An Experience of Principled Negotiation in Requirements Engineering

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Abstract

When considering ways of improving requirements engineering, or indeed any aspect of software development, it is often possible to build on relevant experience in other disciplines. In particular, in relation to the human side of reaching agreement on requirements, *Principled Negotiation* seems to offer a good framework for the process involved. This paper summarises the main concepts of Principled Negotiation and reports on an experience of its use over several years in helping Environmental Health Departments in Northern Ireland introduce IT systems. The relationship between Principled Negotiation and Soft Systems Methodology, a general problem solving strategy built on systems thinking concepts, is also considered briefly.

Keywords:

Principled Negotiation, Soft Systems Methodology, System Change

Introduction

In the preface to his classic text on the management of software development, Brooks (1975) starts with the statement that *"In many ways, managing a computer programming project is like managing any other undertaking—in more ways than most programmers believe. But in many other ways it is different—in more ways than most professional managers expect.*" This reminds developers that software can largely be treated like any other artefact, building on similar development approaches. It also recognises, however, that software has some special characteristics that need particular attention during construction.

With this perspective, improvements to software development can be sought by considering relevant techniques that have proved successful in other areas. Typically, these will have been in use for many years and become established in their field. One such technique is *Principled Negotiation* (Fisher and Ury, 1981), developed through the Harvard Negotiation Project. Principled Negotiation can be used for large-scale conflicts, such as negotiating international peace treaties, but is relevant to any situation were there are differing interests and some degree of mistrust. For example, it can be applied effectively in industrial disputes or in family mediation.

With respect to software development, Principled Negotiation has a role in the client-supplier relationship because of the tension created by the many soft factors that make it difficult to deliver software successfully (Standish Group, 2002; Reel, 1999). Ideally, the client and supplier should both use Principled Negotiation but it can bring mutual benefit even if followed by only one side. Yet another model of use is through a facilitator who is

responsible for helping the parties reach agreement. This is an obvious role for the requirements engineer/analyst.

The next section of this paper summarises the main concepts of Principled Negotiation. This is followed by a description of an experience (by the author) of using Principled Negotiation over a number of years in assisting Environmental Health Departments in Northern Ireland introduce IT systems. A final section looks briefly at the implications of using Principled Negotiation within the BASE methodology (Bustard *et al*, 2000) or more specifically within Soft Systems Methodology (Checkland, 1999), around which BASE has been developed.

Principled Negotiation

In 1978 I was offered my first consultancy, which also turned out to be my first exposure to the types of problem than can arise from *positional bargaining*. It was many years later, however, before I first encountered this term in Fisher and Ury's book (1981) and was able to distinguish between the traditional *hard* and *soft* approaches to negotiation and a *principled* approach.

The consultancy was an expert witness case in which I was asked to assess the effectiveness of a finance company's computing system in relation to what had been promised by the supplier. A report was required, possibly followed by a court appearance to present and justify my findings. The assessment turned out to be relatively straightforward because the supplier had made many rash claims, in writing, and the actual system fell short in a number of areas, in rather obvious ways. The case was settled out of court, based on a very short report tabulating promises against achievements.

Although I was satisfied with the outcome I felt that this was a dispute that should never have happened. In retrospect, it was a clear example of the dangers of positional bargaining. The owner of the finance company was a *hard* bargainer. His approach to business was to negotiate the best price in any deal. The suppliers, a young IT company, were *soft* bargainers. Their goal was to build up their business, compromising pragmatically, where necessary, to secure contracts. The paperwork that I received supported this assessment. The finance company owner kept forcing the price down because he didn't know what he should pay for the work involved, and was effectively testing the supplier's quote. He also blatantly misled the supplier on the budget he had available. The supplier responded by simplifying the technical solution to reduce the price, understating the consequences of the simplifications. Eventually a compromise was reached and the contract agreed. Unfortunately, this was a barely adequate solution at the time of signing, with no room for expansion. Thus, when the finance company's business increased in the time it took to complete the implementation the delivered system was unworkable (because of a lack of on-line storage) and was certainly not 'easy to use' as promised.

Taking a principled view it can be recognised that both the finance company and the IT supplier have the same core interest in this situation, namely to install a 'good' computing system. Such a system would enhance the finance company's business and at the same time help the IT supplier build a reputation for quality work. Keeping this objective in mind might have avoided the costly outcome for both parties. This is one of many communication problems that can occur in software projects (Schmidt *et al*, 1999).

The characteristics of the principled approach, in relation to the soft and hard approaches, are summarised in Table 1. The approach assumes two elements in any negotiation: a *problem* part and a *people* part; that is, a part concerned with technical issues and a part concerned with building a suitable working relationship among the stakeholders. The principled

approach encourages a separation of these parts so that each is given adequate attention and that difficulties in one do not detract from the other.

