Modelling the process of Health Visiting

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Abstract

It is very difficult to get a realistic picture of organizational activity. Yet without such a picture it is well nigh impossible to design Information Technology (IT) systems to properly support the work of the healthcare professional. This article reports on a study undertaken in conjunction with Mancunian Community Health Trust to model certain Trust processes. A number of different professionals were involved in these processes, but the study focused mainly on Health Visitors. This model could be used as a basis for making decisions about the process, as a basis for developing a simulation model, or as a basis for providing IT support for the work of professionals.

1. Introduction

Information Technology (IT) is invading the domain of nursing in many ways. There is a plethora of systems for nursing information management, diagnostic and care planning, and for graphics display as well as adaptations of administrative support systems. This invasion is predominantly driven by top-down organizational needs for data handling and activity monitoring, and to a lesser extent by the technological developments of software tools intended to help clinicians improve outcomes. These developments are on the whole ad-hoc and do not take place within any understandable framework. The combination of need, technology and opportunity leads to proliferation of technologies in certain areas and paucity in others.

Unfortunately there is no coherent approach to the issue of IT support for professional activity as a whole. We have yet to understand how best to bring together the many different IT systems and tools so that they support the health care professionals in their work

One way of addressing this issue is to tie the different technologies together using a communications network. This is the basis for the recently-concluded Integrated Clinical Workstation Programme. Another possible way is through the medium of process models (PM). Process models can be used to drive the organization’s processes through IT [1]. They can also be used as a tool to aid the understanding of complex organizational behaviour. In so doing, they are able to help professionals and managers make more sensible decisions in that area.

The APPUS project (Assisting Process Performance and Utilisation through Simulation) is looking at ways to improve the dialogue between managers and IT specialists through simulation. (Of course a ‘manager’ is *any* professional who has to manage information, processes, or people). The first phase is concerned with understanding the kind of processes which exist in the community healthcare area and which could be considered as candidates for simulation. Funding was obtained from the Engineering and Physical Sciences Research Council (EPSRC) for this 2 year project in partnership with the Mancunian Community Health Trust (MCHT) and Lanner Group, the developer of the Witness™ simulation technology.

The Trust is a valuable resource for investigators. Healthcare processes are characteristic of professional work in other domains and so the results can have wide applicability. Such processes have in common fairly well defined rules (arising from statute, business needs, custom, and professional practice) which act as a framework for the initiative, training and discretion of the individual practitioner. It is only now that techniques are becoming available to model such activity.

This article describes the results of a short study of the organization processes at Mancunian Community Health Trust in which Health Visitors primarily participate.

At the moment, only one site, that of a GP Fundholder with Community District Nurses and Health Visitors working remotely from the Trust centres has been studied.

Although focused on only part of the work of Health Visitors, many of the issues are of concern to nurses in general, to clinicians, to administrators and indeed to professionals in other areas.

2. Support

How should IT support the work of professionals? It can do this in a number of ways:

- by ensuring that data needed by the professional is available when (and only when) it is needed;
- by ensuring that routine transactions occur with minimal human intervention; by ensuring that the nurse's contribution to the organization's processes are handled appropriately;
- by providing information in a way that is intuitive to the individual.

A useful metaphor is that of the 'perfect maid', who discreetly anticipates the every need of her mistress and ensures that everything is 'to hand' at the appropriate time and context. The technological support ought to be there to assist the nurses in doing the work for which they are specially trained, to allow them get on with their job and to improve outcomes. Such assistance needs anticipation and thus a knowledge of the healthcare professional's work process.

In so doing, the vitally important routine communication between people, groups, departments and organizations is supported. Professionals can then focus on the non-routine issues, problems and negotiations, the aspect of professional work that IT cannot handle.

Also it has to be remembered that the environment is ever-changing. This impacts in three ways: (i) the requirements for new systems change as time goes by, (ii) new tools come along and have to be integrated at a late stage, and (iii) the facilities that nursing professionals want from their IT changes. This means that the support systems need to be able to handle change.

If IT is to be capable of such provision, then system designers need to understand what it is that the professional does with the information, what they would like to do with it, when they need it, why, and in what format. A suitable process model can help explore these issues.

3. How organizations 'deliver the goods'

Organizations achieve their purpose by doing three things:

- providing resources for people,
- educating them on a particular way of working, and
- co-ordinating their activities such that the nett effect of individual effort is the fulfilment of purpose or achievement of organization objectives.

