

**Environmental Management Systems: Costs, Benefits and an Activity Theory
Approach to Understanding their Knowledge-Generating Capabilities**

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Abstract

This paper outlines the approach taken by a UK, non-profit, rural small-to-medium sized enterprise (SME), to develop an environmental management system (EMS). A discussion of the problems encountered and solutions employed is presented along with the tangible and intangible benefits.

The paper also reviews the salient knowledge management literature and outlines the approach taken to understand the knowledge generating capabilities of the process of developing an EMS. It finds that organisational relationships are the most prominent inhibitors to knowledge generating activities yet rely upon social events that lie beyond the locus of control of the organisation.

Keywords

Environmental Management System; Knowledge; Activity Theory

Knowledge Transfer Partnerships

This research project takes the form of an extended case study over 4 years comprising two consecutive Knowledge Transfer Projects (KTPs) between The Royal Bath and West Society (RB&W) and the University of the West of England (UWE). KTPs are part funded ventures whereby an Associate is employed to undertake a significant project for an organisation, supported by experts and academics from university (KTP, 2009). While conducting the KTPs the organisation initiated a substantial environmental redevelopment venture. A strategic review identified ISO 14001 and EMAS as potential goals which would maintain the momentum of the ongoing management systems development activities but also result in a more market-valuable achievement. As suggested by some of the literature (Hillary, 1995, 2004; Strachan, 1999), EMAS was viewed as a more market-valuable credential for this particular organisation.

The route toward EMAS was based upon the 'Acorn' (BS 8555) 6 phase scheme which aims to guide SMEs through development of an appropriate EMS (IEMA, 2009). The 'Acorn' scheme has the additional advantage of being certifiable at any of the 6 phases. In this way SMEs can gain some immediate value for their efforts. It also affords a flexible path towards EMS development in that

organisations may elect to pursue either ISO 14001 or EMAS certification once they reach the final phase.

One of the main difficulties encountered during the initial phases of the project was due to the implementation team comprising such a varied number of personnel from across most of the organization's departments. It was in fact extremely difficult to arrange meetings when everyone was available. The Associate's use of information technology, predominantly in the form of email, was invaluable in communicating the proceeds and resulting action plans from each meeting thus maintaining project momentum.

A further problem encountered at this stage was in understanding the vast array of legislation that was relevant to the organisation. This is not to suggest that the organisation was not already compliant but the challenge would be for the implementation team to become familiar with the details of the requirements so that they could generate suitable management procedures and carry out the necessary improvements to buildings and equipment etc. In order to assist with this process a consultant was hired to provide expert advice and guidance. Most interestingly, after only briefly discussing the broad legal requirements with the implementation team he commented "*you now know more than me!*" It transpired that individuals possessed very narrow knowledge of the relevant legislation, however, the consultant confirmed that collectively they possessed knowledge of the majority of the requirements. Initial concerns therefore appear to have been fears over 'not knowing what we don't know' rather than 'not knowing enough'.

Toward the end of the project the issue of sustainability of the EMS became increasingly important: how would the momentum and good practices be maintained when the KTP Associate had left the organization? Whilst the implementation team comprised people from most departments thus ensuring that understanding of the systems were spread throughout the organization, there was a need and desire to ensure that environmental management was something that was embraced by everyone, as a philosophy rather than as 'something that other people did'. Again, the Associate's use of information technology in the form of mass email communications assisted in keeping everyone abreast of developments and highlighting awareness of new procedures. Also, by publishing the implementation team's project GANTT chart, complete with task details and the name of the responsible team member, the importance of the project was communicated to all employees.

Additionally, tasks that were completed on schedule were highlighted with a 'happy face' graphic ☺, whereas tasks that were behind schedule were highlighted with a 'sad face' graphic ☹. This was a useful motivator for the members of the implementation team and was a simple way for other employees to understand how the project was progressing. In fact, every employee effectively became a project supervisor and thereby became closely interested and involved in the project and its successful and timely completion. In order to fully cement the new working practices RB&W and UWE are in the process of initiating a further short-KTP. Not only is this further evidence of the effectiveness of KTPs but the extension to the project will itself form a component of the EMAS objective evidence and demonstrates the organization's commitment toward environmental improvement.

