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An activity theoretic approach to surfacing evaluation issues

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We introduce activity theory and the role of contradictions as a basis for making visible the structure and dynamics of work systems. Then, by way of a case study set in a national counter-fraud agency, we demonstrate how activity theory supports an understanding of an information system in context. Finally, we show how an analysis of contradictions – which are a key element of a current formulation of activity theory and constitute opportunities for growth and development – can surface complex, interrelated issues for subsequent *post-hoc* evaluation.

Keywords: activity theory, case study, evaluation.

1. Introduction

This paper proposes an approach to undertaking post-implementation information systems evaluation in circumstances where the issues to be evaluated and the criteria to be applied are unclear. Whereas evaluation is sometimes a well-planned part of the life cycle, using criteria derived from the original business case or system requirements specification [e.g. Canavet (1994)], in practice evaluation is often undertaken as an afterthought, and decisions have to be made about which dimensions should be addressed. In such cases an evaluation exercise may be triggered by unexpected problems or simply a desire to discover how effective the new technology has proved in use. Even if the requirements specification is still relevant, it is often silent on such matters as impact on working practice or interactions with other systems. Indeed the evaluation context may be even less well-defined – Powell notes that one of the reasons for the relative infrequency of formal post-implementation evaluation studies is ambiguity concerning organisational goals and system requirements [Powell (1992)]. Further, where such work is carried out, it tends to occur immediately after systems rollout and adopts an exclusively technological perspective, see for example [Powell, *ibid*; Andriessen (1996)] among others. A related point, as observed by Andriessen, *ibid*, among many others, is that unanticipated goals and ways of working may have emerged during systems use, thus raising new evaluation issues. These problems are compounded with specifically collaborative information systems. While Grudin regards evaluation in such circumstances almost impossibly difficult [Grudin (1988)], more recent work has emphasised the value of taking stakeholder perspectives [e.g. Walsham (1993); Ross (1995); Blythin (1997)]. In this way, the assessment of success or failure necessarily reflects the different interests and goals of those involved. However, as observed by Randall and many others, the issue is broader than this. "The point is that success or failure of technology in these situations depends on the way in which policy decisions impinge on work practices, and this of course will be something that evolves over time. Whether or not these changes would be successful might also be bound up with the culture of the organisation." [Randall (1996) p.149.]

Thus, as Smithson and Hirschheim [Smithson (1998)] observe in their recent review of information systems evaluation methods, there are significant problems deciding what to evaluate, at what level to evaluate (e.g. macro, sector, firm, application and/or stakeholder) as well as the sheer practical difficulties of the evaluation process itself. Evaluation is, therefore, both a highly problematic and political task.

Smithson and Hirschheim's review groups approaches to evaluation into three 'zones' of application: efficiency of the system in question, the effectiveness of the system and an understanding of the very issues

of evaluation itself (see table 1). These are seen to moving from objective/ rational criteria to increasingly subjective / political.
The first of these, efficiency, has a strong quality and quality control flavour about it. It is the most objective and quantitative of the three. Next, the zone of effectiveness is described as being based upon the theme of cost-benefit analysis (ranging from measures of systems usage through to user satisfaction). Finally, the zone of understanding recognises there is no one best method for evaluation for all situations and contexts. An approach aimed at understanding "…regards evaluation as problematic and seeks to understand more about evaluation in the particular organisational context".
This paper proposes a method to identify issues for the post-implementation, *post-hoc* evaluation of information systems. Its application is demonstrated by way of a case study, then having surfaced issues of potential interest we show how these issues can be evaluated with techniques identified in Smithson and Hirschheim's classification framework.

