

10 Modelling in Practice

10.1 Introduction

In previous chapters, we have argued that responsibility plays a key role in socio-technical systems; however the task of pinning responsibilities down to specific individuals or organisations is not trivial. In this book, we have presented three viewpoints for analysing responsibility. Firstly, the ethnographic approach (Chapters 3 and 4), while highlighting the difficulties associated with locating responsibilities, allows us to describe certain levels of responsibility and identify areas where responsibility needs to be clarified. Secondly, the management perspective (Chapters 5 and 6) enables us to model processes and tasks involved in job allocations in such a way that potential areas of responsibility conflicts can be revealed. Finally, the software engineering models in Chapters 8 and 9 complement these two viewpoints by providing a way of explicitly mapping responsibility to agents, thus making responsibility conflicts and neglects more evident, while also providing a method for analysis.

In this chapter, we will build on the responsibility assignment models, described in Chapters 8 and 9, to demonstrate responsibility modelling in practice. In Section 10.2, we use the production of this book as a case study to analyse how the main goal of producing the book decomposes into multiple levels of sub-goals, each with attendant obligations and responsibilities by different agents. We examine this web of responsibilities, delegations and contractual obligations in more detail in Section 10.3. The case study highlights the dynamic way in which responsibilities flow between agents, come into being and are discharged. We discuss these issues in Section 10.4 before reflecting more broadly on issues of modelling in Section 10.5.

The choice of the book production as a case study may appear somewhat inward-looking and self-indulgent, however we did not set out with this example in mind. Initially we intended to apply causal responsibility modelling to the data in the report of the inquiry into the London Ambulance Service (LAS), which is a classic case of failures at different levels [2]. The post-mortem report did highlight the potential agents or authorities who were responsible for the failures, for example to name but a few, “*LAS management ignored or chose not to accept advice provided to it by many sources outside the Service on the tightness of the timetable or the high risk of the comprehensive requirements*”, “*the procurement rules of the South West Thames Regional Health Authority were based on a quantitative rather than the qualitative aspects*”, “*the LAS board were given a misleading impression by the project team*” etc. This was sufficient for applying the enterprise level modelling in Chapter 7. However, when we attempted to apply the more detailed models, we found that there was not enough information, apart from the operation of the manual system, to show exactly how the processes evolved so we could precisely identify where the causal and consequential responsibilities lay and use those to map onto formal responsibility models.

It is therefore important that we do have some knowledge and insight “from within” a system in order to apply responsibility modelling. In the case of a *tabula*

rasa analysis, we would undertake field observations accompanied by interviews, and discussions with stakeholders. This raw data would then be analysed using the various modelling techniques. The third party accounts in accident reports obviously have their own focus and are not so suitable for this kind of analysis.

Hence, the alternative was to use the production of this book as a case study. This example is interesting in its own rights as it demonstrates rich temporal aspects of responsibility in terms of responsibility delegation and discharge, a common occurrence as systems evolve. It is also an interesting contrast to the LAS modelling in the previous chapter as that is a tale of failure, the fact that you are reading this book and have got to the last chapter shows that this is a successful process!

There are advantages to this more introspective analysis as we have first-hand knowledge, but also dangers as in any form of action research.¹ The authors of this chapter are not co-authors of any of the other chapters and in particular are not developers of any of the methods used and so to some extent have an element of distance, whilst also having access to privy knowledge, such as internal meetings, emails etc.

We deliberately attempt to use the modelling to highlight actual and potential problem areas and as noted previously in the book, such explicit modelling has problematic political effects. An account is never neutral and we will return to the dialogical nature of responsibility modelling at the end of the chapter. However, we have tried as far as possible to write the account that we might produce as an external analyst rather than one we might use for rhetorical purposes to our editors, to DIRC or to you, the reader. Indeed, there is a risk in exposing a warts and all account of this book's production to its readers, but we believe that an honest and open analysis not only demonstrates the many places where failure can occur, but also the rich way in which it does not. Responsible people acting in complex dynamic environments are able to successfully, albeit sometimes fitfully, produce successful outcomes. When thinking about dependability it is often the case that we focus on things that can go wrong, but, whilst easily overlooked, perhaps more important is the way in which things go right.

10.2 Case Study: Modelling Book Production

Research within the interdisciplinary DIRC group was organised around major research themes based at different sites, each with a team leader who acted as the theme champion. The DIRC project director had the overall responsibility of the DIRC project team, but he shared some of his responsibilities in meeting the goals of DIRC with the team leaders. Although the production of this book was an important goal for DIRC, the project director could not achieve this goal on his own. The responsibility lies within the broader DIRC remit and more specifically with the DIRC team based at Lancaster University, who were in charge of the 'responsibility' theme. The team leader therefore becomes the assignment of responsibility.

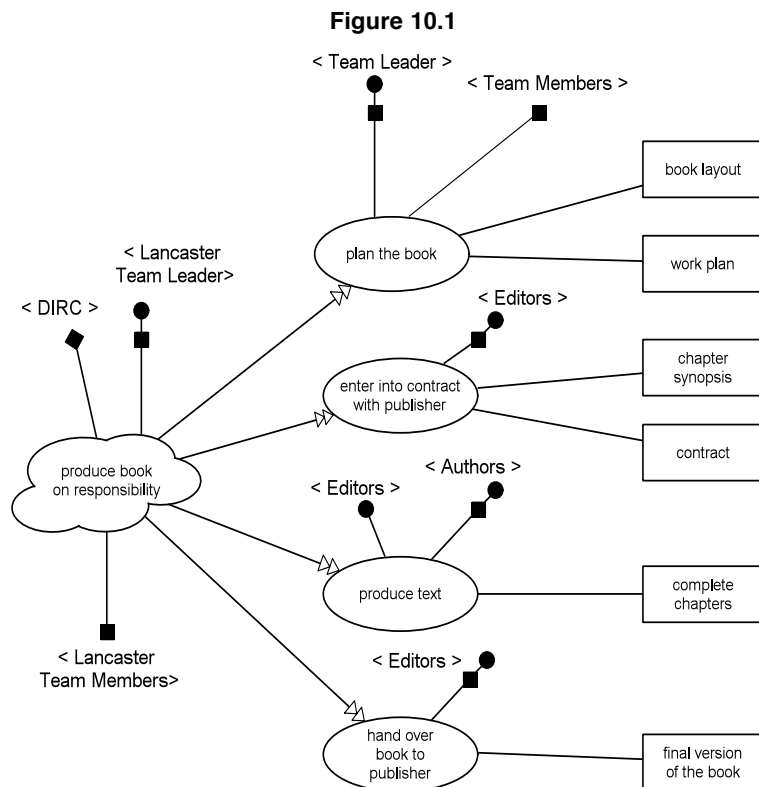
¹ Although this is not action research in standard way as we are applying the techniques largely retrospectively, not enacted as part of the book production process.

The initial plan was that the themes, including 'Responsibility' would be explicitly addressed throughout the project. However, in the first half of the project few resources were clearly assigned to the themes and so, unsurprisingly given the analysis so far in this book, little happened on most of the themes. Happily, this was noticed during mid-point review and was addressed in the latter part of the project. Much of the empirical groundwork was in place from the first part of the project (reported in the early chapters); the models in this book represent the distillation of the empirical data and the team's previous experience, carried out during the latter phases of the project.

We will now apply the modelling notations described in Chapter 8 to examine the flow of responsibility starting from the conception of this book to its crystallisation, with the result of creating new responsibilities as the processes evolved.

