



Latent Error Analysis and Child-Care Chronicling Systems

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Summary

Munro (Munro, 2005) and others have made the point that approaches to investigating child abuse deaths have concentrated on surface issues where human error is regarded as the terminating point in an investigation. This article describes the use of an approach to accounts of serious abuse that is systemic.

The approach is based on one that is used by Boeing, the aircraft manufacturer, to trace back problems to latent errors. The context here is in the development of a set of properties for a computer system that is used for chronicling the interaction between a child and their family, relevant professionals and agencies. Boeing would normally use an aircraft incident report, accident report or an informal description of a set of incidents as their starting point. The research detailed here uses the report of the Victoria Climbié inquiry.

The properties developed from this exercise are then compared with the specification of the Integrated Children's System (ICS), a British chronicling system that has had major problems associated with it. It is posited that a systemic approach would have eliminated many of the problems with the ICS requirements specification.

Although this article describes one system that is extant in two countries it is general in nature in that the principles hold for *any* chronicling system, for example those used in other branches of social work areas, and is not specific to England and Wales, the countries whose social workers employ computer systems associated with ICS.

Introduction

Information technology has a major potential in chronicling: the development of a diary which documents the interaction between a subject, say a child in need, others, external agencies and a children's department. It provides functions such as: the detailing of notes in a legible form, the structuring of these notes, the transfer of the notes from one agency to another and enables the standard type of

searching currently extant in the Internet to mine important information that would often be scattered around a number of paper files.

The Integrated Children's System

ICS is one of a trio of databases (Dowty, 2008) promoted by the then Department of Children, Schools and Families (DCSF) of the British government in order to achieve some of the primary aims and objectives of the green paper 'Every Child Matters' (HM Treasury, 2003). Two of them *ContactPoint* and *Ecaf*, are for the use of all practitioners, whereas ICS is for social care staff only. Essentially the databases consist of a set of business and computer processes that are all but mandated for use by social service authorities as an electronic record of each child's contact with social care. They consist of information on the assessment, planning, intervention and review of interactions between individual children's departments, other relevant agencies, the child in need and others such as family members. It was intended that ICS would be supported by a comprehensive IT system that provided record keeping and reporting functions.

There were major problems with the system and with other technology-lead approaches to social work. These have been documented in a number of articles in social work journals (Bell, 2007; Broadhurst, 2009; Peckover, 2008; Shaw, 2009; Wastell, 2009); in evidence to a second inquiry into the death of a second child Baby P by UNISON, one of the leading trades unions in British social service departments (UNISON, 2008); and in a DCSF-sponsored evaluation of four ICS pilot projects by the University of York (Bell, 2007). A summary of the problems was detailed by UNISON in their evidence to an inquiry that was partly occasioned by death of a child known as Baby P as it stated that:

UNISON wishes in particular to draw Lord Laming's attention to the seriousness of the problems being experienced by social work staff with the Integrated Children's System. Following a number of reports of difficulties being experienced, UNISON has recently carried out a survey of branches to test how widespread the problems are; whether these are primarily implementation, software or general teething problems; or whether this is a fundamental issue with the whole system. We have found that the problems appear to be fundamental, widespread and consistent enough to call into question whether the ICS is fit for purpose.

It is not worth detailing the many problems with ICS. However, a good idea of the magnitude of the failure of ICS can be gained from a list of problems reproduced from a recent guidance note from the DCSF (*Integrated Children's System (ICS) improvement: Guidance package (March 2010)*) aimed at rectifying the problems with the computer system: lost time due to error chasing; rework; delays to casework; time spent in administration rather than on working with children and families; a lowering of morale; retention and motivational issues; increased cost due to error chasing and additional training; duplication of work; users building in short cuts leading to poor practice; non-compliance with statute or data returns; processes not shared across an authority; users reverting to other systems such as *Microsoft Office* (as you will see later this article does not regard this as a problem but as a viable solution); wasted time spent on training; work slowed down; key facts being lost; patterns being lost; opportunities to share data between professionals hindered; and best practice not shared.

