lack of ‘professional’ recognition of the building management sector (Lawrence *et al.* 2012) currently seen as situated within varied organisational structures leading to potential difficulties in providing relevant education guidance.

The empirical study by Aune *et al.* (2009) report on increasingly complex tasks building managers are expected to entail as they “*mediate between end-users and technological systems in order to make “their” buildings energy efficient*”. Building managers are also expected to hold a broad knowledge base in order to fulfil the interchangeable role of “*administrators, service personnel and technicians*” regarding the energy efficient operation and management of buildings. Elmualim *et al.* (2010) discuss the consequent slow progress in uptake of sustainable facility management practice across organizations. Their research highlights the barriers to improving sustainable facility management practices including time constraints, lack of knowledge, growing complexity of required expertise and lack of senior management commitment. Their study concludes by suggesting that building managers have been historically undervalued contributing to the lack of initiative and wider sustainable investment in promoting better understanding of facilities management practice.

Solutions to improving practice and addressing some of the expectations regarding the required competencies of building managers’ are mainly seen in the development of new tools and technologies. A number of studies focus on new tools that would assist building energy managers in specifying, monitoring, analysing and optimising building and system performance. Costa *et al.* (2013) review current energy management approaches suggesting a novel integrated toolkit would enhance skills and knowledge. The toolkit is designed to assist energy managers at “*different stages of their activity relating to systematic energy management in buildings*”. Doukas *et al.* (2007) similarly present a decision support model using rule-sets based on a typical building energy management system.

However, few studies have examined empirically or theoretically how students and educators view learning, skills and knowledge on a relevant and important topic such as energy management for buildings. Although scholarship and policy have stressed the importance of gaining competencies, skills and knowledge on the topic, discussions have largely overlooked pedagogical issues that shape building energy

management. Instead, most discussions as reviewed above highlight barriers to wider professional recognition of building energy management and the need for improved tools and techniques to better current practices.

THE EMPIRICAL SETTING AND RESEARCH METHOD

The distance learning course 'Case T' has been administered and run jointly by two organisations in the UK (a higher educational institution and a professional industry institute) for over 10 years with a primary focus on energy management for buildings. The professional development course includes 14 learning elements covered over 18-24 months through flexible open distance learning. It is primarily targeted at building managers and facility operators with flexible learning viewed as a key aspect of the course delivery approach. Support is provided to students by a body of tutors who are not based at the higher institution but remotely. Throughout the duration of the course, facilitators periodically carried out surveys with students to assess their engagement and experience of the course. Recently, outcomes of surveys carried out by the course facilitators had revealed growing dissatisfaction with the structure and relevance of course material, which led to a review of programme content informed by research that sought to explore students and tutors expectations of the course.

The research design is based on a descriptive case study qualitative method (Bassey 1999) drawing on multiple data sources including documentary evidence and semi-structured interviews. Recent studies on understanding expectations of students in distance education call for qualitative approaches that provide a deeper and richer account of expectations in education settings. A recognition in the literature for the need for a greater qualitative input and more fine-grained analysis led to an approach utilising semi-structured questions allowing for detailed expression of student views, motivations and expectations (Fung and Carr 2000; Stevenson *et al.* 2006).

Qualitative information relating to something cognitive like expectations is viewed as a necessary compliment to aggregated statistical data. The approach in this study responds to this wider call drawing on sets of documentary evidence including course descriptions and specifications, informal discussions with course facilitators, course briefing guides as well as semi-structured interviews with students and tutors. With regards to interviews 25 participants were contacted; to date 12 interviews (out of which 4 were with tutors and 8 with students) lasting 30-45minutes have taken place.

The data was collated and analysed in NVivo initially using descriptive themes (Richards 2009). A theme captures something important about the data in relation to the research question and represents some level of patterned reasoning within the data set. The initial stage of the analysis focused on the identification of codes related to participants expectations of the course, views on mode of delivery, content and role of energy management. This coding resulted in initial descriptive codes from which 3 key themes were extracted around expectations on curriculum competencies, content and mode of delivery. The initial themes and subthemes are illustrated in Table 1.

FINDINGS

Initial findings show a set of student expectations primarily driven by career aspirations and a need to formalize existing knowledge and establish organisational roles. Tutor expectations on the other hand were characterised by career availability and a need to maintain and extend existing knowledge. Key aspects of the findings are discussed in detail below.