Figure 10.1 shows an overall responsibility model for the book production, which represents the key goals in meeting the responsibility for producing this book, the agents associated with these goals and the type of responsibility they hold (causal or consequential), and the evidence that show that those goals have been met.

This book falls under the umbrella of the DIRC research project, thus DIRC holds the management authority. But the Lancaster team leader and team members were causally responsible to DIRC for producing this book, while the



consequentially responsibility for ensuring that this project reaches completion lay with the team leader.

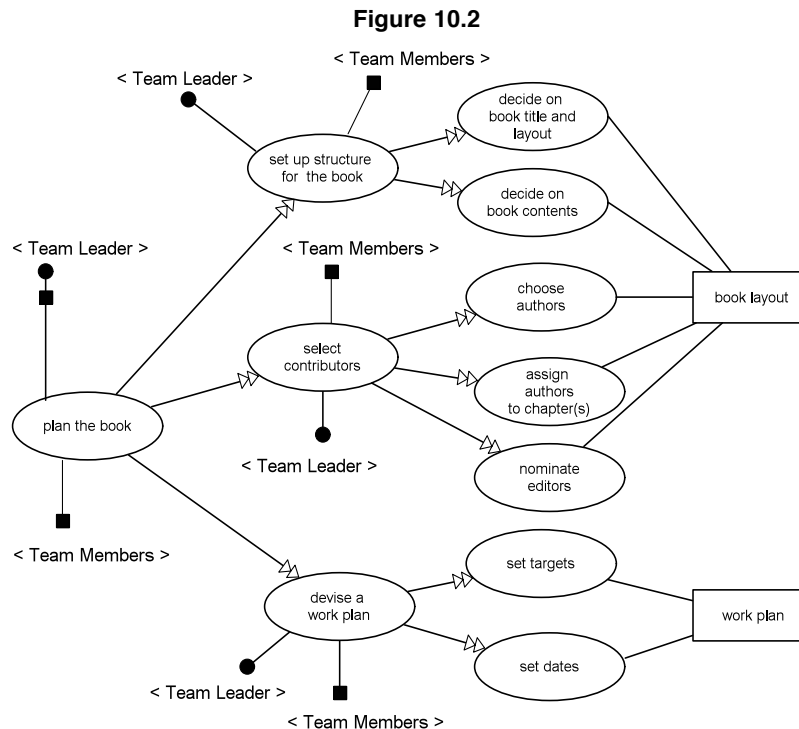
We will now consider each of the main goals and expand the model further to look at the sub-goals associated with these goals and the evidence that is required to demonstrate that these goals have been reached.

10.2.1 Goal: plan the book

The first goal was to plan the book which can be broken down into various sub-goals, as shown in figure 10.2. A series of meetings were held at the planning stage, with the team leader acting as the chair person. The team leader had the consequential responsibility for overseeing that the goal and associated sub-goals were discharged correctly. The team leader also shared the causal responsibility of with the team members as the decisions were taken jointly at the meetings.

10.2.1.1 Sub-goal: set-up structure for the book

The team had to first come up with the structure for the book, taking the targeted audience into account. So issues such as the book title and layout, in terms of the chapters and their headings and how well they fit together, were discussed. The team leader suggested some potential chapters based on the work that the team had done already and also introduced some novel modelling concepts to strengthen the



discussion on responsibility.

10.2.1.2 Sub-goal: select contributors

When the team was satisfied with the chapters' headings and contents, the next sub-goal was the selection of the contributors. In fact, the structure of the book influenced the team leader's choice of authors and editors. Not everyone who was present the meeting ended up with a commitment for the book. Authors were subsequently assigned to one or more chapters depending on how much they could contribute to the book. The team leader was also a major author of this book.

In the case of the editors, one of the editors was designated while the other volunteered. The latter was a major author to this book too. Note that, in this chapter, the former editor will be referred to as the main editor and the latter editor as the co-editor.

After the contributors were selected and the structure of the book was established, a book layout was produced, which acted as an evidence to show that the goals have been reached.

10.2.1.3 Sub-goal: devise a work plan

A number of provisional dates and targets for output delivery were set depending on how much material authors already had and how much extra work needed to be done. This led to a provisional work plan as a piece of evidence.

10.2.2 Goal: enter into contract with publisher

Once the goal for planning the book was met by the team leader, the editors now become causally and consequentially responsible for meeting the next goal – enter into contract with a suitable publisher. Figure 10.3 illustrates the associated sub-goals and evidence for discharging those goals. The editors' roles are interesting here – they act as monitors of the authors' progress, self proclaimed arbiters of quality control and negotiators with the publisher.

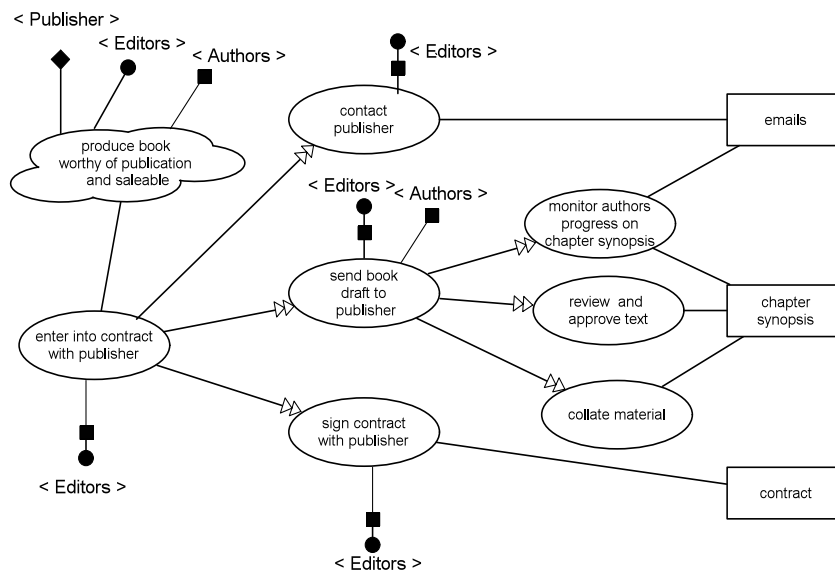
Furthermore, the goal for entering into a contract creates a new responsibility for the editors towards the publisher as an authority. The editors become consequentially responsible to the publisher for producing a book that is worthy of publication and hopefully one that is saleable. However, the causal responsibility for producing novel and unique material lies with the authors.

Although the editors shared some of their responsibilities, they each had their own assigned responsibilities. As mentioned earlier, the co-editor was also an author of this book. So, the responsibility for feeding back comments to authors and undertaking day to day editorial duties fell upon the main editor or rather the latter took the responsibility to carry out those duties as they were expected of him.

10.2.2.1 Sub-goal: contact publisher

At the onset of the planning stage, the DIRC project director suggested a publisher who would be interested in our material as they were already handling the publication of another DIRC research theme related book (Trust in Technology). The editors were responsible for setting up contact with the publisher and the email exchanges between the editors and the publisher act as evidence.

Figure 10.3



10.2.2.2 Sub-goal: send draft to publisher

The editors were also responsible for sending a book draft to the publisher in order to seek their interest which would lead to a commitment for publishing this book. In order to meet this sub-goal, the editors needed a chapter synopsis from each author and possibly a couple of completed draft chapters as examples. Thus, editors had to ensure that authors sent in their chapter synopsis on time.