The latter area is the one of interest to process modellers. The research area of process modelling started as a consequence of the massive problems experienced in the design, implementation and delivery of large IT systems. In the '80s these systems were complex, difficult to manage, ever-changing, and, more often than not, did not fully meet their requirements when they were eventually delivered (late). One approach to this problem was to analyse the patterns of activities adopted by professional software engineers, and to see if modelling that process, and supporting it through IT in a comprehensive manner, could improve performance and quality.

This behaviour is of course very complex but one way of coping with complexity is to seek out patterns of interactions between people or organization units, their activity, and to model them as processes. In the context of process modelling, 'business' and 'organization' can be taken to be synonymous.

Where there is a pattern to the behaviour, we can say that a process exists. A process is a series of steps which brings about some desired outcome. There are many kinds of process - individual human work processes (behaviour only), organizationally-defined processes (those with patterns to interactions and activities), operational processes, production processes and last, but not least, management and change processes. In the context of Health Visiting, for example, there are individual processes (e.g. the health visiting process), and organization processes (such as birth registration). This work is particularly concerned with organization processes, and by focusing on these it has to be recognized that *only a small part* of the work of the professional is described.

4. Process modelling

The word 'model' has two meanings in the dictionary: one is 'abstract representations of an object or concept' - something, devoid of detail, for the purpose of understanding or representing a feature in the real world. Another meaning is 'form', where the model acts as a template to help shape some useful artefact or other real-world construct.

In this article we are concerned with process modelling in only its former sense (however models in the latter sense are of great interest to the Informatics Process Group: how to effectively drive organization processes using IT). A process model can help explain how organization goals can be met by the invocation of processes, such that the deliverables of the process contribute in some structured way to the achievement of organization goals. They can also act as a template for defining and guiding (as closely or freely as appropriate) human activity so that desired outcomes are achieved.

Processes can produce objects (which can be tangible or intangible) or define organization response to certain situations, define how goals are to be attained, or how they are to be maintained. The same rules of process modelling apply to all. Most process models describe methodical steps needed to accomplish some task in a rather mechanistic way, but the IPG is seeking to extend this work by modelling certain of the more routine activity undertaken by professionals. This will hopefully help us understand organization activity, provide a basis for evolutionary change to these processes, provide a basis for improving decisions about such processes by using simulation techniques, and provide the basis for a more rational IT support to professional work activity.

An organization achieves its objectives when individuals do work, and this work is co-ordinated in some systematic fashion. This behaviour can usefully be described in terms of roles, activities, and interactions [2]. Roles are convenient encapsulations of behaviour, and can be thought of as a kind of script, which is brought to life by an actor or agent, and that agent can be a human or a machine. At a railway station, the ticket-selling role might be undertaken by a clerk, thus the role is being enacted by a human individual. However this role could also be enacted by a machine. They can both be thought of as 'playing' roles, interacting with the customer to achieve a desired outcome - the passenger gets the correct ticket for the correct payment. In one case, the agent of the role is a human, in the other, it is a machine. It is quite important to separate the notion of the behaviour from the agent (or actor) 'playing' the role. Of course this is not to say that machines can undertake *any* role, but studying organization activity from this aspect helps to draw out the tacit richness of what people contribute to otherwise seemingly routine activity. Professional work in healthcare is not simply a matter of following a defined process.

A single role in fact describes a simple process, that undertaken by a single agent. These become interesting from an organization viewpoint when we bring them together with other roles with whom they need to communicate to achieve specific organization objectives. A diagram representing this is called a role/activity diagram (RAD). Figure 3 is an example of a RAD.

This formalism is different from that adopted in the NHS COSMOS model [3, 4]. COSMOS was not used for this study because it is more concerned with the clinical record, and with the structure of activities, and, unfortunately, does not support a 'role' concept. For those familiar with COSMOS, a RAD approximates to a combination of its Event diagram and Interaction diagram.

5. The Child Health Information Process Model

The background to this work was researched by the author in a series of interviews across a spectrum of community health workers, focusing on a single medical centre. Interviewees included the GP Fundholder, the responsible nursing manager, an executive director of the Trust, as well as the Health Visitors and District Nursing Sister at the centre. The task was to model the 'Nursing Process' of the Trust at that site.

Initial inquiry revealed the greater interaction of the Health Visitors with the organization processes. Thus subsequent work focused on these processes and the contributions made to them by Health Visitors, and what the processes provided to Health Visitors that enabled them to carry out their professional activities.