1.1 The context

In the Spring of 1999 we were invited by a UK government benefits agency (hereafter the *Agency*) to evaluate a new workflow system which was about to be introduced into their counter-fraud section. This section is responsible for selecting a sample of *Benefit* claims and verifying that they have not been fraudulently claimed (for reasons of confidentiality we shall simply refer to this particular NHS benefits as the *Benefit*). Verification involves liasing with other agencies that the claims are valid, querying discrepancies with claimants and in some cases then re-checking with other agencies before finally passing on all apparent fraud cases to another section for action. Their original system had been almost entirely manual (computers were not introduced until 1994) but changes in government policy required the introduction of automation. The Agency's interest was two-fold: the main systems designer wanted to know how far his design had met the users' needs, while the manager of the section concerned simply wanted to ascertain how the new system was "working" - in an unspecified general sense. The only established success criterion for the system was in terms of the increased level of benefit claims checking. As quickly became apparent, the new information system in question was not without its problems.
Thus we were faced with a pair of distinct but related problems. The first was to identify or surface issues worthy of evaluation. This would involve defining or making visible the workings of the system. Next was the problem of establishing the boundaries of the investigation. This was compounded by the need for the Agency to work closely and exchange information with other benefit agencies. Indeed the grand [political] vision was for a completed integrated benefits system. At this point we decided to adopt activity theory as our 'orienting schema' for this work. This decision reflects our interest in activity theory and our belief that activity theory can provide a holistic, contextualised and situated framework for reasoning about systems. As a consequence, this paper is neither the report of a case study describing how we evaluated the workflow system; nor is it directly concerned with a review of available evaluation techniques and their application. Instead we are concerned with the application of this particular approach in delineating and surfacing evaluation issues in context.
The expression 'surfacing issues', of course, immediately brings to mind one of the distinguishing characteristics of Soft Systems Methodology [Checkland (1981); Checkland (1990; 1999)] and it is worth very briefly considering the approach suggested by Checkland before returning to activity theory's take on the same problem.

1.2 Surfacing issues: Soft Systems Methodology [SSM]

While space does not permit a full treatment of SSM, it is interesting to consider its approach to surfacing issues in a context such as this. As originally conceived, it was intended as a means of reasoning about a system, that is, an organisation or a work-setting. Checkland's approach has been to work with the users, owners and customers of the system as a means of identifying the real purpose of the system and any

associated problems or issues therein - it is, of course, something of a given that the use of SSM is predicated on a problematic situation being the focus of the exercise.
Initially, the methodology had seven stages: the first three concern working with the users of the systems to identify the relevant system [i.e. a succinct definition of the main purpose of the system]. From there we are invited to undertake a number of thought-experiments as a means of investigating how to reconsider or redesign the system, before returning to the real world to assess the feasibility of the redesign. By way of example, in our case study, potential relevant systems for the Agency might include:

- a means of generating revenue for the government;
- a means of enforcing the will of the people in that crime should be detected and the perpetrator punished;
- the instantiation of a grand political vision which will ultimately streamline the NHS and so on. These possible worlds may then be thought through and issues raised.

So, if the agency is about raising revenue the automatic issuing of fines and other financial penalties might be a key issue to identify and subsequently evaluate. Thus the process of surfacing issues is one of establishing multiple viewpoints on the system and working through the consequences of each.
We could continue, working through Checkland's famous CATWOE acronym-mnemonic, and from there to explore a myriad of reformulations of the agency, but for now this brief introduction to systems thinking should suffice. However before turning to activity theory, it is worth noting that Mode 2 SSM, introduced in Checkland and Scholes, is much less prescriptive of techniques and methods [Checkland (1990)]. Mode 2 arose from the recognition that in practical use, formal stage-by-stage application of the methodology (now characterised as Mode 1 SSM) represents only one end of the spectrum of working within the conceptual framework. At the other end lies Mode 2, an approach which takes SSM as a "…framework of ideas, takes as its methodology conscious reflection on the flux of events and ideas, takes as its focus of enquiry the process of learning one's way to purposeful improvement of problem situations." p.283. Turning now from SSM, we consider an activity theoretic take on these issues.