There was an interesting situation that cropped up when the main editor sent out an email to remind authors that the chapter synopsis deadline was fast approaching. He also included in the email a list of authors who had already produced a chapter synopsis and those who had not. Had no authors produced anything, no one may have felt obligated to do so; it is a case of shared responsibility. But the receipt of the email explicitly makes the authors causally and consequentially responsible to the team leader and to the other authors. In fact, authors already take on these responsibilities once they have agreed to write the chapters, but because they are in a group they many not feel the need to meet their obligations until their state becomes visible to the whole group. We will return to this issue of *felt responsibility* later in the chapter (Section 10.4.4).

The editors reviewed each chapter synopsis and discussed their contents. In cases where the synopsis was unsatisfactory, the respective authors were asked to

make the necessary changes and resubmit their text. One of the authors had sufficient material to produce an example chapter at this stage. The main editor collated all the material from the authors and compiled a draft copy of the book, which he passed on to the co-editor, who forwarded it to the publisher.

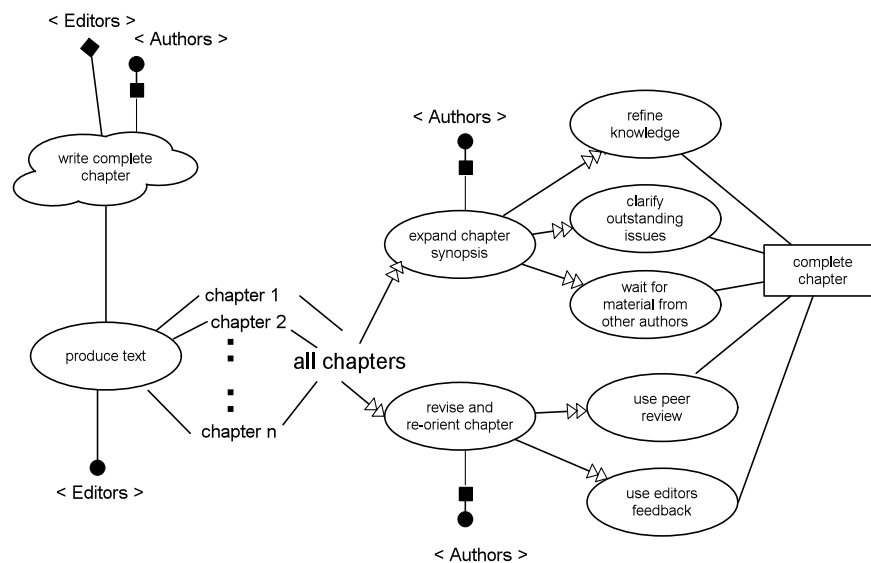
10.2.2.3 Sub-goal: sign contract with publisher

After receiving the publisher's approval on the draft copy of the book, the editors signed a contract with the publisher, thus changing the initial negotiation process into an *obligation*. The contract acts as an evidence of commitment towards this book: first, on behalf of the editors themselves, then the authors, and indirectly DIRC itself.

10.2.3 Goal: produce text

After the editors have entered into a level of agreement with the publisher, their next goal was to produce the text for this book. Clearly, the editors cannot meet this goal on their own; they need to collaborate with the authors. In fact, once authors have produced a synopsis of their chapter, they become causally and consequentially responsible to the editors for completing their chapter(s) and submitting it on time. Figure 10.4 shows the associated sub-goals and evidence that discharge those goals.

Figure 10.4



10.2.3.1 Sub-goal: expand chapter synopsis

In order to expand the chapter synopsis, authors had to refine their existing knowledge and clarify any outstanding issues (usually with the editors and/or the team leader).

As discussed in the introduction, the initial plan for this chapter was to model responsibility using a typical dependability case study. But when further concerns came to light, one of the authors had several meetings with the editors to discuss how best to solve them. The choice for the book production as a case study was suggested by the team leader at the final group meeting.

This chapter depends on the material in the other chapters and furthermore, it documents the production of the book; so obviously it could not be written until the book production was close to completion. This dependency would show up as a potential problem point in a plain process analysis, such as PERT. However, as well as the process dependencies, it introduces a complex set of responsibility dependencies. A pre-condition for the causal responsibility to produce this chapter is that the other chapters are ready. This deferred causal responsibility may serve to reduce the felt consequential responsibility. Not surprisingly the authors did not actively seek to obtain the other chapters as early as possible, and consequently this chapter will not meet its deadline!

10.2.3.2 Sub-goal: revise and re-orient chapter

The peer review exercise provided authors with some useful feedback, which they acted upon by making the necessary changes before submitting their chapter(s) to the editors. In addition, editors were responsible for providing authors with a more in-depth feedback, taking the scope of this book and its audience into account. In some cases, this led to a re-orientation of a chapter in terms of changing its focus or merging it with another chapter.

10.2.3.3 Evidence: completed chapter

The completed chapters are the evidence which discharge authors of all their responsibilities, that is their causal responsibility for writing their chapter(s) and their consequential responsibility towards the editors.

10.2.4 Goal: hand over book to publisher

After the authors sign off their responsibilities, the editors now become both causally and consequentially responsible for handing over the book to the publisher. Furthermore, this completion of goal makes the publisher consequentially responsible for printing this book.

Figure 10.5 shows the responsibility model illustrating the associated sub-goals and evidence that discharge those goals.

10.2.4.1 Sub-goal: ensure authors meet chapter deadline

The editors have the causal responsibility to ensure that authors submit their chapter(s) on time and the main editor sent out regular email reminders to this effect. But the causal responsibility for submitting their chapter clearly lies with

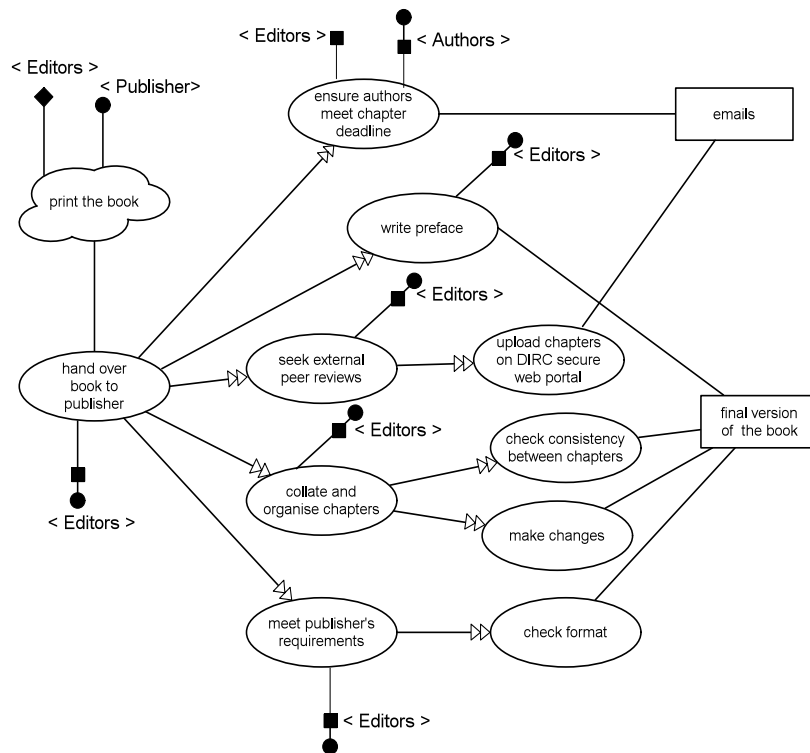
the authors and if they failed to meet their commitments, they were the ones to be blamed.

We should point out that, as authors, we did hinder the editors' efforts to meet their desired deadlines for various reasons, some of which have already been covered in Section 10.2.3.1.