Computer System Specifications

The key to the failure of ICS is its specification. The starting point in any systems development project is a document known as a requirements specification (Sommerville, 2006). It describes what a system should do in user terms, *not* in implementation terms. For example a good requirements specification would not attempt to mandate the technologies that were used in the implementation but would express, in a broad way, what the system should provide. For example, a chronicling system that stores details of the interaction of a children's social worker with a child, his family, other agencies such as police child protection teams and other social workers might specify that

There should be easy access to the case history of a child by other agencies. These agencies include the local police child protection team, the paediatric health services, children's departments in other local authorities and housing departments.

Now, this statement looks abstract. It is, but it has the advantage that it does not close down the solution space which contains possible computer systems. It allows a diversity of approaches. For example, access for the police might be direct, via an Internet connection, where a high degree of security can be assured; it might be via a link social worker at a hospital whose telephone number would be widely advertised and for a children's departments in another local authority it might be achieved via a front line duty worker whose phone number would be widely advertised.

In this example the demands on the design of a computer system are different, for example if access to the system for another children's department is via a phone call then some form of manual protocol should be established which confirmed the *bona fides* of the caller: if a direct, computer-based access is required then, clearly, some form of secure Internet connection is required.

Another example of a general statement that does not imply an implementation is

Children stored in the system should be easily identified from their name and other unique data and their case record retrieved easily.

This is a general statement that could even be used to develop a paper-based system. There are a number of possible computer-based implementations of this requirement:

- A series of indexed web pages could be presented with the child's surname, case number and postcode.
- A search box could be provided into which a social worker would type the child's name and case number.
- A folder with the case records stored as *MS Word* documents could be organised in such a way that documents were displayed in child surname/case number/postcode order in an *MS Windows* window.

Sometimes it is unavoidable to include implementation directives in a requirements specification, for example a system may require to interact with another existing system by passing data to it. The format of the data for the second system may already be defined and, hence, the output from the second system (a design and implementation directive) will need to be described in the requirements specification. However, as a general principle, design and implementation descriptions should be minimised in a requirements specification.

A Technical Segue

This article requires very little knowledge of technical issues. However a basic understanding of some of the technologies required to develop industrial computer systems is necessary to access the remaining sections of this article.

The main form of database used for storing large data in applications where a large quantity of data is stored is that of a relational database. This consists of a series of tables which contain records associated with an application. For example, in terms of the ICS system a typical record would be that describing the initial referral of a child or the health details in the core assessment. Each table would consist of fixed length records.

A key property of relational databases is that, as their name suggests, they keep relationship links between the tables. For example there would be links from a table that contained referral data to the contact details for a child.

Relational database technology is now very mature and a large number of programming languages have facilities for accessing relational databases; typically a program would, via a windows-based form, retrieve a table for records that satisfy some search criterion, extract the records that match the criterion and then retrieve any other records relevant to the ones that were retrieved, for example records associated with significant events associated with the child.

Errors and the Systems Approach

The systems approach to error identification and rectification is one that has achieved a high degree of maturity in the identification of problems after an incident that is associated with an engineered product such as a plane or a chemical reactor. (Reason, 1997). It is also increasingly being used in medical applications (Reason, 2000; Wieman and Wieman, 2004).

The rationale underlying the systems approach to error identification and rectification is to use the surface manifestation of an error as the *start* of an investigation rather than regarding the error as an example of human error with a consequent instigation of processes associated with this (Munro, 2005), for example disciplinary processes or the imposition, sometimes inadequate, of standards and procedures that solely address the surface of the error.

Two medical examples illustrate this approach. The first is where a patient dies because there was a delay in finding specialist equipment that could have helped. Here blame could be immediately ascribed to the member of staff responsible for locating the item. However, a deeper investigation might discover that the member of staff normally did not work in the ward that the death occurred, and, that while they were aware of the location of the item in their own ward, it was stored in a different place in the ward that the incident occurred in. In order to make sure that this latent error did not occur again the hospital would ensure that the item that was missed was placed in the same place in every ward and that it was replaced in its original position after it was used. Also, staff when they are inducted into the hospital would be shown the position of standard items of equipment.

A second example of an error that might be ascribed to individual incompetence is that of a patient being given a wrong injection during some critical incident such as a stroke occurring. This could have happened because the bottle used to contain the injection could have been very similar in size and colour to the one that should have been used. The solution for a hospital is to employ some form of labelling or packaging of medicine

containers that enables medical staff to quickly determine that the correct medicine is being deployed (Berman, 2004).