In the context of the organization, the work of a Health Visitor is too complex to understand in terms a model of the 'Health Visiting Process'. It is more helpful to consider those interdependent processes in which Health Visitors play a part. In some of these, such as the Activity Monitoring processes, it is a minor part (simply furnishing data). Others, such as the Pre-School Child Health Surveillance Programme [5], have the Health Visitor centre stage. The focus of this study was in information-intensive activities and so those associated with the administration of Child Health Surveillance were selected for study. These were referred to a the Child Health Information Process (CHIP). It was recognized that this was a small but significant part of the work of each and every Health Visitor.

One of the problems when dealing with process models is how to differentiate between the Health Visitor as an agent and the Health Visitor as a role in the organization. One way of doing it is to use the noun to refer to the agent (Health Visitor) and the gerund to refer to the role (Health Visiting).

The interviews were undertaken at the workplace and consisted of semi-structured interviews conducted by a post-graduate student. The activities of immediate concern were the information-intensive work involved in administering the Pre-school Child Health Surveillance Programme. These activities took up a significant proportion of a Health Visitor's time, and were information-intensive. This phase of the project took 25 interviews lasting about an hour each.

Almost all information was acquired verbally. The Manchester Pre-School Child Health Surveillance Programme was the most significant document, and others contributed in a lesser way to the accuracy of the model.

In order to make the model more complete, staff involved with systems at the Trust headquarters, Mauldeth House, were also interviewed. An overview of the resulting model is shown in Figure 1. This diagram shows the 4 sub-processes that were identified, and how they relate to each other (by interactions) and to the child. Figure 2 shows the constituent roles of one of the sub-processes.

It was not thought appropriate to model child behaviour for the CHIP, but if it were to be done, it would be a process representation of the 'care plan' for normal development which the Surveillance Programme defines, plus all the variants possible for non-normal development. Thus the box labelled 'child' in the diagram does not represent any specific activity. In this context the child has been taken as a unifying theme for the organizational activity represented by the roles and interactions.

The title above a role is comprised of two parts. The first is the agent responsible for the role which can be an organization (e.g. Mauldeth House) or a staff title (e.g. Health Visitor). The second part is a name for the associated behaviour (e.g. Handling Movement-out). Of course activity in these roles can take place at any time.

An example of a role is shown in Figure 3. This is role no. 17, the Handling of Movements-out, and is the responsibility of the Health Visitor. It shows the different ways that a Movement-out can be initiated and the steps which have to be carried out. These steps are linear, one follows another. It is often the case that the steps that are needed depend on certain conditions, and in that case there can be a number of paths through the role. This can be represented diagrammatically.

There is no clear start and finish to this process model. This is because it is a process designed to handle many instances of care plans of pre-school children.

The modelling process captured first of all the activities of Health Visiting and their interactions with others, then encapsulated them wherever possible into roles. Sometimes they were obvious, but sometimes the role encapsulations had to be invented. The common theme linking all the roles is of course the child, and the child is central to the representation in Figure 1. There are a two transformation processes in evidence in the CHIP, and these are the introduction of child and family data to the Trust systems, and the removal of child and family data from the Trust systems. There are facilitation processes, such as the administering of clinics, and also the handling of change of address.

The Hospital role in the CHIP was speculative. No hospital trust was participating in the study, and it was felt that some behaviour ought to be represented for the sake of completeness.

These diagrams do not show how exceptions are handled. For example: what is done if the address is incorrect? What is done if the child is not actually in the area of the particular Health Visitor to whom it the notification has been sent? This is not because they cannot be handled in these diagrams, but because they are too fine-grained to be useful at this stage. If an IT system was to be used to support the work of the Health Visitor in such activities, process models of such exception handling would be needed.

6. Conclusions

The purpose of this initial phase of the APPUS project was to immerse the researchers in the community health environment and to demonstrate to Trust staff the use of process models. This was intended to be a preliminary step to the building of simulation models to help improve both the professional-analyst dialogue and the quality of decision making.

This part of the project focused on information-intensive part of a nurse's activity. Of the nurses who were potential subjects, the work of Health Visitors seemed to be more information-intensive than that of their colleagues, the District Nurses and thus the subsequent study focused on part of the work of Health Visitors. In fact the work area studied tended to be more of an administrative nature than that which involved the Health Visitors' caring and technical skills. It thus models a portion of the Health Visitors' work which might be considered peripheral to their core activity of health promotion to individuals and to groups. The CHIP process model does not in any way represent the work of a Health Visitor in totality.