10.2.4.2 *Sub-goal: write preface*

The editors were responsible for writing the preface to this book, a sub-goal which they could meet only after having received and read most of the chapters.

Figure 10.5



10.2.4.3 *Sub-goal: seek external peer reviews*

After editors were satisfied with what the authors had produced, the co-editor uploaded the chapters onto DIRC's secure web portal. He then sent out an email to a few interested parties, including the DIRC group, to invite them to give their opinions on the book by a certain date.

This sub-goal is significant as it enable editors to demonstrate to DIRC and others that they are actually meeting their causal responsibility of getting this book

published, as well as, allowing a rigorous external and internal peer review. This gives DIRC members an opportunity to comment on the book and point out any inaccuracies or inconsistencies. The team leader and the editors then used the review feedback to decide on the course of action to follow to rectify the highlighted issues.

10.2.4.4 Sub-goal: collate and organise chapters

The editors were responsible for collating and organising the chapters, making sure that the chapters were consistent and the flow of text was not disjointed from one chapter to the next. They also made any necessary changes, for example, reordered the chapters, which generated a number of minor changes in the texts, fill in references etc.

10.2.4.5 Sub-goal: meet publisher's requirements

Before submitting the final version of the book, the editors had to ensure that the book material complied with the publisher's requirements in terms of the format; otherwise they had to re-format the chapters accordingly.

The main editor did send out a chapter template by email to the authors when they were writing their chapters and some authors used it while others did not. Also, the editors were not too strict an enforcing the use of the template at that stage as the co-editor had agreed to reformat the chapters himself at the end.

10.2.4.6 Evidence: final version of the book

The final version of the book is the evidence that discharges the authors, the editors and the team leader of their responsibilities with the production of this book. It also triggers the publisher to meet their consequentially responsibility to the editors for printing the book, a responsibility which is released when the book is published. Although the authors and editors have discharged their responsibilities at that stage, their consequential responsibility towards the public in terms of the contents of the book only becomes apparent when the book goes on sale. We will revisit the issue of responsibility towards the public in the following section.

10.3 Delegation of responsibility

The responsibility models discussed above have given us an insight into the main processes of the book production and showed how agents discharge their responsibilities by meeting particular goals. However, an interesting aspect that came up through the modelling was the delegation of responsibility and ensuing delegation of authority that occurs as the processes in the book production evolved. Figure 10.6 shows this responsibility hierarchy.

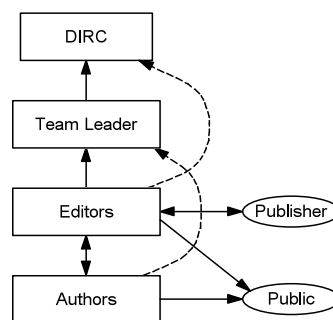
10.3.1 Responsibility to DIRC

As mentioned in Section 10.2, the team leader of the Lancaster DIRC team was consequentially responsible to the project director and subsequently to DIRC as the management authority for ensuring that the book venture reaches fruition. The team leader organised a series of regular book planning meetings, which DIRC

members were invited to attend as a way of demonstrating that he was handling his responsibility. The project director was present at one of the early meetings to show his support for the book and made some useful suggestions. The team meetings gave the team leader and members an opportunity to discuss new concepts that were to be addressed in the book, check progress against the work plan and resolve any outstanding issues. These team meetings tailed off gradually when authors and editors took control of their tasks.

Although the causal responsibility initially fell on the Lancaster team in

Figure 10.6



general, once the editors were nominated, the editors took on the causal responsibility to DIRC for producing this book. The editors showed DIRC that they were carrying out their responsibility by sending out occasional emails to the group to keep them informed of the progress on the book. Also, before the book went to press, the editors invited DIRC members to give their comments (Section 10.2.4.3).

10.3.2 Responsibility to the team leader

When the editors agreed to take on their editorial roles, they became consequentially responsible to the team leader for ensuring that progress was being made on the book. To that effect, the editors sent the team leader a copy of their email exchanges with the authors, the publisher and other DIRC members, thus making the team leader aware of what was happening. Editors also had meetings with the team leader to discuss the progress on the book and resolve any issues that came to light.

Authors, on the other hand, were causally responsible to the team leader for writing interesting material which is a good read and breaks new grounds. Their causal responsibility was sometimes assessed by the team leader (i.e. by reading the text and giving feedback) but more often by the editors, given the responsibility had been delegated to them (Section 10.2.2).

10.3.3 Responsibility to the publisher

After editors entered into a contractual agreement with the publisher, they also became consequentially responsible to the publisher for delivering an interesting,

saleable, good quality book on time. In order to meet their responsibility, editors regularly sent out email reminders to authors, chased authors for their chapters when the deadline was getting closer, reviewed the material authors produced, made suggestions and requested changes bearing the focus of this book in mind, and sent chapters for external peer review. In the words of the main editor himself, he saw the editorial responsibility as “*Our task is to produce the best book we can in the time frame, no more, no less*”.

10.3.4 Responsibility to the editors

The responsibility link between the editors and the publisher is a two-way one. The signing of the contract was also an agreement on the publisher’s behalf to publish this book. This agreement turned into a responsibility when the editors handed over the book to the publisher (Section 10.2.4). The publisher thus became consequentially responsible to the editors for printing, distributing and advertising this book. This mutuality of responsibilities between peers and also the way responsibility flows between participants is common and we will return to this in Section 10.4.4.

Authors were consequentially responsible to the editors for producing relevant and interesting material on time. Authors showed that they were meeting their responsibilities by sending out draft versions of their chapters several times to the editors for review. Furthermore, when authors were more or less happy with their chapters they sent them to a few of the team members for an internal peer review.

The editors were also the authority that discharged authors of their causal responsibility for writing their chapters, a commitment that authors took on when they produced a synopsis of their chapter. Authors were discharged of their responsibilities when the editors were satisfied with the quality of their chapters. However, this is also a case where responsibility conflicts with deadlines.

After the authors had produced their chapters, editors had a limited time they could give authors to make changes, especially after the external peer review which happened shortly before the book went into press. This would have been problematic if the external peer reviews were negative to the extent of asking for some chapter to be rewritten. If this had happened and the editors asked authors to make the changes, then this would introduce a delay which would conflict with their consequential responsibility towards the publisher, i.e. to deliver the book on time. There was a limit on what editors could request authors to do and as editors they had to make decisions on a cut-off point and live with the consequences of imposing this cut-off. This might imply that the editors might need to discard key material because it was unfinished, or to heavily edit or even finish off incomplete chapters. Happily this potential failure did not occur, but it is an example of a common conflict.

Note that this conflict is of two kinds. First of all, there is a responsibility resource conflict as noted in Chapter 8 – the editors have the responsibility to produce a book of quality but within a fixed time period, which may not be sufficient. However, more subtly it is also a conflict between responsibilities: the responsibility *to the publishers* to produce the book on time and the responsibility *to the public* to produce a book of sufficient quality. Happily in this case the responsibility to the publishers also includes quality hence *in extremis* some

solution would have been found that satisfies both. In other cases such conflicts could lead to one or other responsibility being reneged upon.

Another potential conflict was role conflict. The co-editor also had the role of author (Section 10.2.2) and so must have faced some conflicting responsibilities at times. However the internal and external peer reviews, including the reviews from the main editor helped him to discharge his responsibility as an author in a satisfactory manner. To a degree, this effectively delegated some of his editorial causal responsibility for quality checking his own work to a third party, hence reducing the role conflict.