1.3 Surfacing issues: Cultural-Historical Activity Theory [CHAT]

Leont'ev's cultural, historical theory of activity, more commonly, 'activity theory' arose, in part, from the fusion of Vygotsky's psychological and educational research and elements of Marxist thought in the Soviet Union in the 1930's. Activity theory is a body of thought relating the themes of mediated action and socio-historical development rather than a predictive or scientific theory. To date it is not widely accepted in the West: however there are pockets of researchers in Scandinavia, the UK, the USA and Australia who have taken the central concepts of activity theory and extended them to meet their own interest domains, which include computer supported cooperative working and human computer interaction [e.g. Kuutti (1991, 1996); Bardram (1998) and Bødker (1991)]; information systems [e.g. Bødker (1991); Nardi (1996); Hasan (1998)] and organisational behaviour [Blackler (1995)]. Activity theory, in its original formulation, arose from the realisation that all purposive human activity can be characterised by a triadic interaction between one or more individuals using tools to achieve their goals [Vygotsky (1978)]. With this came the realisation that an activity is the smallest meaningful unit of analysis.
Subsequent development of activity theory by Engeström [Engeström (1987)] has added other elements to the original formulation and these are: *community, division of labour* and *praxis*. Community refers to the wider stakeholder groups; division of labour refers to the horizontal and vertical distribution of power and responsibility; and praxis is the range of rules and norms governing behaviour within the activity. These relationships are often represented by the triangular representation shown in figure 1 (the subject node in the figure refers to the individual or individuals involved in the activity; the artefact node represents the mediating artefacts; and the object node or *objectified motive* connotes the purpose or motivation of the activity). The use of activity triangles as a descriptive tool is widespread in modern activity theory literature but it must be remembered that this is only a partial representation of an activity. Next we introduce contradictions and their role in activity systems.

Turner, P. and Turner, S. (2002) Surfacing issues using activity theory, *Journal of Applied Systems Science*, **3(1)**, 134–155.

1.3.1 Contradictions

Contradictions in activity systems were first identified by Vygotsky's student Leont'ev in the 1930's. Leont'ev, building on both Hegelian and Marxist thought, recognised that many core Marxist concepts such as production, consumption and distribution were inherently contradictory. For example, to produce one must first consume. These ideas have been adopted and extended by activity theorists over the intervening years, the most significant of whom is the Finnish academic Yrjo Engeström. Engeström is perhaps the prime mover in the research into the applicability of contradictions to understanding the dynamics of activity systems. His most obvious contributions have been to classify contradictions into a number of distinct types and to scale them from the overarching concepts of Leont'ev to more manageable proportions. So instead of 'production' Engeström has examined the contradictions in the day to day operation in such things as law courts and hospitals.

Contradictions are manifest as disturbances in the free running of an activity or as recent innovations. Engeström has classified contradictions into four types which in turn can be mapped onto one or more related activities [Engeström (1987)]. These are illustrated above – figure 1. Those contradictions internal to a single node of an activity are described as *primary* contradictions. The next category of contradictions are those which occur within an activity between a pair of nodes are described as *secondary* contradictions. *Tertiary* contradictions may be found when an activity is remodelled to take account of new ways of working. Thus they occur between an existing activity and the projected or prospected new form of that activity. Finally, those contradictions occurring between different co-existing or concurrent activities are described as being *quaternary*. From this it can be seen that a complex and evolving web of contradictions may emerge. Primary and secondary contradictions in an activity may give rise to a new activity which in turn spawns a set of tertiary contradictions between it and the original activity and this is may be compounded by quaternary contradictions with co-existing activities. As academically interesting as this is, the identification of contradictions has one clear practical application: they make visible the structure and dynamics of work in context. Indeed Engeström has recently coined the term 'expansive visibilisation' to describe "a powerful intervention methodology for dealing with major transformations of work" [Engeström (1999) p.63].

1.3.2 Expansive visibilisation

The process, which resembles participative design, comprises four basic steps:-

Step 1. *To make the disturbances and innovations visible.* Artefacts will be collected; key individuals debriefed and the activity checklist used to guide the observation. This will be supplemented by videotaping as required for particularly troublesome work situation and the challenging of *myths* which are frequently invoked to explain or defend incongruent work practice.

Step 2. The second step is to engage researchers and practitioners in analyses that *connect these seemingly random incidents with contradictions in the activity system* that time and again give rise to such disturbances and innovations.

Step 3. *To implement the resolution of the contradictions and assess their consequences*. The third step comprises the design and implementation of partial novel solutions to the contradictions. This is step, work actions and their representations and associated artefacts are examined and played with, with the intention of reorganisation them expansively to solve contradictions in this activity.

Step 4. *Visibilization*. As partial solutions, or newly designed actions, are implemented, they may lead to intended and unintended practical consequences. In this step, these consequences are monitored and the solutions are revised in feedback sessions, using data derived from observation as well as documents and other artefacts from the newly designed practice.