The two examples here are primarily didactic. However, they also have an important relevance to the theme of this article. First, they concern issues associated with locating important artefacts. There is an analogue here with the use of a computer-based chronicling system in that the location of important information such as a paediatrician's report on a potential physical abuse diagnosis should be easily found.

Second they deal with stress as a cause for errors. The two medical examples both occur in a highly stressed environment: that of dealing with a patient that could die and applying procedures that reduce the risks that this will happen. Social workers also work in stressed environments.

. . . traumatised, even defeated occupation . . . the manifestations of stress and unhappiness in . . . social services departments were various, serious and pervasive. Social workers talked of how commonplace it was to see colleagues in tears . . . [with] social workers . . . walking out . . . of people locking themselves into their rooms or just disappearing from the office for hours on end. Going sick for some time each week or month seemed routinized in many agencies. A large number of the long serving fieldworkers had recurring and serious health problems which resulted in extended periods of absence. Many spoke of being emotionally and physically exhausted by the demands of their work.

(Jones, 2001) reproduced in (Collins, 2008).

It would clearly be over-claiming to say that the stress of a medical event such as that experienced when dealing with a critical incident is similar to that associated with the work of a social worker: for most clinicians, apart from those involved in A and E work, the former consists of periods when routine is carried out interspersed with moments of high stress.

Social work within an environment where there are staff vacancies, where events are often interrupt driven, where there is a high workload and where the consequences of getting a decision wrong leads to a more constant stress, albeit at a lower level than that intermittently experienced by medical staff during critical incidents—however, it is still the type of stress that leads to errors.

The inevitable result of stress is of a consequent lack of attention to detail resulting in: missing the label on a bottle, taking time to discover the location of critical equipment, missing the contradictory reports from two paediatricians from different hospitals and mislaying a FAX from a child police protection team. In the stressed environment that is a children's department a documentation system where it is difficult to find key documents can directly lead to serious harm being occasioned to a child through important information not being at hand or, indirectly, by the fact that the overhead required to locate important information lessens the time for a social worker to carry out front-line functions.

In terms of the relevance to this article the Victoria Climbié report that forms a central document in the remainder of the article describes social work environments where stress was high arising from factors such as: large numbers of vacancies, high work-load, financial cutbacks and in one case a structural reorganisation.

The processes used by systems practitioners to analyse surface errors and identify deeper errors (often known as latent errors) are conceptually simple. A number of them are described in (Reason, 1997). There are two uses of such techniques: that of validating a

system and ensuring the absence of latent errors and that of determining the reason for an error with a view to eliminate latent error conditions. The former involves the generation of potential error-conditions via scenarios and checking back into a system whether such errors were committed because of deep-seated error conditions in the system. The latter is very similar except that the errors are actual rather than generated from some scenario.

Procedures to identify latent errors used in areas such as aero-engineering are conceptually simple and, when used to eradicate a latent error, consist of the following steps (Reason, 1997):

1. Gather descriptive information about the incident: data such as when it occurred, for example, what component of a plane was affected.
2. Describe the nature of the event. For example whether it led to a flight delay.
3. Describe the nature of the lapse. For example, a component falling from a maintained plane and injuring a maintenance worker.
4. Detail all the contributing factors, for example the fact that a worker was not trained or did not have the proper set of documentation to carry out a task.
5. Detail any procedures or policies that could have prevented the incident but failed.
6. Detail the corrective measures that need to be carried out to prevent the incident occurring again.

There is not a large literature associated with the use of systems approaches in social work and a lack of case studies, There are a small number of books, for example (Chetkoy-Yanoov, 1992), (Ross, 1999) and an equally small number of research articles, for example (Munro, 2005) and (Rzepnicki and Johnson, 2005). Most of the literature concentrates on providing well-argued cases for the adoption of the approach. An exception to this is (Fish *et al*, 2008) which provides both training material and two valuable case studies on the application of systems techniques to case reviews. In terms of the research in this article: the use of systems techniques to improve computer support to social workers there is currently no literature.

The aim of this article is to show how this simple list of processes can be used to determine the properties of a computer system that can be used for chronicling the events that are associated with a child who is the subject of attention of a children's department. It used the report of the Victoria Climbié as a starting point.

