Redesigning ambulance services in London and Manchester: A tale of two cities[1]

Although based on events occurring nearly twenty years ago, the messages of this case are as relevant today as they were then. And it is important that the lessons of history are learned. The case epitomises management as design, with IT used as the primary instrument of innovation within an implicit sociotechnical framework which stresses both improvements in service performance and in the quality of work-life. The case also provides a master-class in the management of (technological) change in one site (the Manchester Ambulance service), brought out all the more cogently by comparison with the catastrophic failure of a similar initiative in London. The case is also of interest methodology, for its innovative use of psychophysiological methods in order to measure stress levels in operation conditions.

Whether or not the problem of IT failure is more or less prevalent in the public sector, such calamities are certainly more visible, taking place in full public view. Perhaps the most celebrated such disaster in the UK came in 1992, when the recently implemented computer-assisted despatch system of the London Ambulance Service (LASCAD) crashed. LASCAD has since become notorious as an iconic example of information systems failure. The crash itself hit the newspaper headlines with lurid suggestions that 20–30 people had died as a result. The Chief Executive resigned and questions were asked in Parliament, leading to the instigation of a Public Inquiry. Intense media interest was aroused and further enquiries followed. In summary, the various investigations revealed a sorry state of affairs. Several immediate factors were implicated, although ultimately the root cause of failure was laid at the door of LAS's senior management. Although the LASCAD fiasco occurred some years ago, the key issues remain as valid today as ever; sadly, they appear to be timeless. I shall begin with a summary of the highlights of the London fiasco, before moving on to parallel developments in Manchester.

Poor decision-making over the choice of supplier was one symptom of the managerial malaise. Despite the consultants Arthur Andersen recommending a working budget of £1.5 million and a cautious implementation time-scale, the successful bid, in an open tendering process, had come in at £937,000, nearly £700,000 cheaper than the next tender. Part of the reason for this low price was the quotation of only £35,000 for software development from the software partner (SO) in the successful consortium. The previous IT experience of SO for emergency services had been limited to administrative systems and the software had perforce to be developed from scratch. SO were persistently late in delivering software and the package had manifest technical deficiencies. Despite these clear warning signs, no action was taken by LAS management. No formal quality assurance processes were in operation and it appeared that the consortium had been largely left to get on with it themselves.

Also problematic at the time was the parlous state of industrial relations in LAS, where a climate of distrust and 'them and us' antagonism reigned between management and staff. A

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core feature of LASCAD was its capability for locating and allocating ambulances to handle incidents, an explicit attempt to automate the despatching task. It is unsurprising that it was seen by control room staff as a reflection of management's desire to reduce discretion and to eliminate outdated working practices. There had also been very limited consultation with ambulance crews in the design work and a gap of several months arose between training and implementation. During implementation there had also been evidence of deliberate sabotage, with staff entering incorrect data, for instance, a classic 'counter-implementation' tactic.

Having exhumed the bones of the LASCAD fiasco, let us turn to our main case study, a similar initiative at roughly the same time in another metropolitan district: the Greater Manchester Ambulance Service (GMAS). At the time, GMAS's emergency ambulance service was provided by a fleet of around 65 highly-equipped vehicles with paramedical support, based at a number of dispersed ambulance stations. The movements of the ambulances were coordinated by a control centre in central Manchester. At the time, GMAS was undertaking a similar computerisation project to the LAS one. It involved a product known as ALERT which had been procured from a local software house and was based on tried and tested software used by other emergency services.

Of note, was the computer project's direct alignment with the business strategy of GMAS. GMAS had recently applied for 'Trust status', endowing greater managerial and commercial independence in the 'internal market' conditions instigated in NPM's early ascendancy under the Thatcher regime. Computer-based information systems were seen as essential. Quoting from the Trust application:

> *…[they] enable planned initiatives in the pursuit of improved service delivery. In the short term, this information will ensure that management can, where necessary, re-deploy resources to become more effective and cost efficient. In the long term, the information will provide an accurate, comprehensive and detailed database which will be available when the Trust is entering into negotiations with purchasers.*

A brief history of the GMAS computer project

From interviews with key staff and from my personal involvement with GMAS over 18 months, a short history of the project will now be reconstructed, highlighting critical aspects of the way the change process was handled. We take up the story in the summer of 1993, with the appointment of an experienced middle manager (PC) from within the service. PC possessed a strong combination of technical and managerial skills and worked full-time on the project. Implementation was set for the Spring of 1994. From the outset, PC took a firm hold on the technical side of the work, engaging in extensive and thorough negotiation with the software providers. Although ALERT was a proven product, considerable customisation was required in order to ensure that the system exactly satisfied GMAS's requirements and was consonant with their working practices. 'Getting it right' was seen as the top priority in project planning rather than hitting deadlines. On the user side, the importance of keeping control room staff well informed and up to date with progress was recognised; a newsletter was created and regular meetings were held to inform staff of progress and to allow anxieties to be voiced. Where possible, staff were involved the development of the system and many features were included of direct help to them, e.g. a database of key unofficial landmarks (such as public houses).