As can be seen steps 1 and 2 are effectively concerned with analysis, while the remaining two have implementation and evaluation as their focus, therefore only the first two steps are immediate relevance here.

Turner, P. and Turner, S. (2002) Surfacing issues using activity theory, *Journal of Applied Systems Science*, **3(1)**, 134–155.

The complementary nature of this approach to SSM should now be evident. Issues are identified, their aetiology examined, resolutions are considered (just as in SSM) but then solutions or partial solutions are evaluated. And it is this link from the examination of issues to the practical which is of interest here. We now move from this brief introduction to Engeström's use of activity theory and contradictions to a description of our case study.

2. The case study

For most of the 50 years since the instigation of the UK National Health Service (NHS), the tacit assumption of government and the administration, has been that little or no fraud existed. Checks made in the first half of the 1990s, however, revealed an estimated £30 million annual loss from fraudulent claims for the *Benefit* alone. In mid-1997, further investigation discovered *Benefit* fraud levels of nearer £100 million annually. Despite a change in Government in May 1997, the campaign against fraud remained entirely congruent with the new administration's emphasis on the rights and responsibilities of the citizen in a stakeholder society. A press release around this time emphasised the involvement of the wider public as stakeholders "…those who are exploiting the system are not only cheating taxpayers, they are depriving patients of the care they need." (Department of Health 1997). The counter-fraud measures announced included a "greater use of information technology". The following year saw a proclamation from the Minister that "Fraud will not be tolerated in the new NHS. We promised action and we are delivering." (Department of Health 1998a). The promised action took a variety of forms: among others, the introduction of an Internet site for the public to report fraudsters and the introduction of "the latest in IT systems". Later in 1998 a new strategy document was launched: Countering Fraud in the NHS (Department of Health 1998b), which placed a major emphasis on the *Benefit*. There were also figures attached to targets for its reduction – a 50% reduction in evasion of charges for the *Benefit* by the end of 2002/3 – and a new emphasis on the measurement of levels of fraud. This, then, is the overall background to the changes in the work of the fraud section at the Agency.

2.1 The work of the counter-fraud section

At the time of our first visit, claims processing had just moved from an almost entirely manual process supported by a simple database, which achieved a processing rate of around 100,000 *Benefit* claims per year. The first phase of the new system consisted of the introduction of a scanner to read details from the paper claim form. This replaced the manual keying of the details into the database by clerical officers. As the scanning process was not perfect, an image of the claim form was presented to the clerical staff to be verified and amended as necessary and then returned to the embryonic workflow system. Throughput in this phase was targeted to increase to 150,000 per year. The atmosphere in the office appeared busy but relaxed, the staff occasionally chatting to their immediate neighbours and across the banks of desks, and moving around the office to talk to others or attend to work elsewhere in the room. The workload was organised so that while each officer spent most of their time verifying details captured from the scanner against the original forms, they also had a variety of other tasks such as liasing directly with other agencies, contacting claimants by phone to clarify details of their case and so forth. The job afforded opportunities for the exercise of expertise in such matters as the regulations pertaining to exemption, the likely cause of discrepancies in dates relating to eligibility for exemption, and the relative accuracy of the records held by different agencies and their likely speed of response. Such expertise was not acquired through formal training, but through learning on the job and experience elsewhere. In addition, staff were organised on a rota basis to answer the constant phone calls from claimants, and now, to feed the scanner.

2.2 Three months later

On our second visit, when the scanner and verification tools had been in place for some three months and additional software introduced to speed up the checking of addresses, the informal working atmosphere still evident. Indeed, loose collaboration between the officers could be observed as they exchanged suggestions on

the best tactics for interacting with the new address database – which had again been introduced in advance of training or the provision of a manual. Interviews at this point with the clerical officers elicited that the current job was still felt to be reasonable in content. However, there was also concern about the perceived shift towards a more narrow role of a data entry clerk, with an expectation that duties such as the telephone rota would become confined to particular staff rather than shared among the group. The new tasks also required a good deal of concentration and a greater focus on on-screen data.