Costs & Benefits of EMAS

One of the most significant project expenditures was the manpower cost of the implementation team. Since they carried out this work in addition to their everyday duties it is difficult to calculate an exact cost, however, we estimate it to be over 2200 hours: note that over 1500 hours of this was incurred by the KTP Associate. The other costs incurred in preparing for EMAS audits and certification can be broadly grouped into two types; those that were 'costs for compliance' to fulfil EMAS and legal requirements, and those that were 'costs for benefit' that generated some tangible improvement or return.

It is possible to provide financial justification even for the 'costs of compliance' since these could often be conceived as preventive expenditures. For example, the cost to upgrade the bunding around one oil store was £500. However, the potential cost of not performing this work could equate to £5000 upon summary conviction and even rising to an unlimited fine should a conviction on indictment be made. In addition to this could be the cost of cleaning up the oil in the event of a spillage which has been estimated to be in excess of £50,000 should the oil reach a natural watercourse. The scale of the 'costs of compliance' will obviously depend upon the nature of the work that the organisation is undertaking. However, the argument for offsetting these against the potential costs in the form of statutory fines and the negative impact that non-conformance would have upon environmental stakeholders is relevant for all organisations.

The 'costs for benefit' are usually easier to justify especially when expressed in terms of operational improvement. Table 1 shows the investment realised by RB&W in improving its gas, electric, water consumption and sewerage production. A significant reduction in utility costs has been achieved at no cost simply by raising environmental awareness. It must also be noted that these figures are subject to seasonal fluctuations to some degree, however, the magnitude of improvements are considerably larger than the observed variations in business activity.

The improvements to date, expressed in Table 1 as operational benefits, could be communicated in the annual EMAS disclosure in terms of its environmental benefits. The financial benefit is of concern to the organisation but this could be expressed in volume or units of gas, electric, water and wastes consumed or produced. For example, changing the general waste disposal contractor provided no financial benefit but has resulted in the organisation increasing the proportion of general waste that it recycles by 82% over the previous year. This form of disclosure would be of greater interest to environmental stakeholders, particularly public stakeholders, and thereby be more likely to have some positive marketable value.

	Costs and Main Initiatives	Benefit (cost reduction on previous year)
Gas	£minimal Phased change to wood-burning boilers.	25%
Electricity	£minimal Phased change to low-energy lighting.	4%
Water	£minimal Phased change to waterless urinals.	5%
Drainage and Sewerage	£15,000 Redirect rainwater runoff from sewers.	16%

Table 1, Benefit Realisation

Nature of Knowledge

One of the reasons that RB&W was formed, and is stated in their charter, is to 'encourage agriculture, arts, manufactures and commerce' in the South West of England. It was envisaged that following the successful completion of this project RB&W would become a catalyst for the development of EMSs by the various enterprises within the rural economy in the South West of the UK, in particular as an advisor for the adoption of EMAS.

The acquisition and transfer of knowledge is a topic that receives much attention in the literature yet is often treated as something that 'just happens'. A full review of the knowledge management literature is beyond the scope of this paper but an indication of some of the problems that may beset any attempts to pass on the lessons learnt from such a project may be of value and are presented here.

The act of interpersonal 'socialization' is seen to be a particularly important aspect of knowledge creation and transfer (Nonaka, 1994; Fernie, Green, Weller and Newcombe, 2003; Kivrak, Arslan, Dikmen and Birgonul, 2008). However, knowledge management effectiveness may be defined as "*whether the entity receives and understands the knowledge needed to perform its task*" (Sabherwal and Becerra-Fernandez, 2003, p227). This alludes to the fact that socialization is not necessarily a simple matter of passing on one's experiences but that a complex series of cognitive processes take place before such experience is accepted. Szulanski (1996) terms the factors that inhibit or prevent knowledge sharing as 'internal stickiness', whereby absorptive capacity, causal ambiguity and source-sender relationship have significant effect. Pfeffer and Sutton (1999) acknowledge that whilst much of a firm's performance must be determined by the knowledge that they possess, "*a much larger source of variation in performance stems from the ability to turn knowledge into action*" (p87). This perspective is echoed by Blackler (1995) who recognises that knowledge is an 'active process', "*rather than regarding knowledge as something that people have ... knowing is regarded as something that they do*" (p1023).