Live implementation of ALERT occurred in June 1994. Stress levels were beginning to rise in anticipation of the transition to computer-based operation. The manager of the control centre commented as follows on the testing phase conducted immediately prior to full implementation:

> *There was a great deal of apprehension at first … A lot of people didn't want the system, they feared it would make their job harder. Now they all want it …. they didn't want it switched off at the end of the trial.*

PC handled this critical period with considerable élan. A comprehensive training programme was executed, building up from basic training in keyboard skills to role-playing exercises with simulated incidents. Staff were provided with well-designed, individually customised, user manuals. The successful execution of a series of live trials was used to build up confidence in the system and to test it under real operational conditions. The quality of the training, the care taken in tailoring the design of the system and the thoroughness of the testing programme helped to ensure that the switch-over to computerised operation was a complete success.

Prior to computerisation, ambulance command and control had involved two basic stages, beginning with receipt of a "999" telephone call. Call-takers took down details of each call on a paper form, the "Call Receipt Record" (CRR), which was then handed to an ambulance despatcher depending on the incident's location. There were four such despatchers, each responsible for a quadrant of the GMAS area. Having decided which vehicle to deploy, the despatcher contacted the appropriate ambulance station and the vehicle was mobilised. Communication between despatchers and ambulances was mediated via a combination of the telephone and a radio link. Ambulance crews used a small panel of buttons in the cab to transmit status signals back to the control room, indicating the time at which the ambulance left its base, the time of arrival on scene, etc. This information was vital and, prior to computerisation, the despatcher was required to transcribe it manually onto the CRR and also onto a 'plotting chart', an A3-sized grid recording the changing disposition of each despatcher's ambulances.

In essence, the computer system had replaced this paper-based process with a shared database: call-takers now typed the requisite information directly into the database and jobs were automatically routed to the appropriate despatcher, appearing in a job queue on the despatcher's display. ALERT indicated the ambulance stations closest to the incident and provided a number of other useful information displays, e.g. an electronic version of the plotting chart. Although ALERT had not changed the basic structure of the command-and-control process, it had improved it in a number of areas, e.g. assisting in establishing the definitive location of incidents by providing an on-line 'street-finder' and a thesaurus of well-known landmarks. The integration of the radio link (i.e., the automatic recording of status messages) provided a major advantage as this laborious activity had sapped a significant amount of time and attention.

Over the implementation period, a number of changes were also made to the physical arrangement of the control room. Its austere decor was given a face-lift and the layout of the room was changed, in order to concentrate the despatchers at one end of the room with the call-takers at the other. Before the change, control staff worked in two teams, each a mix of call-takers and despatchers. While the new configuration at first sight appears to be detrimental in breaking up the teams, there was a strong rationale for the re-organisation, namely that it brought the whole group of despatchers into close proximity, which facilitated cooperation and coordination for incidents close to quadrant boundaries.

Evaluation

A comprehensive evaluation of the impact of ALERT was carried out, which was my primary responsibility on the project. Two periods were compared: pre- and post-implementation. Baseline measurements were taken in January/February 1994 and post-implementation data was collected in October/November 1994. By this time, ALERT had been running smoothly for several months and was well bedded-in. The evaluation took a sociotechnical approach; both staff welfare and performance were treated with equal importance. In particular, the alleviation of stress had been an explicit design objective. Ambulance command-and-control is stressful enough, as can be imagined, so aiming to reduce rather than add to this, was an important goal. To assess this, a real-time psychophysiological evaluation was carried out focusing on the relationship between work demands and stress levels for despatchers during operational conditions. Two cardiovascular parameters were measured (heart rate and blood pressure) using a device purchased from a high street chemist, which was simply slipped onto the left index finger with minimal intrusion. Despatchers were also asked to indicate their 'subjective state' at the same time, i.e. how anxious and fatigued they felt using a simple rating scale.