2.3 Moving to the next phases of the workflow software

By our third visit, around two months later, the next phase of the workflow software had been implemented. This sampled claims according to criteria such as geographical area and basis for the claim, automated the delivery of batches for checking to the officers' desktop machines and generated case details to be queried with other agencies. Additional scanners had been introduced, thereby increasing the volume of input to the system and targets had been raised, although still on a group, rather than an individual basis. This time the atmosphere was palpably different. Staff were mainly static in front of their PCs, and there was little conversation except when leaving the desk for a formal break.

From the manager's perspective at both the second and third visits, the new system remained largely on track to meet its goal of increased throughput, although it was recognised that the overall job of the claims officer was now rather different and potentially less satisfying. There had been some teething troubles, particularly with the scanner hardware, and feeding the scanner was acknowledged to be a most unpopular task, but most difficulties were being resolved. The cause of the remaining problems lay outside the section, either with bottlenecks elsewhere in the Agency, which delayed the input of claims to the section, or with tardy response from other agencies. Accordingly, some reduction in targets had been negotiated with more senior officials to take account of these circumstances. Overall, in the manager's view, the whole process would become even more effective and streamlined once all the technology was in place and new accompanying procedures introduced, for example, the dropping of reminder letters to people whose claims were being queried. This is the position at the time of writing, but further phases are soon to be implemented which will automate the input of responses from other agencies, generate letters to claimants, process the replies appropriately (via scanned input), and ultimately demand penalty payments from fraudulent claimants.

3. Surfacing issues

We begin by considering the pre-workflow configuration of the counter-fraud work in activity theoretic terms, then the new automated activity as it exists at the time of writing. Originally the object of the activity was the checking of claims to detect fraud; the subjects of the activity were the staff of the Fraud Section, and the supporting artefacts comprised established procedures, claim forms, and the original, modest database. The work was undertaken as part of a community of heath professionals, health service officials, and other benefit agencies. The work was divided in the following way: the Fraud Section was responsible for checking claims and detecting fraud; health professionals authorised the delivery of the Benefit and the UK Government make policy. Within the fraud section, responsibilities were allocated such that individual staff processed a batch of cases through the system, these tasks being varied by other duties such as answering telephone queries. Rules and norms included the assumption that some claims would be fraudulent, that fraud was both morally wrong and a criminal offence and that a sample of claims must be checked each year.

3.1 Identifying potential contradictions

Adopting the first two steps of Engeström's expansive visibilisation approach, we considered the working of the agency looking for disturbances and innovations and from there tried to identify potential contradictions. (We confined ourselves to the analysis phase of Engeström's approach as it not our intention to conduct a redesign.) However we must add the caveat that the identification of contradictions is not well documented by Engeström and must, to some extent, be a matter of judgement. We were quickly able to identify a number

of disturbances and innovation which we classified as primary, secondary / tertiary and quaternary contradictions. We operationally defined those disturbances and innovation to which the word 'within' could be ascribed as being indicative of primary contradictions. An example of this might be a new software system which proved to be problematic in operation.
We decided to group potential secondary / tertiary contradictions as they are characterised as being between aspects of the same activity and between versions of the same activity respectively. Finally, disturbances between parallel (co-existing) activities were treated as symptomatic of quaternary contradictions.

3.1.1 Primary contradictions

In practice we found relatively little evidence for primary contradictions, that being said one of the junior supervisory staff had been given the job of collating and reporting minor software bugs to developers. However we did find some evidence of primary contradictions with the new artefacts introduced to the agency.

1. The scanner used to image the benefit forms experienced operating difficulties which included a build up of the paper dust which left a broad streak across the resulting image.
2. The hopper feeding the scanner with the paper benefit forms was found to be prone to frequent jamming and as a major source of irritation to its operators.

3.1.2 Contradictions between activities and between nodes

In the work of the Agency as currently organised, several aspects of the activity have changed significantly, most tangibly in the introduction of new artefacts in the forms of the scanners, workflow system and associated new procedures. There are also, however, shifts in the object of the activity – no longer just to detect fraud, but also to deter and prevent it – while the community of stakeholders has now expanded to take in UK taxpayers and patients requiring treatment. Within the Section itself, responsibilities have been re-arranged so that the job of the basic grade staff is effectively limited to data verification. What follows is consideration of a sample of potential tertiary contradictions. What follows is consideration of a sample of potentially tertiary contradictions of which four are shown as labelled arcs in figure 2. For reasons of space and clarity we have omitted the secondary contradictions of which there are many.