The Victoria Climbié inquiry

In February 2000 a young child, Victoria Climbié died at St Mary's Hospital, Paddington. She had suffered horrendous abuse by her great aunt and a male friend. The death caused a huge popular outcry and a public inquiry was mounted by the then British Department of Health. The report (Laming, 2003) detailed 12 occasions when her life could have been saved and also contained a chronicle of documentation, management and communication errors that meant that the opportunities were not taken. In citing sections of the Climbié inquiry this article will use the paragraph numbering in the report.

It is worth briefly describing two examples relevant to this article. The first was that there was conflicting medical evidence in a number of documents one of which suggested deliberate physical harm had been occasioned to Victoria and documentation which negated this (6.337). The second was that front-line staff often had to work with 'numerous volumes of guidance' (1.60) and that in some cases documentation was out of date.

There have been a number of critiques of this extensive report. For example, Munro (Munro, 2005) has pointed out that in common with other investigations the report concentrated on surface error rather than systemic errors.

Rustin (2004) has stated that ‘the quasi-judicial procedure adopted in this inquiry was well adapted to providing a detailed analysis of the sequence of events’ but, in antithesis to the thrust of *this* article, pointed out that it was able to attribute ‘responsibility for failures and errors to individuals associated with the case’. The article also contained criticisms of its procedural focus which encouraged the use of low-level instruments such as procedures and standards.

Reder and Duncan (Reder and Duncan, 2004) presciently pointed out that one of the possible fall-outs from the inquiry would be that remedies may be over determined by bureaucratic bias, but that the report offered major opportunities to implement organic improvements in areas such as training and resourcing.

Parton (Parton, 2004) in comparing an earlier report on the death of a child, Maria Colwell, pointed out that the overall impression gained from the Colwell and Climbié reports is that the complexity associated with the responsibilities of agencies had considerably increased—another stress factor to add to those detailed in an earlier section of this article.

The main thrust of responses to the Climbié report was to—correctly—predict an increase in procedural constraints and micro-descriptions of children’s social work practice. ICS can be seen as a concrete manifestation of this in that it: forced social workers into a rigid workflow with predetermined times for key activities; presented the computer user with a large number of forms, each form having a main purpose of providing management information; used many tick-boxes in order to check that small procedural steps had been carried out; and relegated the essential narrative focus of social work into small text boxes which were isolated from other text.

What this article attempts to do is not to contribute to any debate about the effect of the Climbié report on British children’s work, but to gain utility from the report by using the surface description of errors to attempt to identify systemic errors and then transform these errors into a requirements specification for a chronicling system for children’s services.

What is worth saying as an endnote to this section is that the Climbié inquiry report detailed the non-use of information technology within children’s departments: the overall image that is gained of the employment of IT was of an almost complete lack of utilisation: the reader of the report is confronted with images of FAX machines disgorging large amounts of paper; the development of handwritten narratives; undocumented, important phone calls; and the use of manual filing systems with filing trays or boxes being used for the temporary storage of documents in transit. This should not be seen as criticism. What has to be remembered is that the inquiry detailed normal practice in social work offices in the late nineties. There is however, criticism in this article of the deployment of IT; but it is that of the system(s) that were used to improve the day-to-day work of the children’s social worker.

Analysis of the Climbié Inquiry Report

The inquiry report detailed a number of problems within the children’s departments and external agencies that knew Victoria Climbié. A list is detailed below with a small subset of examples from the many documented in the report.

- A lack of documentation of procedures governing a child in need or out-of-date documentation being employed (4.16, 6.68).

- A lack of training for new inductees to children's social work (4.16, 5.29, 5.30, 5.47, 6.9).
- The absence of data that could be used when allocating a social worker to a case (4.24).
- Inadequate filing systems (5.34, 5.36, 5.179).
- Inadequate management information (6.72)
- Major financial pressures (5.39-5.44).
- A major reliance on agency staff (5.59, 5.60, 5.163).
- A reliance on paper systems (5.84) and electronic FAX transmission.
- A reliance on word of mouth for conveying important information (6.176, 6.183, 6.220)
- A lack of records that document important events (5.90).
- Inadequate documentation (5.105, 5.108, 5.116, 5.139, 6.7).
- A poor state of narrative fragments, for example their being illegible or perfunctory (6.185).
- Missing documentation (5.112, 6.225, 6.230, 6.278).
- Delays in carrying out important actions (5.127, 5.169).
- Poor communication between external agencies and social workers (5.142, 5.149).
- A lack of analysis of cases (5.183, 6.17).
- Problems with managerial supervision (5.185, 6.38-6.40)
- Problems with staff recruitment and retention (6.130-6.140).
- Procedures and processes not being followed correctly (6.151).
- Worries that notes had been inadvertently or deliberately modified (6.526, 6.527).
- Problems in relationships between a social work department and other agencies (14.17-14.22).