10.3.5 Responsibility to the author

The responsibility between the editors and the authors is also a two way one. So after authors deliver the final version of their chapters, the editors become consequentially responsible to the authors for getting their chapters printed in the book. In addition the emails saying "these authors have completed" also create a responsibility of authors to one another. In terms of the responsibility models, if A is an author who has completed a chapter and B is an author who has not, then the editors have a consequential responsibility to A to get the book published. However, it is clear to A and B that the editors cannot discharge their causal responsibility to do so until B has completed her chapter. Because B and the editors are peers (see also Section 10.4.4), some of the consequential responsibility is effectively shared by B; A might reasonably blame B if the book is delayed.

10.3.6 Responsibility to the public

Although the delivery of the book to the publisher discharges multiples responsibilities, for example, the authors' responsibility towards the editors and the team leader, the editors' responsibility to the team leader, DIRC and the publisher, and the team leader's responsibility to the project director and DIRC, the consequential responsibility to the public for the contents of the book only surfaces when the book is put on sale. This responsibility therefore emerges after authors and editors have fulfilled their causal responsibilities of writing the book.

The public is the authority that decides if the book is of sufficient quality or not. However authors and editors have no control from the point the book goes on sale and they can carry no further actions. If the public is not satisfied with the book, the named people on the book will get the blame!

Note this pattern of responsibilities when handing over a product is common to most mass-produced goods (in this case printing is mass production). In such cases the causal responsibilities are necessarily discharged before the product is handed over with the implicit promise of 'fit for purpose' and attendant consequential responsibilities. Contrast this with services where the pattern is more one of ongoing, and mutual responsibilities, or the 'signing off' in more bespoke product development as found in Chapter 3.

10.4 Reflections on responsibility modelling

In this section, we will look back on the process of producing responsibility models to discuss the issues prompted by it. We begin with the process of information

elicitation and the translation of this into models. This process highlighted issues connected with the singular and dynamic nature of the book writing process, the way in which responsibility flowed between agents and the different ways in which responsibility can be discharged ... not all of which include fulfilling obligations.

10.4.1 Information elicitation and translation

The focus during information elicitation was clearly on responsibility issues, for example, finding out who was responsible for doing what; how were they going to discharge their responsibilities; were they actually doing what they were supposed to do; if not why was that so and who gets the blame? The data was collected using a combination of field observations, interviews and abstractions from artefacts.

Field observation was particularly useful during the initial planning meetings which happened fairly regularly. The team leader, authors and editors were all present at the meetings and the decision making processes could be easily captured from start to end.

The book production was unlike for example, an office situation where there are several instances of the same process at different stages of completion. In such a case, so long as one sees each process during the study period, they can be easily pieced together afterwards. Instead, the processes with the book production became more protracted in nature after the planning stage and the agents were distributed. Because direct observation was going to be impractical, the obvious alternative was interviewing. As the main editor acted as both the coordinator and the mediator, he was the ideal person to talk to.

Long-term processes may appear inactive but they are still represented within the organisational ecology, either in people's memories or in physical and electronic artefacts. In fact, reading through electronic artefacts such as email exchanges between different agents, electronic copies of draft chapters gave one a pretty good idea of what was happening, what stage authors had reached and whether any problem was surfacing. So, as analysts, one understood the contexts well enough to 'read' the artefacts. These artefacts also acted as prompts when talking to the main editor.

The observation of the planning meetings enabled one to work out the goals of the book production system, who were the responsible agents, what was they responsible for, and who were they responsible to. So the first stage was fairly easy to map onto models using the notations in Chapter 8.

However, the follow on stages were more problematic due to the dynamic nature of the tasks which led to the delegation of responsibility. It was difficult to represent the discharge of one responsibility which led to the assignment of a new responsibility to another agent towards another authority. It was however important to decide where to place boundaries; consequently, the shift in responsibility acted as natural break points. We therefore introduced a link from a goal to a responsibility under an authority in order to express the relationship between the discharge of a responsibility and the assignment of new responsibility. This may not be how the model was initially devised to be used but it did allow us to start a discussion on the delegation of responsibility.

10.4.2 Dynamics of responsibility

One of the central features of the book writing as an evaluative case study is the dynamic nature of the responsibilities. At any point we have a snapshot that could be captured using models as in Chapters 8 or 9, but this constantly shifts and changes. To some extent a 'creative' process such as book writing is different from some of the more repetitive or at least repeated processes in other case studies. However, on closer analysis the dynamism is of three kinds:

- dynamism of ad hoc process – where a process is created on-the-fly by the agents, often based on a one-off set of requirements.
- dynamism of singular process – where the kind of process is better understood, but where this is a particular and one-off application of that process
- dynamism of ordinary process – where the process is more routine and repeated, but still includes regular movements of responsibility

Each of these is commonly found in other settings (including non-academic and non 'creative').

10.4.2.1 *Dynamism of ad hoc process*

Aspects of the process were ad hoc and created on the fly. Whilst most of the participants were experienced with projects of various kinds, the particular nature of DIRC was unusual as it was a long-term cross-site project with fairly loosely specified objectives. The working out of the project's internal processes and activities and in particular the themes and resulting books were an evolving process. In terms of Chapter 6's life-cycle analysis, the phases of 'procurement' and 'operation' are intertwined.

This form of dynamism suggests that responsibility models may be useful not just at a prior analysis stage, but as support for ongoing negotiation of responsibilities. This is similar to workflow systems. Many workflow systems have their models fixed at an initial design/definition stage and are hard to modify during operation. In contrast, some workflow support systems recognise the way in which actual work responds to exceptions and the exigencies of the moment and so provide means for users to add and alter workflows on the fly; rather than instruction to "do it this way", instead an auditable and accountable means to record "I did it my way".

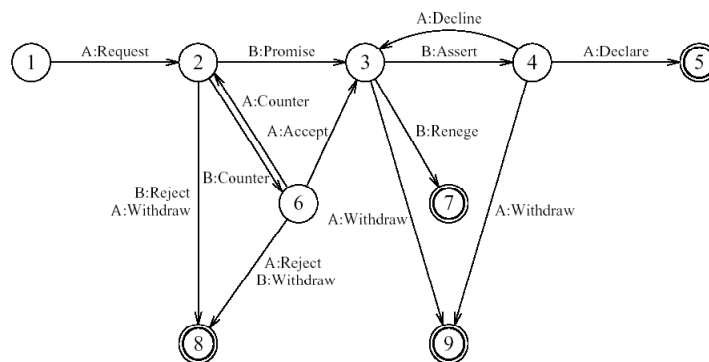
However, as noted at the end of Chapter 8, the explicit recording of responsibility is itself a political act. In Searle's speech-act theory, a 'Conversation for Action' (CfA) [4] captures the way in which individuals negotiate requests and promises (see Figure 10.7). Effectively a CfA is a record of an ad hoc creation and later discharge of responsibility. However, when these CfA were recorded explicitly in an augmented (and notorious) messaging system Coordinator [3], the nuanced ways in which responsibility was created and authority exercised became explicit and in many organisations this led to rapid rejection.

10.4.2.2 Dynamism of singular process

Bed management and train drivers going through signals (hopefully on green) are regularly repeated activities, whereas book writing tends to be a one-off. Perhaps performed many times during an author's lifetime, but to some extent each time singular.