Then, as now, national targets and indicators were used to appraise the performance of ambulance services, e.g. an ambulance should be on scene, for instance, within 8 minutes for 50% of incidents. There was clear evidence of an improvement in performance with ALERT, with the hit rate increasing from 55.4% to 64.4%. This improvement is particularly impressive as the number of emergency incidents had increased by 15% between April and October. Underpinning the improvement was a small but significant reduction in incident response time of around 1.5 minutes. Although seemingly small, it is possible to translate this, albeit tentatively, into a meaningful outcome for one important class of emergency, that of cardiac arrest, where the relationship between emergency care and survival has been extensively researched. Research has shown an improvement in the probability of survival of 0.7% for each minute reduction in response time. Although theoretical, with 2530 cases per annum this translates into 35 to 40 lives saved.

Regarding stress in the control room, let us begin by noting that the despatcher's job is a very demanding one. In essence, despatching involves two inter-linked tasks. The primary task involves identifying the location of an incident, prioritising its importance and finding the most appropriate ambulance to despatch. Linked to this is the complementary task of ensuring that there are no gaps in cover, i.e., local areas where all ambulances are active on jobs with none available for new emergencies. This secondary task can involve moving ambulances from one location to another, "like pieces on a chess board" as one despatcher put it. The essence of the despatcher's job is to balance these two tasks, knowing that life or death can depend on getting it right. Moreover, there is little spare capacity: at peak times as many as 80% of ambulances may be occupied on jobs. The combination of cognitive complexity, an uncertain dynamic environment, low spare capacity and high risk, adds up to a cocktail of acute stress. Comparing high and low levels of workload, it was found that whereas blood pressure increased with workload for both paper and computer-based operation, the rate of increase was approximately 50% less steep for ALERT. This represents dramatic evidence that ALERT was helping operators to cope with escalating task demands with less stress. Similar results were found for subjectively recorded anxiety levels.

A short post-implementation questionnaire was used to elicit users' opinions about the impact of ALERT. Overall, control staff reported that ALERT had significantly enhanced their level of job satisfaction. There was also a majority feeling that ALERT had improved their ability to cope with the stresses of control-room work, that it was easy to use and helped them do their job better. Only 8% said they would prefer to return to the paper system, with the overwhelming majority (83%) indicating that ALERT had led to significant overall benefits.

Comparisons with LAS: management lessons

In contrast to many IT initiatives, the GMAS project appeared to have been a success – all the more striking when compared with the failure in London. In our original paper we systematically contrasted the two cases in order to identify the critical factors in the Manchester project that were responsible for its success, highlighting key differences with London in a number of areas (Wastell & Newman, 1996).

Undoubtedly the appalling state of industrial relations in the LAS case had been a general toxic factor. By contrast, in Manchester good relations between staff and management prevailed, characterised by trust, constructive cooperation and open communication. User involvement had also represented an area of obvious difference, with GMAS management having seen ownership as critical and taken care to involve end-users in system development. The attention given to staff training and communication had also led users to feel involved in the process and to feel some attachment to the system. Management commitment had been another area of critical difference. In the London case, management involvement had been lamentably weak, with project management virtually non-existent. In GMAS, by comparison, we have a model example of decisive leadership. An experienced manager had been assigned full-time to the project, an effective man-manager who worked with close attention to detail on the human side of the implementation process as well as the technical aspects.

Technologically, there were also critical differences between the two projects. The LAS system, for instance, had involved significantly more software development work, with an unproven supplier. Hence, the technical risks were much higher than the GMAS case where the decision had been made to opt for tried and tested software, albeit requiring extensive customisation. There were also crucial differences in design philosophy. LASCAD had followed what we called a "machine-centred approach", aimed at reducing the human role through automation (Wastell & Newman, 1996). In GMAS, however, the design philosophy had embraced a "tool paradigm" (p.296); there had been no question of the computer system usurping the human role. Through helpful information displays and the removal of unskilled secondary work, ALERT's role had been to support operators in their primary task of despatching ambulances; it had not encroached on the problem-solving kernel of their job. Suggestions of candidate ambulances were for information only; decision-making had remained solely the prerogative of the operator.

REFERENCE

Wastell, D.G. and Newman, M. (1996). Information systems development in the ambulance service: a tale of two cities. *Accounting, Management and Information Technology*, 6, 283-300.