Consequently, while the support of an experienced organisation would undoubtedly be of value while working toward EMAS certification it is likely that the transfer of knowledge would be complex and, purely in terms of effort to facilitate 'socialization', a costly one. As has been shown earlier, the support of consultants was useful but contributed little material value to the project. Furthermore, the apparently subtle but disparate nature of firms, particularly SMEs, would suggest that the degree of similarity between organisations, even those in similar sectors, would be slight. For that reason, the applicability of organizational knowledge from one context to another, between different sized organisations, or organisations in different sectors or countries, must be questioned. The act of undertaking a detailed evaluation of one's own organisation is therefore imperative, both for internal ownership and ultimate sustainability of the EMS and as a knowledge-generating exercise.

Activity Theory

Engestrom (2000) emphasises Activity Theory (Figure 1) as a useful tool to study and understand work. Although constructed some time ago by the works of Vygotsky (1978) and Leont'ev (1978) it has relatively recently acquired status as a recognised research tool among multidisciplinary researchers. Activity Theory relates closely to the perspectives of many who identify that experience is a prominent factor in knowledge generation and learning, "*through engagement with activity systems, new knowledge...will emerge*" (Avis, 2007, p175; Alavi and Leidner, 2001; Keursten and van der Klink, 2003; Bedny et al, 2000; Cook and Brown, 1999; Miller and Morris, 1999; Leonard and Sensiper, 1998; Lave and Wenger, 1991; Polanyi, 1983).

Activity Theory portrays everyday work and action in light of the longitudinal work structures and goals of the encapsulating organisation or group. The continual forging, relaxing and reforging of relationships between actors and artefacts is termed 'knotworking'. The knots become the focus of attention during the enquiry rather than the actors and artefacts themselves. Activity systems are cyclic and self-modifying and self-perpetuating since their actions result in further actions.

Figure 1 depicts the structure and objects of study described by Activity Theory. The 'subject' is the individual to be studied, the person that is carrying out the work. The 'Object-Outcome' is the intended outcome of the work and 'Tools' are those material artefacts or methods by which the goal may be achieved. 'Rules' are the organisational controls that are in place in the form of procedure or management imposed constraint, 'Community' is the social environment of the organisation in which the subject is situated. Finally the 'Division of Labour' is, as it suggests, the way in which work is apportioned.