In the case of this book, the actual book production part with its interactions of editors, authors and publishers is reasonably well understood. Most of those involved had gone through similar processes before and even though aspects are negotiated on an ad hoc basis, the overall process and attendant responsibilities are well known. In some sense the 'procurement' phase is part of the organisational memory of those involved. Of course, the fact that this is both recognised, but not

Figure 10.7 Conversation for Action



identical every time, itself creates problems that a truly unique process would not possess. In particular the agents may have different beliefs about both process and responsibility based on slightly different experiences of book writing.

In addition, the singularity means that each stage of activity tends to lead to a discharge of one responsibility and the assignment of new ones. This discharge and assignment typically requires communications, which Chapter 6 reminds us are fraught with dangers. Furthermore, the succession of new responsibilities means it is essential that the parties know and understand the flow of responsibility, thus exacerbating the problems of differing beliefs and experience above.

10.4.2.3 Dynamism of ordinary process

This constant process of discharge and creation of responsibility is itself normal. Even in Adam Smith's archetypical needle factory each worker by doing their bit on the pin discharges their responsibility on that pin and creates one for the next person in the line. Of course, in discharging their responsibility for one pin, they also instantly take on an identical responsibility for the next pin and so on. So in some sense there is a dynamic of passing on and taking on responsibilities even here.

Most processes are neither as repetitive as a Victorian needle factory, nor as dynamic as book writing and there is a normal dynamic of responsibility: the

signalman sets the signal and thus discharges responsibility and passes it on the train driver. Both rely on the track and signal maintenance workers in that they assume that the signal as seen by the train driver is the signal as intended by the signalman.

In previous work this chapter's authors have modelled the way a flow of activity moves between individuals within and between organisations [1]. Our interest in this flow was largely on the temporal organisation, how the processes as a whole is fragile or robust in the face of delays, lost communications etc. However, in the context of this book it is interesting to note how each communicative act typically involves a movement of responsibility.

10.4.2.4 Modelling dynamism

These three kinds of dynamism suggest slightly different uses of responsibility modelling.

In the case of extreme division of labour, as in the needle factory, we have a relatively easy job of static modelling and verifying that parties understand and are capable of performing their duties. The fundamental changes in manufacturing industry show that this is achievable, although with widely different models from coercion to shared ethos on how this is managed. In such domains the close alignment between causal and consequential responsibilities through organisational hierarchy means that more complex models as in this book are unnecessary. Of course even these domains involve many activities off the production floor, from maintenance to sales where more complex modelling is required.

In the extremely ad hoc processes, the parties are aware of the ongoing negotiation and so it may be sufficient to simply supply tools or mechanisms that make the current state visible, and thus help track the discharge of causal responsibility. Modelling here is perhaps as useful for its educational value, sensitising those involved to potential failure modes as opposed to analysing those modes on a one-off basis. Potentially, as noted above, models could be built into support tools, but where the model is developed alongside the execution of the process.

The most difficult case is however the most common one in administrative and service industries, where parties have multiple responsibilities that are relatively static structurally although dynamic in terms of the moment to moment tasks and obligations. The routine nature of work means that responsibilities are often tacit, but the dynamic nature of tasks means that responsibility is constantly moving between individuals with attendant risk of failure. Happily this is also where the models in this book are most appropriate and potentially valuable. However, to do so we do need to be more explicit about the way in which responsibility moves ... or is shifted.

10.4.3 Flows of responsibility and monitoring

In the authors' own previous analysis of processes, we identified a common pattern we called the 4Rs (none of which is responsibility!): *request*, *receipt*, *response* and *release*. The request is where someone else, often implicitly, passes something that embodies a need, perhaps a draft chapter from an author to the editor. The receipt is when the main agent becomes aware of the request – the editor opens the mail

with the draft chapter in it, the response is the attendant action – comments on the draft and the release is the actions that 'tidy up' afterwards, perhaps filing or discarding the printed draft.

Notice that word 'release', the sense that in some way the agent can breathe easily, because the response passed on responsibility (or at least causal responsibility) to the next agent in the process. This is because the 'response' typically creates an attendant request for another agent who then has responsibility for performing the next step in the process. Note that this is not an explicit negotiation of responsibility, but a normal flow in the organisation.

This flow is normally effected or accompanied by communication or conversation, with all the attendant issues described in Chapter 5. However, this is a communication about the outputs or artefacts of work, not explicitly about responsibility. The passing of responsibility is implicit and tacit: if the draft chapter is in the editors' hands, the author does not need to worry about it and vice versa. Such processes are fraught with problems either if there are failures (human or technical) in communication or if one of the parties fails to fulfil obligations ... e.g. if the author does not deliver on time.

Whilst the chain of agents in a process clearly embodies a passing of causal responsibility, too often this effectively is treated as if it were also a passing of consequential responsibility. If even this one distinction, highlighted multiple times throughout this book, were more commonly recognised, it would have a substantial impact on dependability.

There are two principle ways in which such dangers are averted.

The first solution is to analyse and, if necessary, adapt the process so that it becomes self-healing – failures at some point are compensated elsewhere. Here effectively the process designer/analyst and high-level management is taking ultimate consequential responsibility for the process as a whole. In this case agents have causal and consequential responsibility *only* for their part of the process.

The second solution is through process ownership, the fact that consequential responsibility is not passed on with causal responsibility is explicitly recognised and becomes part of the person's job specification or understanding of their role. This is a technique used in some (but not many!) help desks; rather than completely passing on the enquirer to an expert, the first point of contact retains responsibility and checks that the advice given satisfies the enquirer.

Note that in this second solution the person with consequential responsibility effectively takes on a second causal responsibility, namely one of monitoring (see Chapter 9) even though the 'doing' causal responsibility has moved elsewhere. From a dependability point of view we have a problem that, for humans, monitoring is hardest when the thing being monitored is most reliable. If 50% of time the expert does not help the enquirer then verifying this is clearly necessary, but if 99% of the time there is no problem then monitoring appears less worthwhile and hence may be neglected leading to problems in the 1% of times when things go wrong. Monitoring is also difficult when there are variable times involved, for example, 'check in 3 hours time' is harder to remember than 'check now'.

The process may be deemed so bullet proof in the first solution that no explicit monitoring is required. However, whilst one would not have a step-by-step monitoring of such processes, there is often some intermittent monitoring that the

process is being normally carried out as expected. In other words, there is a consequential responsibility at some level of management with an associated monitoring of causal responsibility.

Where monitoring tasks are detected during analysis this suggests that the analyst verifies that there is some electronic, paper or other system in place to support the monitoring. For example, a duplicate of a posted form may be placed in a tray until the original is returned, the presence of the duplicate acting as a reminder. We have previously also suggested that electronic or paper to-be-done-to lists can be used to record what other people are expected to do [1]. Certain project management tools support just this, although typically at a high level of granularity. Note the way, in Section 10.3.4, that the editors copied emails to the team leader, allowing the team leader to easily monitor progress.

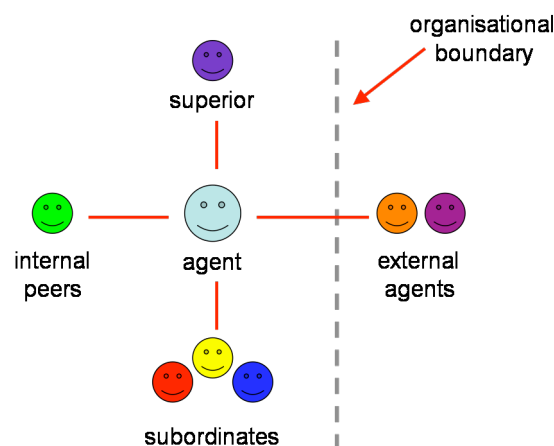
10.4.4 Discharging responsibility or passing the buck

The handing over of activities during the 'flow' of a process is deemed a passing on of responsibility; for the agent who has completed a stage (the sender) their responsibility is discharged. In some cases the next person down the line (the recipient) also acts as 'authority' in that their acceptance of any artefacts or messages implies they are satisfied that what they have been given is sufficient for them to carry out their own part of the process. In other cases, for example, where the recipient has no choice, the authority is effectively the sender.