3. The original range of artefacts employed by the staff in the fraud section were a familiar range of procedures and documents. Many staff joined the section with experience of similar tasks at other related agencies, from which they were able to generalise, while others learned from their more experienced colleagues. The new system imposed quite different ways of working; no time had been available for training; nor was a manual initially available.
4. As we have already noted there was a dramatic shift in job content for the section's staff. Prior to the workflow system being introduced they worked as case officers taking a batch of claims to be checked and working with them until their validity had been established. This involved sending out a series of standard letters and dealing with telephone calls from claimants. It was not unusual for this process to take several months in some cases. Thus the job entailed involvement in the entire lifecycle of the verification process. Post-introduction of the new technology, the job content of the staff shifted dramatically to verification alone. Verification entailed checking that the technology had correctly scanned and interpreted the contents of the benefit claim form. In practice this involved presenting the scanned image of the form to the clerks who would resolve poorly 'read' details. Such changes in job content can be summarised as moving from being a case officer to a data entry clerk.
5. When we observed the staff at work in the early phases of the new system, informal cooperation in problem solving was the norm. The demands of the new system brought a switch to parallel working with little interaction, as staff became focussed more exclusively on their PC screens. The longer term issue this raises is that of the effect on the sharing of knowledge and experience among the staff,

particularly for newer members. This however introduces a more significant point, that domain expertise may become irrelevant as the claims validation process becomes very largely automated.

6. Finally there has been a subtle but important shift in the rationale or motivation of the activity as a whole. Prior to automation the manual checking undertaken by the section's staff was seen as a means of checking against deliberate fraud and resolving genuine mistakes made by ill or social disadvantaged people. Post-automation came the implicit belief that the systems could be made so reliable that automatic fines and bills could be issued to fraudulent claimants. The presumption of innocence had be dropped [or at least mislaid].

3.1.3 Quaternary contradictions: broadening the scope of the evaluation

This brings is to the second problem we identified at the beginning of this paper, namely, the scope or definition of the problem boundaries. So far we have primarily limited the discussion to the workings of one office. However, in this case, as in many others, the interpretation of findings [and any ensuing action] must be viewed in the light of issues and constraints belonging to a wider system. We therefore need to review the new, automated activity in question alongside other related, parallel activities. Consideration of the socio-political background to the fraud section's work allows us to identify two further related activities, namely, 'treating the sick' and 'administering benefits'. Here too are contradictions.

7. The counter-fraud activity relates to 'treating the sick' through of the explicit aim of freeing more resources for this purpose. There is, necessarily, a potential contradiction between the rigorous elimination of fraud and the values pertaining to the care of sick people. While the results of an evaluation based on local criteria might suggest [for example] that the processing of all cases can and should be automated, the co-existence of the treatment activity and its associated norms means that an element of human decision making must remain. This does not mean that the contradiction is removed, but rather that the system can only function through its tacit suppression.
8. There is also a contradiction between the public policy of encouraging all of those who are entitled to the *Benefit* to claim it with the equally public policy of protecting the public purse by being tough on fraud.

From an analysis of the potential contradictions in and beyond the *Agency* we now consider how these surfaced issues might be evaluated.

3.2 From contradictions to evaluation

Contradictions highlight areas where the organisation, system or work situation in question may wish to take stock of the situation and identify opportunities for change and development. Thus, they necessarily precursors to defining dimensions for evaluation. What is apparent in this analysis is that there is a reasonably well defined mapping from the types of contradictions identified and the broad type of evaluation approach and related techniques described by Smithson and Hirschheim. Primary contradictions appear to map onto the efficiency zone being susceptible to quantitative analysis. Secondary and tertiary contradictions are more subjective and qualitative in feel and map onto the efficiency zone; and quaternary contradictions seem to have a stronger relationship with the understanding zone as does the process of identifying contradictions themselves. Table 2 illustrates these relationships.