Health Visiting is not an easy area to model. In common with their colleagues in the area of health care, and with professionals in other disciplines, the organization can provide only a framework in which they can carry out their work, but because of the diversity of situations that can be presented, much is left to the discretion of the individual Health Visitor. It is thus a more interesting area for the process modeller. Process modelling may also be able to help in other areas, not so much in terms of organization processes, but more in the modelling of personal work processes.

6.1 The process modelling

It was relatively easy to identify activities and to assemble them into roles in an approximate manner. Health Visitors had little difficulty in understanding and discussing work activity in terms of the role-activity-interaction paradigm. What was more difficult and time-consuming was to get the model acceptably correct (i.e. with no known conflicts). This is to be expected as much of the knowledge of professional workers is tacit: they know what to do but, because they rarely have to think about each step, have difficulty in recalling exactly what are the specific steps [6]. It was furthermore necessary to explore areas of doubt, and it sometimes required negotiation to complete the model.

The processes of an organization comprise a complex network. Information about such processes is spread throughout organizations and across conventional functional units. Staff tended to be very familiar with their segment of a process, but have only a sketchy knowledge of its other parts.

The researchers had sometimes to invent new names to refer to the concepts they were modelling (such as roles and process fragments). That would imply that the professionals (Health Visitors, Systems Administrators, and Managers) may not be equipped with the vocabulary needed either to reflect upon, to discuss or to manipulate a process as a whole.

The interviewees were often asked about the objectives of the process, why the process existed, but this was very difficult to ascertain. In part this was due to the simplistic notions of 'objectives' held by the researchers, and in fact the objectives of the process tended to emerge from the process modelling exercise. They could range from the simplistic- 'the purpose of this activity is to keep Trust data up to date' - to the strategic - 'this activity is needed to maintain the health of the population'. It was difficult to determine an appropriate level of granularity for any specific context.

Stating a particular and rather obvious objective, such as 'To introduce child and family data to the Trust systems', may mask other objectives of this same activity, such as 'Establishing of the relationship between the Health Visitor and family', or 'Enabling the Trust to undertake its Child Protection responsibilities'.

One possible way of teasing these out would be to consider what would happen if the particular process or activity ceased to take place.

The question is often asked 'how much detail is needed in the model? Again it depends on what the model is going to be used for and, unfortunately, the resources available to undertake the modelling. Enough detail is needed to at least capture the essence of the process.

6.2 The process model

The more common process models focus on some object of transformation and document the successive changes of state that the object undergoes from start to finish. In the medical domain, the object is often the patient being transformed from an initial state of sickness to one of fitness. This way of representing process is useful for top-down understanding of behaviour, but does not help us understand or support the co-ordinating work process of Health Visitors and other staff.

A total of 20 different roles were needed to represent the CHIP, and this indicates the complexity of this apparently straightforward administrative activity. In the evaluations, the model was found to be too complicated for ready understanding by those unfamiliar with it. In part, this was because the processes themselves are complicated, but also because names had to be invented for some roles, and staff were simply not familiar with them. To help overcome this, certain roles were grouped together into the sub-processes as shown on Figure 1.

This work confirmed that the role-activity-interaction paradigm is an intuitively attractive way of modelling processes such that, with very little training, professionals such as Health Visitors could set about modelling the processes in which they are involved.

There was no framework with which to relate the roles, and the theme of a child served as a unifying concept, but this would not be appropriate for other areas of Trust process activity.

The model has to be accessible and adaptable, and this is a particular problem where the process is applicable across a large number of sites and is followed by an even larger number of Health Visitors. As a way of addressing these issues, the model was placed on a private world-wide-web server as an experiment.

6.3 Usefulness of the model to the Trust

Many areas of business and government have found benefit in paying close and regular attention to organization processes. These processes were, many years ago, typically clerical in nature, but in the last fifteen years, the focus of interest has moved to more professional activity, of which the Child Health Information Process might be considered typical.

The Trust was not a process-aware organization. There was no systematic routine assessment of the efficiency or the effectiveness of organization processes. This may be because establishing a process is a difficult and time-consuming process in itself, involving negotiations among different organizations, interest groups, and professions. Having established it, the only reason for revisiting it is only if something is manifestly wrong, which usually happens when some party fails to follow the process as defined. Another reason might be that bigger problems requiring more immediate management attention were manifest elsewhere.

The final CHIP model was accepted as being generic to the Trust as a whole, with the deviations at certain sites clearly identified.