The acceptability of this kind of passing on and the possibility for failure is influenced by the relationships between sender and recipient (Figure 10.8). If the next movement is 'up' to a superior in an organisation, then regarding the process flow as a discharge of all responsibility is reasonable, whereas passing it down, in a similar way to delegation, may pass on causal, but not consequential responsibility for the process as a whole. Note how the report in the Ladbroke Grove held Railtrack responsible for duties delegated to employees.

In the case of the production of this book, many of the relationships are

Figure 10.8 Kinds of organisational relationships



between peers. That is people who may be considered professionally responsible for their own actions and the obligations they take on. (Note this peer-ness is relative to the agent seeking to delegate or otherwise pass on responsibility.) Peer-relationships (whether internal to an organisation or with third-parties) are particularly problematic and open up possibilities for failure. In such cases an agent seeking to pass on responsibility may to a large extent pass on aspects of consequential as well as causal responsibility as it is 'reasonable' to assume the peer will perform duties as promised.

One key test here is whether an external authority will accept the passing on of 'blame'. Again in Ladbroke Grove whilst Railtrack "*employed and employs reputable experts*", they were still held at least partially responsible for the failings of track and signalling (see Chapter 4, Section 4.3). Peer relationships frequently create joint responsibility (as described in Chapter 8, Section 8.2.2) and these have particular problems when roles are not well defined. In particular, diffuse responsibility can commonly be felt as reduced responsibility even if an outsider would regard all parties as jointly and *severally* responsible.²

Process flows create a form of composite responsibility where if the process is well designed and all parties fulfil their individual casual responsibilities then the overall goal is fulfilled. Problems are due primarily to the fragility of processes and apportioning blame on failure. While consequential responsibility for the whole process may be hard to ascribe, each part is effectively discharging the consequential responsibility for their part by fulfilling their (causal) obligations.

However, meeting causal responsibilities is not the only way to discharge consequential responsibility. Referring back to the conversation for action (Figure 10.7), note that the performance of the promised activity occurs during state 3, but the conversation does not terminate due to the completion of the activity or achievement of a goal, but through the acceptance by the requesting party (person A) that the goal has been achieved (state 5), or even by the acceptance of A that the activity will not or cannot happen (state 9). That is consequential responsibility may be discharged without the corresponding causal responsibility so long as the authority explicitly or implicitly either agrees (incorrectly) that it has been fulfilled or agrees it need not be fulfilled.

The CfA only considers two party interactions (effectively A is the authority), but the passing of responsibility between peers is also a way for one agent to discharge consequential responsibility. This is exactly what Railtrack were appealing that they had done when saying they had employed *experts* for track and signalling. In this case it is clear that Railtrack intended that an appropriate level of maintenance and service would be supplied. However, fulfilling obligations usually incurs cost, so during negotiations there is often a pressure to discharge consequential responsibility rather than fulfil ultimate goals. We can see elements of this in the focus on "signing off" in Chapter 3 (Section 3) where the aim is not to "make sure the design is correct", but to "undermine any basis for user complaints". Certainly the attempt to satisfy security concerns by training the users suggests an attempt to sign off a problem without really tackling

² Note that this term "jointly and severally" is applied to commercial partnerships in British Law, meaning that a creditor can pursue one partner for the full debts of the partnership if the other partners are unable to pay or cannot be traced.

it and passing the buck to the user, although this was blocked by other parties. We also see this in the concept of "future proofing" in Chapter 2.

So consequential responsibility may be discharged in four ways:

- (i) the goal is fulfilled (and the authority accepts this)
- (ii) the authority accepts the goal has been fulfilled, but in fact it is not
- (iii) the authority accepts the goal need not be fulfilled
- (iv) the responsibility is passed on to another

All of these except the second can be legitimate (in an informal sense) and even the second may be used as a workaround for the third. However, the latter three may also be used as excuses or attempts to pass the buck. The Ladbroke Grove report shows that when this legitimacy is tested in extremis attempts to sidestep responsibility are both recognised and reprimanded.

Note that the difference between the first two forms of discharge is about *belief*. The issue of knowledge or belief has recurred in this book, for example, the types of responsibility vulnerability on Chapter 8 include "uncommunicated responsibility" where responsible agents are not aware of their responsibilities. Appropriate knowledge is often overlooked in modelling of functional processes and is clearly even more important to keep in mind in these higher-level processes.

But it is not just what people believe that is important, but also what people *feel*.

In the case of the book we have many relationships between peers, which is potentially problematic and could in principle lead to breakdowns. However, whilst the academics involved do not necessarily always achieve their goals (especially on time!), neither do they usually seek to subvert the processes in which they are engaged. In fact, the wonder of human relations is not those times when people hoodwink or deceive one another, but that they are so honest and helpful.

Now for the book this can be seen as a form of self-interest. Each author has a vested interest in the success of the book and their own chapter in particular as this reflects on their own academic standing. However, most academics are not that Machiavellian. Close to this is a sense of professional pride – even if no-one reads the book still it is a matter of personal pride that it is good – that is an additional responsibility where the authority is oneself.

However, even that is not the full story. The reason for emails discussed in Section 10.3.5 saying who has ... and has not ... completed their chapters is that they make authors *feel responsible*, to each other and to the editors.

In public organisations it is usually these feelings of responsibility that are more important than any formal or even legal responsibilities. The difference between the two, felt and legal responsibility, is most obvious when things go wrong, the difference between guilt and blame. If people officially have responsibility and yet do not feel responsible, they are likely to subvert systems and bypass checks. However, if they feel responsible they will do the opposite.

In recent union action in UK universities it was apparent how many lecturers took action (not setting or marking exams), but also did all they could to minimise the effect of their actions, for example, making sure papers were set before the actions formally started. That is the lecturers abrogated their contractual responsibilities to the university but attempted to fulfil their felt responsibility to one another.

Where there is both sufficient knowledge and also this sense of felt responsibility, we often see robust self-healing systems. This was apparent in the bed management discussed in Chapter 8 (Section 8.4). Clearly in various ways staff fail in their causal responsibilities to maintain up-to-date and accurate information in the system – it does not show the 'true' information. However, they know and have mechanisms for achieving the ultimate aim – that is finding a bed when one is needed.

In contrast the Ladbroke Grove report seems to suggest a 'jobs worth' culture where what matters to each agent is demonstrably discharging responsibility but the bigger picture is lost. The report chastises not just the particular failures, but the corporate 'ethos'.

10.5 Does modelling work – a return to philosophy

In this chapter we have looked at a case study and used that to reflect on the modelling and the gaps in the modelling relating these to earlier chapters and studies. Whilst the modelling enabled us to capture aspects of the responsibilities in the book case study, many of the issues we have been discussing have been precisely about those aspects not captured fully within the modelling. Does this mean the modelling frameworks are not working?

They are certainly not complete. The issues of dynamism and change, of the passing of responsibility, and of feeling and belief are not 'captured' by the modelling; some are in part, but none in full.