Many of these incidents arise from problems that a sensitive computer system suited to the day-to-day work of a social worker data could not *directly* solve. There are two examples of this. First, retention and recruitment would not really be addressed by a technologically advanced, perfectly implemented IT system, although a poor implementation would be a contributing factor that lead to poor retention (UNISON, 2008). Second, poor line supervision would not be affected by a good IT system: its role here would be subsidiary, but supportive, of adequate managerial processes.

The stress in this paper is on what a good chronicling system would contain and is, thus, limited in scope.

The Analysis

The analysis that was carried out was based on a dilute version of one implemented by the Boeing Corporation (Boeing, 1994) a condensed version can be found in Reason (1997). It follows the outline description found in the section 'Errors and the Systems Approach'.

All the surface errors that were associated with the lack of a paper or computer-based resource were listed and then they were aggregated into a functional description of a computer system that would, at best, eradicate the error or, at worst, reduce the probability of the error considerably. Below is a description of one particular set of events associated with the social worker that was responsible for Victoria Climbié in Haringey (6.207-6.208). It is worth pointing out that I did not have access to the old Haringey procedures and, as a consequence, have not provided details of how they were deficient but have hedged the actions regarding their modification in the *Corrective measure* section. The reference in the *Link to requirements specification* section is to a numbered bullet point in the next part of this article.

Error Nature: Social Worker with no experience of a s47 inquiry allocated.

Potential nature of the lapse: No checking of experience.

Contributing factor: Difficulty in finding information about social worker experience and applying any procedures.

Any procedures and processes: Local procedure handbook in Haringey.

Corrective measure: Computer-based documentation should be created describing the experience of each social worker—both permanent and agency social workers. The current process for checking experience should be examined; if deficient it should be modified and if non-existent created.

Link to requirements specification: Bullet point 22.

Another example of the documentation of an allocation lapse (6.209) is

Error Nature: Social Worker with heavy workload allocated further case.

Potential nature of the lapse: No checking of workload

Contributing factor: Difficulty in finding information about social worker workload.

Any procedures and processes: Local procedure handbook in Haringey.

Corrective measure: Computer-based documentation should be created listing the current cases—for both permanent and agency social workers. The current process for checking experience should be examined and if deficient should be modified and if non-existent should be created

Link to requirements specification: Bullet point 22.

Here, as with most systemic errors, there are a number of contributory factors in the examples above they are poor documentation and a possible lack of procedures. This article concentrates on those related to computer implementations.

Properties of a Children's Chronicling System

The analysis of the Climbié report detailed in the previous section gave rise to the following properties of a system for chronicling the interaction between a children's department, agencies such as the local police child protection unit, a child and any other persons relevant to the child's state.

1. The system should make take cognisance of the general computing skills of social workers.

2. The system should be developed in such a way that implementation of change, for example change associated with the reorganisation of a children's department, would be straightforward.
3. The system should reflect current government and local authority mandates regarding child care, for example those associated with census reporting.
4. The system should reflect current legislation regarding confidentiality and access, for example the Data Protection Act.
5. It should be straightforward to modify the system to cope with new events, for example local changes in child protection procedures or government policy changes.
6. The system should be easily available to social workers and others such as staff at Accident and Emergency departments. This should either be direct, via a computer, or via a member of staff in the children's department using well-defined procedures.
7. The notes for a child should be held in *one* computer-based document: the case notes.
8. The case notes for a child that is held by a children's department should be easily searchable using the same facilities that are provided by a modern search engine.
9. The collection of case notes that are held by a children's department should be easily searchable using the same facilities that are provided by a modern search engine.
10. There should be sufficient detail in the case notes for the child to be uniquely identified.
11. The case notes for a child should be partitioned into events that chronicle the interactions with the child and others. For example, the event of a strategy meeting, a referral or a case closure. These events should not be confined to internal occurrences within a children's department but would also include events associated with external agencies, for example the event of a child entering a hospital.
12. When an event is created guidance text on how the event should be documented and progressed should be initially created within the text for the event.
13. The case notes should contain text that acts as an index; this index should be ordered chronologically with each event being easily identified. It should be easy to move from an index item to the event that it describes.
14. As a child progresses through their interaction with a children's department they should be assigned an identifying category, for example 'child in need', 'child in care' or 'child whose case has been closed'.
15. It should be easy to display all the children in a particular category.
16. It should be easy to print all or part of the case notes.
17. It should be straightforward for a manager to annotate the case notes and that the identity of the manager can be easily discerned from viewing the case notes.
18. It should be easy to create a file from part or whole of the case notes that can be sent electronically to another agency.