Soft	Hard	Principled
Participants are friends	Participants are adversaries	Participants are problem solvers
Goal is agreement	Goal is victory	Goal is a wise outcome reached efficiently and amicably
Make concessions to cultivate relationships	Demand concessions as a basis of relationships	*Separate the people from the problem*
Be soft on the people and problem	Be hard on the people and problem	Be soft on the people, hard on the problem
Trust others	Distrust others	Proceed independent of trust
Change your position easily	Dig into your position	*Focus on interests, not positions*
Make offers	Make threats	Explore interests
Disclose your bottom line	Mislead on your bottom line	Avoid a bottom line
Accept one-sided losses to reach agreement	Demand one-sided gains as the price of agreement	*Invent options for mutual gain*
Search for the answer they will accept	Search for the answer you will accept	Develop multiple options; decide later
Insist on agreement	Insist on your position	*Insist on objective criteria*
Try to avoid a contest of wills	Try to win a contest of wills	Try to reach a result based on standards independent of wills
Yield to pressure	Apply pressure	Reason and be open to reason; yield to principle not pressure

Table 1. Summary of Principled Negotiation in relation to hard and soft bargaining

The four main tenets of principled negotiation are highlighted in italics in the table. These are:

- Separate the people from the problem
- Focus on interests, not positions
- Invent options for mutual gain
- Insist on objective criteria (for the negotiation process and decision making)

The emphasis is on recognising higher-level interests and common ground, looking to create a wide range of mutually beneficial options and avoid becoming entrenched in fixed positions that impede progress to a good solution. Each negotiator is encouraged to appreciate the other's point of view and to follow a fair process. The approach is intended to reduce the wasteful conflicts that can occur in such circumstances so that each party can speak freely, and collectively reach the best solution available. Fisher and Ury also give advice on what to do if you fail to convince the other side to take a principled approach, or if they engage in 'dirty tricks' (Ury, 1991).

Principled negotiation can be used to handle difficulties that arise in projects, such as negotiating a delivery overrun or a substantial change in functionality. To provide maximum benefit, however, it is perhaps best used from the outset to determine initial requirements and

set the context for development. This possibility is examined in the next section, which also provides further explanation of the principled approach.

Principled Negotiation in Requirements Engineering

Principled Negotiation is often promoted as an example of good practice in project management (O'Connell, 1996; McConnell, 1996). More recently, it has also been advocated by the SEI as one of the recommended techniques for handling the 'soft side' of software process improvement (Paulk, 2000). The earliest computing reference to the approach is in Boehm's paper on *Theory W: Make Everyone a Winner* (Boehm and Ross, 1989), which has a central idea similar to the notion of 'inventing options for mutual gain'. His work now focuses more on negotiated requirements (Boehm *et al*, 1994, 1998, 2001, Grünbacher and Hofer 2002). This notion became prominent in the early 1990s (Easterbrook, 1993, Robinson and Fickas, 1994) and has a growing number of advocates (Herlea Damian *et al*, 2000). Principled Negotiation is a useful general technique in support of this approach.

There can be no doubt that the Principled Negotiation concept has been successful. The book describing the technique (Fisher and Ury, 1981) has sold over two million copies, and its approach and suggestions have remained valid for over twenty years. In particular, the second edition in 1991 (Fisher *et al*, 1991) remained largely unchanged from the original—it simply adds a chapter to address ten of the most commonly occurring questions raised by those attempting to apply the technique—indeed, these are mostly elaborations and illustrations of points made in the original text.

Despite such success, the authors are apologetic (modest?) about the book's content, pointing out that the principled approach really just documents best practice in the field rather than revealing a new technique. Specifically their conclusion starts: "*There is probably nothing in this book that you did not already know at some level of your experience. What we have tried to do is organise common sense and common experience in a way that provides a usable framework for thinking and acting.*" This qualification could probably be applied to any management text or indeed to any proposal for organising human behaviour—including, of course, suggested techniques for requirements engineering and software engineering.

One appeal of the principled approach is the thoroughness with which it has been considered and presented. Another strength is its underlying moral position of encouraging a search for fair solutions while treating people considerately in the process. Perhaps its greatest appeal, however, is in its basic simplicity—being distilled down to a few key ideas. These could be used in any field where negotiation is involved and this section attempts to consider the implications of the approach for requirements engineering. This is done through a real-world example.

By an interesting coincidence, shortly after first learning about Principled Negotiation, in late 1990, I was approached to help Local Government with a requirements engineering problem, in which negotiation was a significant issue. Government funds had been made available to Environmental Health (EH) Departments in Northern Ireland to facilitate automation of their information management. Belfast (the capital) already had its own IT Department and was working independently of the other 25 District Councils. EH Departments in this latter group had been trying to clarify their computing needs by working directly with local suppliers but had run into difficulties—hence their contact with me. My brief was to help them produce a system tender and assist in the follow-up selection process. Below is a discussion of the use of Principled Negotiation in tackling these tasks, considered under the four main tenets of the approach.