Table 1 Key themes regarding users' expectations of the course overall, mode of delivery and content

Expectations	Course overall	Mode of delivery	Course content	Future aspirations
Students	Formalising knowledge	Time (learning)management	Practice drivers	Management career aspiration
	Implementing learning	Personal contact throughout	Future competencies	Personal development
	Career enhancing	Additional learning	Personal relevance	
Tutors/facilitators	Transitioning career	Time (support) management	Theory makeup	Greater involvement in course curriculum
	Availability	Initial contact	Requirements communicated	
		Knowledge base		

Expectations regarding the course overall, content and mode of delivery (Student Participants)

Formalising knowledge

A number of student participants often discussed their expectations of the course through reflecting upon their career aspirations. In particular a number of students conveyed a sense of requiring status and recognition within their work place as an important aspect of undertaking and completing the course. For instance, one of the participants reflected upon the effect the course had on his standing within his firm:

"...it's helped to improve my standing within the department, sort of build my skill knowledge level and it's helped build respect amongst colleagues..." (Participant N)

Student participants also expressed a need to formalize existing knowledge in order to be able to implement novel ideas and energy management proposals within their workplace. A number of student participants discussed their current work activities that were not necessarily brought about through learning from the course but had been reaffirmed after the completion of the course. Participant R discussed her workload and application of energy management techniques regarding benchmarking. She suggested that although most of the knowledge on the topic of building energy management had not been necessarily gained through the course but reaffirmed, it enabled her to *"start to apply that and produce sustainability documents for a number of trusts"*.

Most students discussed their knowledge of energy management through their experience in their professional roles in work settings across diverse organisations from local authorities, telecoms, leisure and health industries. Knowledge on energy management issues was directly linked to students' engagement of work practice within their specific settings. One of the participants suggested that he *"had an idea of what energy management was...because he had been in the "role a couple of years before he started the course, so it reaffirmed more about it"*. He also suggested that although *"he hadn't touched on more of the industrial side of it"* because his background was in housing and therefore less applicable to his daily activities. A number of students also remarked that their thinking on energy management had not

been altered through participation on the course but provided motivation to progress further in their career:

“It didn't really change my thinking, it more motivated me as to which direction I wanted to take my career in, so it's made me realise what part of the course I found easier than the other parts and that's the areas where I would rather focus my work” (Participant U)

Overall most students approached the course as a way of furthering their career and gaining respect amongst their colleagues. Expectations regarding the course were strongly infused with career aspirations and formalising what is already known.

Time (learning) management

When discussing how the course was delivered (currently primarily as paper based rather than blended or internet based) students mainly referred to issues regarding availability of personal and professional time. In particular, a number of students remarked on needing to spend significantly more time than anticipated on the course. One participant discussed his need for personal time and difficulties with anticipating time management issues accurately:

“Obviously, it depends student to student and their abilities, but they guided 360 hours- I'd say I spent a lot more on it, to be honest with you...I was doing it in my own time, so I was doing a couple of hours two/three nights a week, so it's something you'd pick up and put down, so I would say there was more time involved” (Participant E)

In addition to personal time students also discussed difficulties of managing course requirements within their professional obligations and time at work. A participant reflected upon the need for support within the workplace as dependent upon the nature of the company whether in the public or private sector. He discussed his work as being within the public sector noting difficulties with ‘top management’ and the lack of a ‘supportive director’. Unless energy management was viewed as a priority area that required training and upskilling within the company it would be difficult to justify time spent on a course.

“... they still have not got that energy management savvy head on at the moment, it's more middle managers that have got the task of trying to reduce budgets and therefore we're looking at trying to reduce our budgets through electricity and gas reduction through sorting out their plant operations, you know, fitting it to their building occupancy. We tried, a number of times, in rolling out some energy management schemes, but again, unless the board approves it and are prepared to support you on it, then it is hard pushed” (Participant U)

Most students did not discuss expectations of the course mode of delivery as paper or internet based. Expectations regarding mode of delivery mainly led to reflections on time management and difficulties in planning time accurately and effectively.

Practice drivers

Students tended to describe their expectations of the course content in relation to their professional background. For many students energy management had become an issue encountered at work and many had previously worked in non-scientific contexts such as leisure or healthcare. One of the participants described his expectations of the course content being driven by his professional background in the fitness industry and his progression into a head office management position. His ‘disposition to deal with

data' meant that 'he was left to' deal with any energy management issues within the company.

Students also conveyed their expectations in relation to their geographical location often discussing the course content in relation to their national background. One of the students discussed the specific conditions within Seychelles noting how:

"...daylight hours are the same all year round, the temperature's about the same all year round and he's having a bit of difficulty trying to establish any ways of saving energy because they don't use much" (Participant E)

Expectations regarding the course overall, mode of delivery and content (Tutor Participants)

Transitioning career

Tutors discussed expectations of the course through reflecting upon their career over time and in particular transitions from industry to teaching. A number of tutors described their experience of industry as evolving around issues of energy and the environment in various ways. Upon reaching the end of their career many chose the part-time flexible tutorial role within the course as an extension of their career.