Neither should they be. Even at a formal level it would be foolish to try to include everything in a single model, there are ample formalisms for dealing with time (see the parallel DIRC book on time [\[**ref**\]](#)), so we should perhaps just be thinking of connecting the more focused responsibility models with other formalisms. However, more fundamentally, many of the issues are quite nuanced. Even if we were to introduce a logic to manage people's beliefs about responsibility, it would be simplistic at best and would certainly not help with the affective issues of 'feeling' responsible. Models should be part of a richer picture.

Nor do they need to be. The models did not adequately describe the dynamics of responsibility. However, they did allow us to clearly express snapshots of the pattern of responsibility at particular times and hence highlight and track the changes; that is the models did not encompass the dynamism but enabled us to more clearly see the issues and problems.

In Chapter 2, Wittgenstein's aphorism 69³ was quoted, referring to the meanings of words, part of this reads: "we can draw a boundary – for a special purpose". In common language, the word "responsibility" is indexical, it is how it is used. However, the various analytic and modelling chapters, for a special purpose, have given it and other words such as "authority" more prescribed meanings – boundaries have been drawn.

³ Interestingly the aphorism number "69" brings to mind the Yin Yang symbol, which also emphasises the problematic nature of boundary drawing.

It is right that we treat these boundaries, these definitions for a purpose, with care. They are based on aspects of real studies of the world but are also to an extent artificial and it is not surprising that there are difficult 'boundary cases': for example, can you have consequential responsibility when you have no resources to accomplish the objectives? However, though our categories struggle when faced with a chimera, yet, prompted by its very unnaturalness, we are forced to reflect on those categories and understand them better.

When Wittgenstein describes language games, he says a word's meaning is precisely the way it is used. The definitions and models in this book are serving a dialogical purpose, they are part of a 'game', but are very actively the moves in a game, which is to make a system more dependable. The analysis, definitions and models serve not just to describe the way responsibilities fall, falter and fail, but to actively change systems and design processes in order to prevent failure. The boundaries we draw are "for a special purpose" and it is transformative: the words and models are part of a dynamic semiosis; they are intended to not just denote concepts, but change practice.

When we looked at different kinds of dynamism we saw various ways in which models could be used.

In the case of more repeated processes, the modelling of responsibility will be primarily done by a designer/analyst and be part of the dialogue of requirements elicitation and design. It is interesting that the study in Chapter 3 is about design itself. So there are reflexive aspects here; we would expect the design team to use responsibility modelling themselves, but also the 'signing off' of a system is itself a passing on of responsibility by the design team.

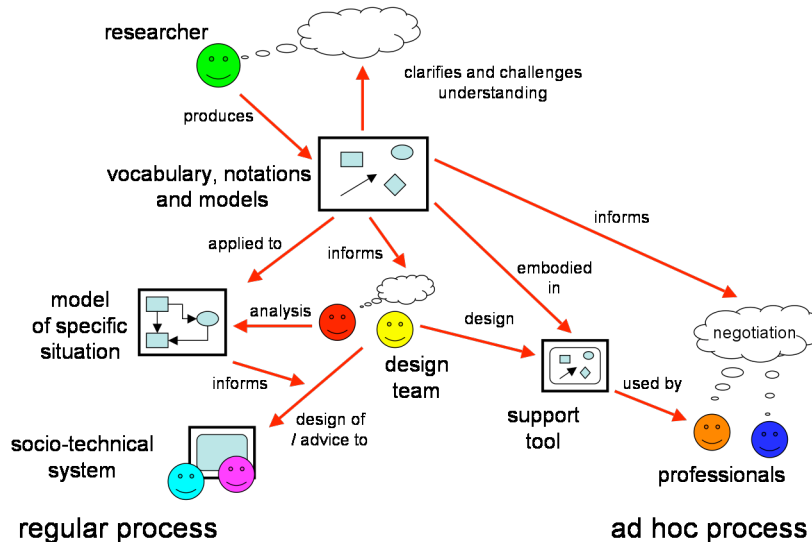
The purpose of the modelling during the design process is partly to highlight potential problems and failures due to responsibility. While the applications in this and the previous chapters are retrospective, they do appear to highlight appropriate issues in complex situations. The fact that the models can be applied at a fairly high level also suggests that, in addition to being a retrospective analysis tool, they will also be usable early in the design process.

In addition, to this more analytic use, the language and concepts can be used to discuss and communicate aspects not fully encompassed by the models, precisely as we have done in the latter part of this chapter. Indeed, as we noted earlier, this chapter was deliberately not written by those who formulated the models, so we had no vested interest, yet we rapidly found ourselves fluently using the terminology to discuss issues.

In the case of ad hoc processes where, quoting Chapter 6, the shared responsibilities are "implicit, negotiated and dynamic", we suggested that this may offer the potential for tool support where the stakeholders can dynamically record their shifting responsibilities and mutual expectations. Again the aim of this is not just to inform but to transform; by recording responsibilities, as understood in these definitions and models, this will not merely reflect truth as it was, but create truth as it will be. Because it is recorded it is so.

Alternatively, simply having a richer vocabulary may help professionals in their process of negotiation. Interestingly in this chapter we are analysing the production of this book, while of course finishing off a chapter, which is part of that process. As we did this we found ourselves, as authors, using this vocabulary of responsibility to communicate and negotiate with our editors! While this book is

Figure 10.9 Dialogical roles of responsibility models



a reasonable thing to expect a designer or analyst to read, it is not designed for the end user, so perhaps there is a need for an additional "all you wanted to know about responsibility" guide for use in professional development training.

10.6 Summary

This chapter began with a case study using the causal responsibility modelling from Chapters 8 and 9; we looked at both goal structure and patterns of delegation. The process turned out to be highly dynamic in terms of its unfolding responsibility structure and also complex in terms of its multiple and interwoven relations between parties. We elaborated several of these themes in latter parts of the chapter.

The information elicitation used a variety of techniques, field observations, interviews and examination of artefacts such as emails and chapter drafts. Because of the nature of the case study, different methods of elicitation were applied at different phases and this is likely to be the case with any application of modelling.

A notable aspect of the case study was its rich temporality: both in terms of process and responsibility. The models did not address these explicitly, but by allowing precise formulation of snapshots of responsibility enabled us to expose and discuss this temporal structure.

We saw that there were three types of dynamism related to ad hoc, singular and ordinary processes. These different types of dynamism suggested different forms of application of the models: used informally as a vocabulary for discussion, applied formally as a method for analysis and potentially embodied in support tools.

We also discussed the way in which the process flow of activities between agents also created flows of causal responsibility and the problematic nature of consequential responsibility in such cases. We noted how the common pattern of 4Rs (request, receipt, response, release) that has been noted in earlier work on temporal modelling of processes often implied a shift of responsibility between agents at the response stage. Recognising the potential dangers of gaps in responsibility suggested common ways to 'patch' problems, notably through self-healing processes or through process ownership.

The dynamic flow of responsibility also highlighted the way in which consequential responsibility could be implicitly 'passed on' and hence discharged without fulfilment of obligations. This led to recognition of other ways in which this could occur, some legitimately others not. We particularly noted potential problems that arise due to peer-peer responsibility relationships.

Whilst it is common to focus on the negative ways in which people can 'pass the buck' and in other ways fail to meet responsibilities, we also noted the importance of felt responsibility and how appropriate professional and organisational ethos can lead to self management and hence dependable systems.

Finally, we considered the way models of responsibility play a dialogical role during design and potentially during the use of ad hoc processes, picking up the earlier discussion on types of dynamism. Whilst the models are not complete they play their part in the 'game' of design allowing a rich discussion of potential problems and solutions, and just as important, identifying successful, fault tolerant patterns.

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