Having said this, the logical analysis of the model (by staff at all levels) did highlight certain inconsistencies in the way that the work was carried out, and opportunity was taken to rectify these. These findings have prompted inquiry into why activities were in fact carried out, and, because processes such as those modelled in this study are carried out thousands of times a day around the Trust, the knowledge that any even slight improvement in the way that work is carried out can result in significant benefits for all.

Managers have to make decisions come what may. In the absence of tangible models, these decisions are based on rather sketchy mental models which can be remarkably remote from reality. Process modelling offers a way of clarifying the confusion and making non-political models of organization activity which can be of use both to the manager and the professional, and provide a focus for dialogue between them.

Many processes in the NHS cross organizational boundaries. Inter-organizational process management really needs to be maintained independently of line management reporting structure, and the collective ownership of cross-boundary processes recognized.

The process model diagrams do not make any reference to the skills needed to undertake specific tasks but it would not be difficult to incorporate such information in future work.

6.4 Implications for other professions

It is important in the planning and development of systems and tools for the year 2000 and beyond that professionals and managers are in a position to put their view to the IT specialist. In turn, that specialist must be responsive to their needs, even though these needs might not be stated with the clarity and precision needed to define IT systems. Process models can facilitate this dialogue by contributing towards a common vocabulary.

Difficulty was found in getting the model ‘right’, and it has to be recognized that it will not be long before changes are forced upon it by events elsewhere. In this kind of environment, static models of processes, or of systems, are really not good enough. A possible way of mitigating the effects of this problem is to emphasise the need for models to be adaptable and accessible, as can be done using the world-wide-web, and for an IT systems themselves to be evolvable. If this were the case, it would not matter so much if it was not entirely correct ‘first time round’.

It has to be mentioned that the existing Management Information Systems, although ostensibly set up to ‘help professionals’ are really inadequate to truly support the work of professionals. Much more has to be done to promote systems that really do support professionals in their work, and process models of work activity may go some way towards this. Professionals do not use software applications and IT systems in isolation, and process modelling can help describe that context and model the integration between people, applications, and systems.

6.5 Further work

When this article was written no decision had been made about the continuation of the APPUS project, however a number of possibilities exist to build on the work described here:

- To simulate this model. To translate this model into one suitable for executing discrete event simulations using the Witness system, to ascertain some norms of performance, and to try to replicate existing performance in the model before experimenting with changes.
- To use the model a basis of dialogue about the process. It would be interesting to subject the model to a rigorous appraisal, to ensure that the consequences of its operation were as intended and to ensure there was no better way of undertaking this work.
- Tease out objectives. It is clear that relating process activity to organization objectives is fraught with difficulties, and work must continue to address this.
- Map other Trust processes. As mentioned, the CHIP is one of many processes which are followed in the Trust. There is no point in simply mapping all the process that there are, however consideration could be given to constructing a framework for relating the processes one to another, and a means of assessing which processes are worth modelling in some detail.

Whichever way forward is chosen, the Trust will in future be better placed to appreciate the value of one of its less tangible resources: its processes.

7. Acknowledgements

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Figure 1

ROLE INTERACTIONS OF THE CHILD HEALTH INFORMATION PROCESS

Sub-process general view

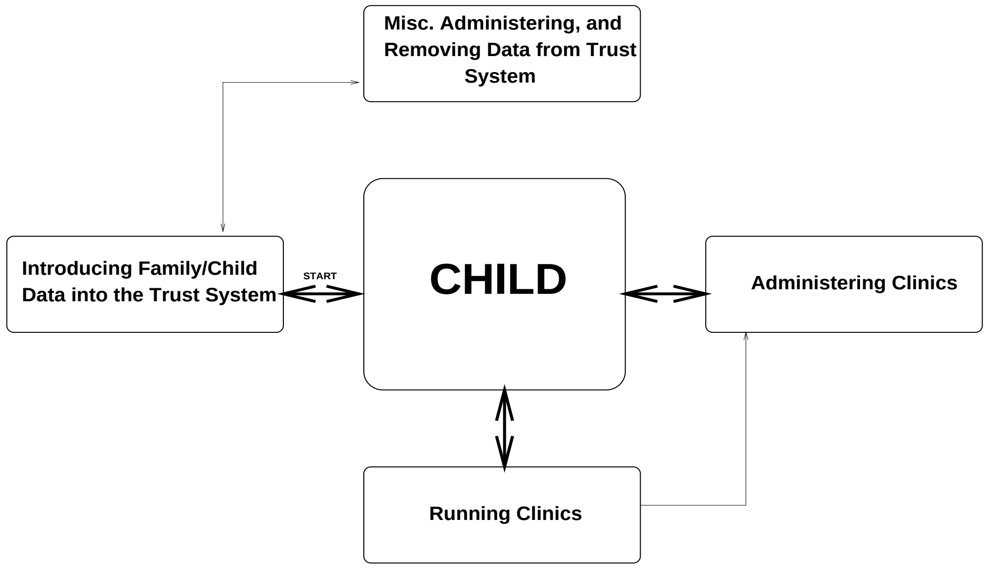
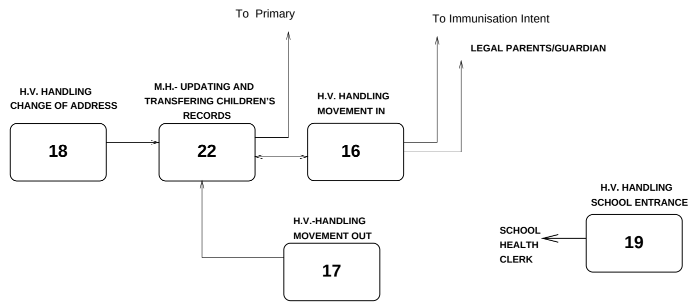