Table 2: Mapping contradictions onto Smithson and Hirschheim's evaluation zones and techniques

Turner, P. and Turner, S. (2002) Surfacing issues using activity theory, *Journal of Applied Systems Science*, **3(1)**, 134–155.

Zone	Contradiction	Example evaluation techniques
Efficiency	1. Problems with the scanner. 2. Paper jams.	Hardware / software monitor Quality assurance
Effectiveness	3. Training – retraining issues 4. Changes in job content 5. The changes in working practice 6. The prospect of further total automation	Cost-benefit analysis Critical success factors User satisfaction Gap analysis
Understanding	7. Treating the sick while deterring fraud 8. Encouraging benefit uptake while protecting the public purse	Social action Organisational behaviour Sociology

4. Conclusion

As this paper has shown, we would commend activity theory and the use of contradictions, in particular, as a powerful means of making the dynamics, problems and opportunities of work visible. Not only does a contradictions analysis identify issues in the relatively well-supported evaluation zones of efficiency and effectiveness, but it also addresses the much less well defined and explored *understanding* zone. At present, however, a degree of investment by the analyst is required in familiarisation with the rich set of concepts afforded by the theory. However activity theorists in several centres are currently working towards the further operationalisation of the concepts for use by the practitioner. Bardram's work [Bardram (1998)] is an early instance of this, using activity-structured scenarios as a vehicle for the consideration of future possibilities, while a more recent example is the Activity Checklist developed by Kaptelinin [Kaptelinin (1999)]. This raises another area for development, that of user participation. The application of activity theory is at its most powerful when actors in the system engage with the continuing evolution of their work through taking stock of the current situation and considering opportunities for change and development. The organisational climate at the Agency did not support such involvement, but in more sympathetic environments, an activity-focussed evaluation becomes an opportunity for participative organisational learning. We are currently exploring these possibilities in a different organisational context.

An unexpected consequence of this work is the realisation that we can no longer assume that the portfolio of evaluation tools and techniques which, in the main, are still largely predicated on single user, personal productivity application running on a PC will be adequate. There is, instead, a case to be made of a suit of related and interrelated tools to meet the needs of modern multi-user, collaborative networked applications. Finally, despite the lack of explicit instructions on identifying and classifying contradictions, we found the process surprising easy and straightforward.

4.1.1 SSM and activity theory: an opportunity for further work?

It is also worth briefly revisiting SSM and to compare it with this contradictions-driven approach. The key research question must be, 'Would an SSM-driven approach arrived at the same or similar issues to evaluate?'. The answer is very likely, yes but with several important caveats: firstly, SSM has not been shown to map onto evaluation categories (zones in Smithson and Hirschheim terms) much less individual evaluation methods. Indeed, for many, a weakness of SSM in its more usual role is the difficulty in effectively 'interfacing' it with other methods. However it would be unfair to rule out such a mapping. Secondly, the contradictions-driven approach offers more structure to this kind of investigation compared with, in particular, Mode 2 SSM. This is a strength or a weakness according to taste or preferred ways of working. It does, however, open up the intriguing question of using this contradictions-driven approach *within* Mode 2

Turner, P. and Turner, S. (2002) Surfacing issues using activity theory, *Journal of Applied Systems Science*, **3(1)**, 134–155.

SSM and this is worthy of further investigation. There are distinct strengths to SSM – such as multi-viewpoints – from which the method here would benefit.

4.1.2 Post-script

Having made visible the work of the fraud section and having surfaced issues which might have benefited from evaluation or redesign, it worth considering what actually happened. We had identified three alternative strategies the section could adopt: (i) do nothing; (ii) address some of the individual issues in a (traditional) piecemeal fashion or (iii) adopt the contradictions analysis as the basis for a participative re-design . The first alternative – do nothing – was an entirely credible choice given the political will behind the project and, taking a strictly cost-benefit view, the new technology and working practices only affected 30-40 members of staff at the Agency, while the potential benefits to the NHS and the wider community were great. The third option proved to be impractical for the usual reasons of time and cost and equally usually a reluctance to involve end-users in the re-design process. Thus the second alternative was adopted by default. User interface usability problems were reported to the designers; a manual was written and training on the use of the scanner given. This came as no surprise to the authors of paper as it is all too typical of such situations.

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