19. Version control should be implemented on the case notes in that any change to case notes will create a new version with the old version being still in existence.
20. There should be a computer-based document that provides details of each children's social worker such as their office number and mobile number together with a list of children they are currently responsible for.
21. It should be easy to move from a child's name in the social worker listing to the case notes of a child.
22. The list of social workers should contain, for each social worker, data necessary to ascertain whether that can be assigned to a child. This data will include their current workload and a synopsis of their experience and training.
23. It should be easy to discern the progress of the case notes.
24. It should be easy for a social worker to include in the case notes documents or links to documents originated outside the children's department, for example word-processed documents from a hospital or an email from a housing department.
25. It should be easy for managers to examine the progress of cases, both on an individual basis and also collectively.
26. The case notes should contain data that is required for statutory reporting. This should be embedded in such a way that it can be easily extracted either manually or via a computer program.
27. It should be possible to transfer data from a variety of devices to the case notes, for example a laptop computer or a blackberry organiser.
28. It should be easy to transfer the case notes for a child from one children's department to another.

The vast majority of the statements above were constructed from the analysis that was carried out. The only exceptions are statement 1 to 5 which are general statements that should always be included in a requirements specification.

There are a number of statement such as 'easily extracted', 'easy to move', 'easily identified' and 'easily searchable'. What these statements mean is that the functions that they describe should be implemented in such a way that a small number of mouse movements, mouse clicks and data entry should occur.

The description above is informed by two factors: the systemic analysis that was carried out and by good practice in specifying a computer system (Sommerville, 2006). This clearly is a very small description and, compared with the hundreds of pages of computer documentation provided to local authorities and package developers of ICS, some orders of magnitude less. What it does do, however, is to transfer responsibility to children's departments for the development of chronicling systems where a proper analysis of needs can be carried out based on factors such as the organisation of the children's department and the local nature of the client base. It allows a number of simple implementations, for example one where the case notes are stored as *MS-Word* documents.

Differences

The aim of this section is to examine the differences between the requirements specification documented above and the contents of the DCSF document *Integrated Children's System Minimum Compliance Criteria* that specified the criteria that would be used to decide whether a system matched the requirements of ICS and hence qualified for

grant support. References below are to ‘business requirements’ within the document. What is interesting about the results of this research is that much of the specification for a chronicling system that has been developed by the systemic investigation detailed in this article can be found in the DCSF documentation for example (D33)

Having entered information, staff are able to output (to print or screen as appropriate) information in a convenient and concise format.

and (D36)

Front-line staff and managers are able to see on a computer screen a list of children for whom they currently have case responsibility. Managers are able to determine which cases are unallocated.

are not far removed from the requirements specification that has been described in this article. However, general statements such as these are swamped by mandates about implementation. The remainder of this section examines some of them.

The first criterion in the document (D28) stated that

NB: Single data entry is fundamental to the system. Implicit in the business requirement was that the IT system should have single data entry, otherwise it will not support practitioners effectively and will not work as intended

This effectively shut down the solution space of designs in that it specified a forms-based interface to the system rather than the free-text interface that would be used in a word-processor based system or a wiki-based system. A general statement (D32) was made that

..information required for each of the key processes for responding to children in need is held electronically using the content of the appropriate ICS exemplar.

The reference here is to the specification of a form known as an exemplar documented in the DCSF requirements documentation; the exemplars contained form elements such as tick boxes and text boxes—in some cases very large numbers of them. They resemble the type of forms that are used in industrial and commercial computing. Here the implication (rather than a mandate) is that there would be a one-to-one relationship between the contents of exemplars and individual records in the database used to hold case data.