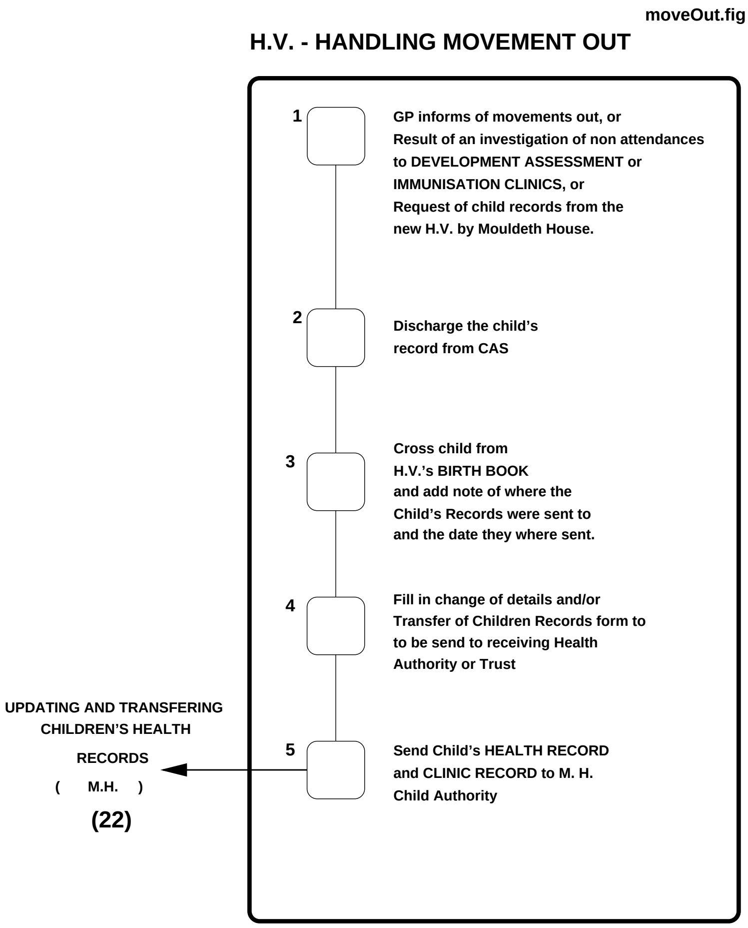
Figure 2

Role Interactions of Administering Sub-Process



Misc. Administering, and Removing Data from Trust system

Figure 3


moveOut.fig
H.V. - HANDLING MOVEMENT OUT
1
GP informs of movements out, or
Result of an investigation of non attendances
to DEVELOPMENT ASSESSMENT or
IMMUNISATION CLINICS, or
Request of child records from the
new H.V. by Mouldeth House.
2
Discharge the child's
record from CAS
3
Cross child from
H.V.'s BIRTH BOOK
and add note of where the
Child's Records were sent to
and the date they where sent.
4
Fill in change of details and/or
Transfer of Children Records form to
to be send to receiving Health
Authority or Trust
5
Send Child's HEALTH RECORD
and CLINIC RECORD to M. H.
Child Authority
UPDATING AND TRANSFERING
CHILDREN'S HEALTH
RECORDS
(M.H.)
(22)