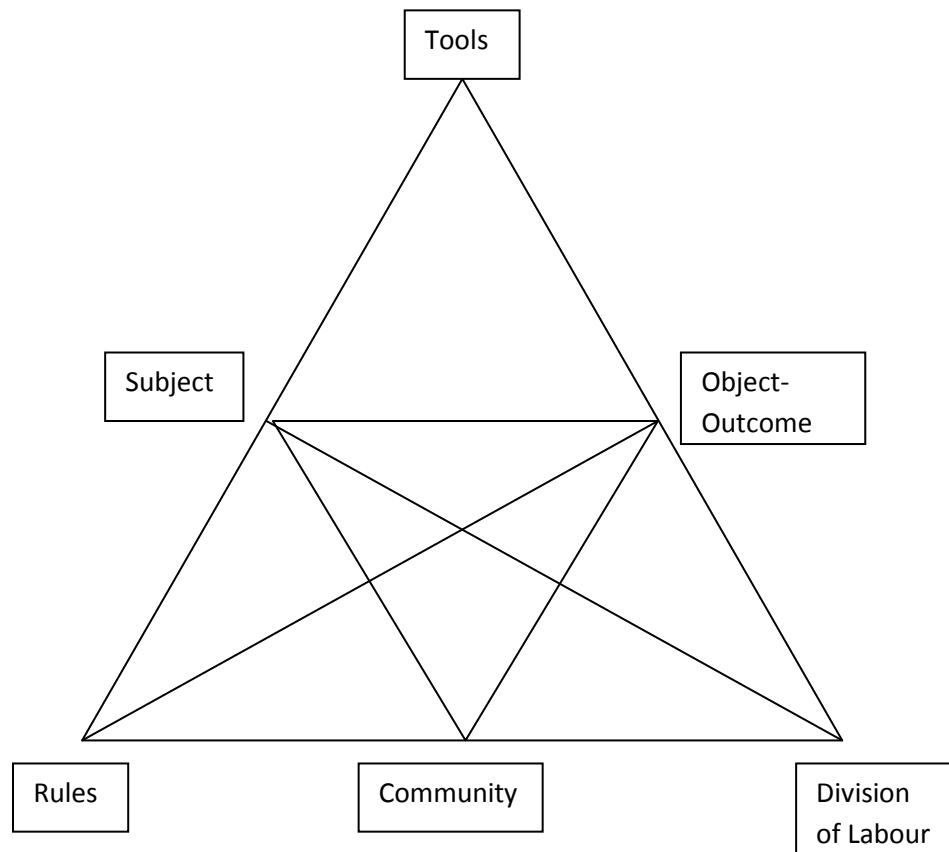


Figure 1, Activity Theory Framework

Methodology

A series of interviews were conducted with the KTP Associate employed by the University of the West of England and the Royal Bath and West Society. The interviews were undertaken over the 18 month duration of the KTP and occurred at times when significant project progress had been made. Interview questions were designed to explore each of the six factors noted in Activity Theory framework and were modified over successive interviews in order to more fully explore valuable and emergent themes.

The Subject of the investigation is the KTP Associate and the Object-Outcome is the design or modification of business practices and procedures in order to ultimately develop an environmental management system (EMS). The Tool that was used to understand the current business practices so that they could be redesigned was Process Mapping (Hines and Rich, 1997).

For sake of brevity this paper presents a discussion of only those factors and themes that proved most valuable to the investigation, along with exemplary quotations from the interview transcripts.

Data Analysis

The Subject appears as the most important factor within this study, not merely because it is the focus of the interviews and is the person undertaking the work, but because it is their motivation to perform the work that appears most adversely affected by events over the duration of the project.

*...I was really 'go get em' very positive three months ago and now it's...
'is this ever gonna happen' ...it grinds you down...*

It is the Community factors that most often appear to contribute to frequent episodes of demotivation, in particular due to relationships between two specific members of the organisation: hereafter these individuals are referred to as A and B.

During the early stages of the project the tensions between specific members of the organisation required intervention and consumed a significant amount of senior management resource.

Management's involvement was described as,

...almost a parent to keep two rival siblings, apart and behave themselves.

And subsequently,

I think [management's] really crucial in managing the personalities of the process.

It is most intriguing to highlight the nature of the Associate's relationships with these members of staff.

The Associate's close proximity to person A has apparently enabled him to discern the limitations of their involvement with the current process and determine the requirements of the modified process.

Consequently, there is no perceived need to investigate further. Whereas the relatively large distance between the Associate and person B has initiated a desire to explore their involvement in the process much more closely.

When discussing the frequent periods of socialization with the colleague that worked in a separate building,

I made such a real conscious effort not to just email and phone [but] to go in person to physically go and spend time with [B] in terms of understanding her processes and her input into the process and also to get to know her as a person and a human being by standing outside when she's having a cigarette when I don't smoke...

Interestingly the Associate notes the “dismissive” nature of colleague A that further inhibits his ability to forge a close relationship; this statement is repeated over time. However, initial discussions also reveal similar attitudinal difficulties with colleague B with whom he subsequently formed a valuable working relationship.

...he [A] can be very, very difficult to approach, he’s very busy and when you try and have a conversation he’ll answer the phone during it...

While some attempt was made to engage in sociable acts with A these were quickly discontinued; after being asked if the Associate had taken the same informal approach with A, replied,

No.

...it’s something that I have done to start off with and I’ve left in a way...

...I find it really hard to approach him [even] being sat across the desk from him ...