The criterion used for searching (D34) specified a form of search that relied on database linkages being maintained between entities such as:

The database containing all the basic information on children in need is searchable so that links can be made for the purposes of safeguarding children. These include in both search directions: adult – child; child – address; child – family; child – school; child – placement; child – need category; child – service.

This implies the use of a relational database where such relationships would be held; again the stress in this part of the document is on data fields.

The data about key adults associated with a child (D35) was also specified in such a way that an industrial relational database should have been used. This is also true with regard to the services that a child received (D38) and also with regard to querying the names of children who are associated with an adult (D40).

In probably the most direct description of an implementation (D48) using individual records the business requirement states that a number of separate *records* associated with exemplars are populated with data from the core assessment exemplar. Here the clear

implication is that a system is to be based on a collection of discrete records and hence would lead to an atomisation of the data.

There are a number of references to the exemplars (D49, D50). An examination of the exemplars indicates that they are displayed in such a way that they imply a forms-based interface.

The differences between the requirements specification derived from a latent error analysis and the contents of the DCSF document *Integrated Children's System Minimum Compliance Criteria* is key to an understanding of the failure of ICS.

Implementation directives were scattered throughout all the DCSF documentation effectively mandating the use of a relational database with records that had a one-to-one relationship with parts of an exemplar. What this led to was the development of a system that atomised the data associated with a child and destroyed the narrative forming process that is key to client interaction in social work (White *et al*, 2009).

Using a relational database also relegated the text that was associated with an event to something subsidiary to the management information associated with an exemplar; for example a common complaint about implementations of the ICS was that the text boxes associated with exemplar forms were of fixed length (due to the nature of relational databases) and that staff filling in these boxes spent an inordinate amount of time editing the text to fit.

Another area where the compliance document was deficient was in the mandating of the use of exemplars. The core assessment contains a number of these exemplars, displayed in such a way that they could be mapped to a computer form; each of these contains associated text and a series of checkboxes, for example the health section contains 18 checkboxes spread over two pages with space for free text which, at most, would contain 200 words. It is described by:

Please record details of areas of strength, specific details of any areas of unmet need and any evidence which suggests the child is suffering, or is likely to suffer significant harm in relation to health.

The use of checkboxes has been controversial, certainly in popular accounts of the trials of staff using the ICS system (Child protection stifled by £30m computer system, *Guardian* 19th Nov. 2008) and it is worth focussing on them.

Tick boxes are routinely used by professionals in a number of areas. Gawande (2010) describes their use in medicine, aviation and complex projects such as the building of a state-of-the-art shopping complex. Such checklists have been highly effective in medicine for example (Haynes, 2009).

There are a number of reasons for using checklists. The first is where a series of tasks is so complicated that even an experienced practitioner may forget an important step in that task. The second reason is that some tasks may be so stressful or carried out in a stressed atmosphere that steps might be omitted. The third reason is to assist inexperienced staff carrying out a task.

In the Climbié Inquiry report there were a number of occasions where there were problems with extant standards and procedures, for example (1.60), (5.63) and (6.59) and the use of inexperienced staff (1.56). The use of these checkboxes could be seen as an attempt to address the three issues that alluded to in the previous paragraph.

However, the check boxes were inadequate for a number of reasons. First, ticking such a box does not indicate that a task has been carried out. Second the fact that the compliance document issued by the DCSF specified (D32) that

The system SHOULD include the capability to collect the tick boxes in the health; education; emotional and behavioural development and self-care skills; identity and social presentation; family and social relationships; and family and environmental factors sections of the *Core Assessment* forms and the equivalent tick boxes on the *Assessment and Progress Records*.

further added pressure on a certain type of implementation on the developers of ICS systems. The tick box specification does not directly mandate a relational database implementation (they could be implemented in a word-processed document); however, combined with many other implementation directives the clear message to the implementers was that an atomised, record-based, forms-based implementation was mandated.

It is worth pointing out here that, irrespective of the deleterious effect of including these boxes in terms of computer implementation, that many of the items that require ticks violate a number of principles governing them. The main principle is that it should be easy to confirm that an action associated with a tick-box has been carried out for example that a wing-flap on a plane has been deployed in a certain way or that a particular configuration of an item of ophthalmic equipment has been established before it is used in in-vitro surgery. Many of the check-boxes do not have this property. For example in the health part of the core assessment exemplar there are boxes labelled 'Child is given an adequate and nutritious diet including fluids', 'Child has a regular sleep pattern' and 'Parent gives comfort if child is ill or injured.' It is difficult to understand how this information could be reliably ascertained given that it might be elicited from adults who were abusing a child. Second tick boxes should be used sparingly (Sharp *et al*, 2007). Third, that in a human-centred application tick boxes should be subsidiary to text. The cue given in the printed examples of the exemplars provided by the DCSF is that tick boxes represent the main way that the interaction with a child is documented; this is exacerbated by the fact that a relational database system is oriented towards fixed length text descriptions such as the name of a product or the address of an employee.