"Then, after university - 1964 I graduated - I went back to the research laboratory, where I spent 20 years and I was dealing with...I think I mentioned in that letter, with fuel, energy and the environment. And after that, when I was the age of 40, I decided that the fuel industry had finished in Britain and I took redundancy and had a complete career change" (Participant B)

One of the tutors reflected upon their career in a major power company over 30 years as enabling the expertise needed for a tutorial role on a course. He had chosen to develop into a teaching role mainly in order to maintain his knowledge of the energy field. In particular many tutors discussed the need to 'remain in contact in the energy field' and not lose connections and knowledge built up over many years as a key expectation of the course overall. Many tutors when asked about any perceptions of education support expectations they may have had conveyed a sense of openness and flexibility in providing 'whatever level of support was required'.

"I didn't know what to expect...I was prepared for anything really" (Participant S)

Time (support) management

Tutors conveyed their expectations of the course mode of delivery through discussing difficulties in managing different levels of required support for students. Although many tutors (as above) discussed being prepared for providing any level of support many discussed difficulties in managing diverse capabilities within students. One of the tutors discussed the importance of making knowledge available to students at an early stage and relying on industry experience to provide adequate support.

"So, having had some experience of doing it, I would go back and give real world comments, people had queries and questions as to what, why, how...well, we do these things because in various ways, so I was trying to give a rather truly academic input, which is fine, but does have its limitations if you have a real world aspect to it" (Participant PM)

In addition to difficulties in managing time and support effectively tutors discussed the need to manage students' expectations better. One of the tutors reflected upon his

experience of a student who had recently undertaken the course coming from an accounting background.

“She works in accounts and was given the job of dealing with all the energy accounts so she wanted to know more about energy...but the theory floored her” (Participant S)

Tutor S discussed in detail his experience of managing expectations the student (discussed above) had of the course not anticipating the mathematical content and focus on physics.

Theory make-up

Tutors discussed their expectations regarding the course content through recalling their industry experience. In particular a number of tutors discussed the need for theory within the course as dependent on students particular work activity needs. One of the tutors reflected upon a students' experience of the course who *“decided to set up on his own as an energy consultant and he did very well”* without relying on the theoretical aspect of the course. Tutors also recalled their own experience in industry.

“So, some basic energy savings are absolutely obvious, so no, you don't need the theory, the theory's useful, don't get me wrong, the theory is very useful and some of the calculations that we're asked to do in the assignment are relevant, but no, the is a bit overpowering for most people” (Participant S)

DISCUSSION AND CONCLUDING COMMENTARY

Although the focus of this study has been on a single distance learning course in the UK, there are some helpful insights for educational studies of building energy management more broadly. Through drawing on distance learning literature and highlighting 'expectations' as a parameter by which to explore how users approach a course, a number of valuable observations are reflected upon regarding the course overall, its mode of delivery and the course content.

First, students studying building energy management are often located in diverse professional settings from health to local authority, to leisure and energy brokering. The diverse professional backgrounds have varying effects on how students approach the course content from a focus on organisational hierarchies to an emphasis on operational issues.

Second, most students approach the course overall through being motivated by a need to formalise knowledge and enhance professional status. Formalizing knowledge is primarily approached through enhancing and applying existing skills rather than expecting to learn anything novel. Tutors on the other hand approach the course overall as a way to interact with a well-known subject and maintain knowledge built up through many years working in the energy sector. For many tutors prolonged experience of professional settings in industry have led to an educational role and engagement with learning as a way of maintaining interest and expertise in energy management issues. Few participants conveyed the expectation to learn anything novel or a need to extend knowledge as discussed in the distance learning literature.

Regarding the course content it can be observed that most students approach and discuss their expectations of the course content in relation to their workplace or geographical location. While students focus on the nature of their work daily activities in relation to course content requirements, most tutors approach the course content as a way of extending and building knowledge. Also, with regards to the course mode of

delivery most students discuss issues of time management as a personal or professional issue highlighting difficulties in anticipating and planning appropriate time to complete course tasks. Tutors on the other hand approach the course mode of delivery through issue of time management as different levels of support, often emphasising limitations in their ability to correctly anticipate sufficient support that students might need.

In addition to differences in discussing expectations of the course, participants overall conveyed varying understandings of energy management itself as either an operational, strategic or individual issue often dependant on the nature of the organisation they worked in. Scholars have discussed the need to better understand the role building managers play at different organisational levels in order to advance a firm's sustainability agenda emphasising the need to retrain and upskill (Morgan 2014). However, there is a lack of research exploring the requirements, needs and expectations regarding the educational aspects of energy management. The challenge for educational institutions is to provide tailored content appropriate for diverse range of professional backgrounds, size and nature of organisations within public and/or private sectors taking account of the complex nature professional expectation of a course have. The course is primarily approached as a way to either formalise or maintain knowledge rather than develop novel learning. Potential ways to develop the course through increased practical learning and situated problem solving within multiple organisational settings are being considered.

Future studies would benefit from further explorations of students expectations in particular across diverse organisations in order to better understand how competencies and skills are approached within varied sectors. In addition more empirical research is required to extend insights into definitional requirements for the education of building energy management particularly through flexible distance and part time learning routes.

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