...and I think it’s quite apparent what he needs from this process and it’s quite clear what he’s not getting currently so I’ve not had to delve too much into it.

After the process had been modified there are persistent difficulties which appear to be largely due to the lack of technical skills and confidence of A and B. Both are seen to have an age-related lack of familiarity with computers and other information systems, the Associate says specifically of the staff member A,

It’s almost a, not cultural but, being of the generation he is...

However, of B, commenting on her support for the project and her willingness and openness in discussing and solving problems with the new process, says that,

She’s a star.

While this could be interpreted as purely “a clash of attitudes” between people, it is notable that there are several relationships between the Associate and other members of staff that display similar characteristics. In each case the ‘positive’ relationships are marked by informal socializing events. Furthermore, that the socializing events predate the development of the valuable relationships, and that socializing is not necessarily merely an observed phenomenon of an existing relationship.

These socialization events appear to be repeated during times of difficulty, problem solving, or disagreement whereby the informal nature of the relationship resurfaces,

...one of my little chats with [B] was full of positive comments about myself.

...It was nice that it confirms that I did do it the right way.

These events may be interpreted to be structuring events (Giddens, 2008) ones that shape the Community and thereby shape the organisation's culture and shared working practices. They are places and times where individuals share meaning and context so that future discussions are based on a shared knowledge.

Conclusions

As public and market pressures conspire to raise the importance of environmental management so are organisations likely to pursue the development of an EMS. ISO 14001 and EMAS are probably most widely recognised as the routes that organisations can adopt. The overall merits of each approach are difficult to compare, however, the requirement to disclose environmental incidents and performance under EMAS has the potential to provide more market value without necessarily sacrificing the process based approach and benefits that ISO 14001 can deliver.

The 6-step 'Acorn' scheme gives SMEs a common path to follow in order to develop an EMS while affording them the freedom to elect to ultimately pursue either ISO 14001 or EMAS certification depending on their strategic intent. This degree of flexibility is valuable particularly for SMEs that comprise a highly heterogeneous sector of commerce.

In this instance, EMAS has been shown to have delivered considerable tangible environmental and cost benefits. It has also incurred substantial, but largely justifiable, costs both in the form of capital expenditure and the consumption of human resources. One of the key reasons for pursuing EMAS was its perceived marketable value to the organization. While it is difficult to give this a precise figure we can confirm that a significant contract was gained as a consequence of the organisation being able to materially demonstrate its commitment to environmental concerns.

The complexity and uniqueness of an organisation makes it imperative that initiatives are lead by its own employees for they have detailed knowledge of the products, processes and practices. While consultants may provide valuable guidance and support, in this case mainly in the form of confidence and confirmation, it is the responsibility of the organisation to conduct its own detailed analyses. Furthermore, these initiatives are knowledge capturing activities, knowledge that may be highly valuable if it were carried over to other organisational projects and activities.

The study of organizational knowledge generation and transfer is complex, due to the heterogeneity of organisations themselves and also to the methods by which knowledge may be studied and interpreted. Activity Theory provides a means of understanding organisational and sociological structures and their effect upon individual's work. It is an individual's work that can be conceptualised as a proxy for knowledge generation and transfer.

This study finds that inter-colleague relationships are the prime inhibitors to individuals carrying out work and are therefore inhibitors to knowledge production. Neither the nature of the work, nor the organisation's rules, procedure and practices appear to have a significant negative effect. These relationships are determined by more than mere 'personality clashes'. Both productive and non-productive relationships were seen to transcend initial attitudinal differences.

The nature of the productive relationships appear marked by socialising events that occur over time and it is these events that are seen to be key to establishing long-lasting and beneficial working relations. The implications for organisations would simply be to initiate socialising events at the beginning of significant projects. This is generally common practice and was also undertaken at the beginning of the KTP that forms the basis of this study.

We therefore speculate a paradoxical situation that this represents for organisations intending to maximise their knowledge-generating abilities: While socializing events are significant determinants of productive collegiate relationships, artificially generating them may deprive them of some unseen yet necessary quality and render them ineffective.

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