Conclusions

An important point that should be made about the work documented here is that to apply the system techniques described does not require a serious error to occur. Clearly this article relies on such an event. However, working back from errors and threats in order to improve a system, irrespective of whether it is computer-based or not, can be carried out by professionals for example by using workshops or computer tools such as wikis in order to improve and learn (Fish, 2008). It is a standard technique, for example, in computer security where an existing computer system is examined by listing the threats that can occur, deciding on whether the system can resist the threats and, if not, deciding on changes to the system to cope with the threat (Stalling, 2008).

There are a number of general conclusions that the research reported in this article makes which are *not* specific to the Victoria Climbié inquiry, the ICS system and English and Welsh social work:

- That if chronicling systems for professionals such as social workers, probation officers and health professionals are to be developed, the specification of the chronicling system should be as free of implementation directives as possible.

Such directives close down a solution space and can easily impose on professionals a rigid approach to work. Clearly issues such as the timing of critical events in ICS were mandated externally; however, it should not be a technical issue as how these timings are kept to. This issue should be addressed by individual children's departments via an attention to managerial processes, *supported* by a computer system and not by a requirements specification that acts as a proxy for management implementing a form of technology-based nagging

- That a consideration of latent error conditions within a system is capable of creating a description of a computer system that addresses the needs of a class of professional workers. This is a highly focussed example of the approach put forward in articles such as Munro (2005) and in works such as Fish (2008).
- Specifying a computing system in terms of just eliminating surface errors can produce an artefact that is no substitute for good management, good training and a professional approach to children's social work. The example of the check-box approach to report writing is an example of this: proper supervision, an internal audit regime and the reliance on pure narrative is clearly a better solution to the problems of documenting interactions that are associated with a child in need of protection or support than ticking boxes and entering very limited amounts of text.
- That latent error analysis combined with a proper standard of describing requirements specification creates a description that would return a high degree of involvement in the specification of a computer system to front-line professionals and their managers. It has given rise to a specification at a level of detail that it can be used by local authorities to develop or commission an inexpensive system whose *detailed* properties would be determined by children's professionals critically examining their own work. The word-processed solution, described here, could be in use after the specification and construction of the required *MS Word* templates.
- That the description of the system described in this paper is generic and could be used as the basis for chronicling systems in other areas. The vast majority of requirements statements can be applied to any system for chronicling.

Clearly this article has a narrow focus in that it describes the use of a form of systemic analysis to specify the requirements for a chronicling system in children's social work. Many of the latent errors that were discovered as part of the analysis were non-documentation related. These were eliminated as they fell out of the narrow focus of this research. However, enough of them were discovered to posit that the technique has major 'application in areas outside computer system specification for children's social work.

My hope is that that the results reported in this article would have two effects. First, it would provide enough description and evidence to enable children's departments to question the efficacy of atomised approaches to chronicling and implement much simpler systems. During the final drafting of this article a new Conservative government took office in the United Kingdom with sweeping aims for children's social work including the use of computer systems. A key extract from their aims document (Conservative Party, 2010) is

Allow Local Authorities to build systems that work for their employees, rather than Whitehall. OFSTED recently reported its dissatisfaction that the Integrated Children's Systems (ICS) in many local authorities are cumbersome, time-consuming and have a negative impact on social workers' assessments. These systems are built to restrictive government

specifications which greatly slow down record keeping. Tellingly, Kensington and Chelsea, who refused government grants and had their IT team sit design their own system with their social workers, have just been given an award for their innovation. We want all Local Authorities to have the freedom to develop their own user-friendly systems to specifications that reflect their needs rather than those of central government.

It is hoped that the research here will contribute to this intention.

Second, that it would provide some evidence that a systemic approach to error response works and can be applied in other areas such as training, informal auditing of current practice and managerial supervision.

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