Separate the People from the Problem

The EH problem initially looked like a negotiation between a client and potential suppliers facilitated by an independent analyst (me!). Looking more closely at the situation, however, several complexities emerged:

- *There were multiple clients*. The 25 EH Departments were structured into four groups: Northern (10), Southern (5), Eastern (5) and Western (5), each of which had a headquarters, giving 29 sites for computer systems in total. The four EH Groups wanted to work together on a single specification for a computer system but would take independent decisions on the responses received through the tendering process. A computer procurement committee had been formed, with representatives selected from each EH Group.
- *Members of the client group had significantly different computing experience.* EH Departments in two of the groups had been using computer systems for several years but the other two had purely manual procedures. There was also some tension between the two groups with previous experience because of possible bias in relation to existing suppliers. Among the green-field groups, one was happy to go with the majority view while the other was concerned about the apparent high risks in acquiring computer systems, implied by the 'horror stories' reported regularly in the press.
- *Some in the client group were unsure of the independence of the consultant*. Unfortunately, consultants are generally treated with some suspicion and there is widespread belief that most will produce whatever opinion is required for a suitable fee. I had this experience early in my career. Following the consultancy with the finance company, described in the previous section, they approached me again (a year later) seeking an opinion on three proposals for a new computer system. I initially assumed that this was to avoid their previous mistake. Certainly the budget involved was much larger. The client, in briefing me on the submissions, indicated a preference for the second proposal. Giving me a weekend to produce a report, I ranked the second and third proposals at similar levels but gave the third the edge because it supported immediate file updates rather than overnight batch processing (this was a long time ago!). This conclusion was not what the client expected; he ignored my report (and request for payment) and selected the second proposal anyway. I was happy to put this down to experience, but was forgetting that all projects run into problems. So a year later, when the chosen supplier failed to deliver on time, the 'overlooked' fee was settled and my help requested once again. I decided not to take up the offer this time.

Clearly then, there was sensitivity in the people side of the environmental health project and a need for me to behave in a way that inspired confidence, helped diffuse internal tensions among the client group and ensure that everyone had an opportunity to engage fully in the process, regardless of their previous experience. Being aware of the principled approach encouraged me to look for issues and take explicit measures to resolve them.

Focus on Interests not Positions

Focusing on interests meant highlighting common ground, both among the EH client group and also between them and their potential suppliers. Such interests were identified at the outset and often reiterated at meetings to help fix them in everyone's mind. For the EH client group these interests were:

- *The basic need for a computer system.* Retaining the manual approach was not an option because of the effort required to produce statutory reports and the requirement to meet a

growing demand from Government for occasional ad hoc reports stretching across long periods of environmental health activity.

- *The additional benefits of computerisation.* With a computerised system it would be much easier to implement the (then) new statutory risk-based approach to inspecting premises. Keeping more precise records of staff activity would also make it easier to make a case for additional staff when required.
- *The benefits of working together on the system specification.* This approach allowed experience to be pooled and helped each one involved build a shared understanding of requirements.
- *The need to act quickly.* Government funding to support the introduction of computer-based information systems was currently available but might disappear at any time, so prompt action was desirable.

There were also interests shared between the client group and their potential suppliers:

- *The benefits of the EH client group going to tender together.* This simplified their interaction with suppliers. For example, the potential suppliers could demonstrate what they already had to offer to the entire client group, rather than hold individual demonstrations.
- *The benefits of adopting the same system.* This was a possibility although the tender allowed each group to make a separate decision. If all groups selected the same system then there would be cost and operational benefits, both for the client group and the supplier. The 29 possible operational sites would be a healthy customer base for any supplier, reducing their risk of suddenly going out of business, and justifying, if necessary, the establishment of a local office in Northern Ireland.
- *The benefits of having a good working relationship with the eventual supplier.* Some in the EH client group saw the computer system as a single purchase. I had to make clear therefore, that all useful computer systems evolved and encourage them to think of the EH system as an ongoing development. This implied a good working business relationship with the supplier. Some in the client group were uncomfortable with this concept as it seemed to leave them vulnerable but recognised the benefit of having an opportunity to make improvements and respond to legislation and technology changes.

The need to build good working relationships among the EH client group proved to be relatively straightforward because of the goodwill and co-operation among the members of the EH computer procurement committee. The Chairman was particularly effective in creating this atmosphere, being a 'natural' principled negotiator.

Invent Options for Mutual Gain

As mentioned in the previous section, it was made clear that the computer system would evolve over time. It also emerged that it would be necessary to spread the implementation of functionality as well. The Government money available was not substantial and a considerable amount would be needed to provide basic hardware, networking, and staff training. Thus the tender was drawn up for a *first phase* of development, focusing on *food control* but making clear what future expansion was necessary. Food control was the most significant area of activity in environmental health departments, the others being *health and safety*, *public health acts*, *consumer safety*, *pollution control* and *licensing*. This approach was an example of inventing an option for mutual gain—it made it easier for suppliers to tender while reducing the risk to the EH client group of taking on too large a project.

Other options for mutual gain included:

- *Developing a comprehensive set of criteria for system selection*. It was important to recognise the factors relevant to the effective procurement, installation, operation and further development of the computer system. Suppliers were likely to offer different products and services to differing standards. Some suppliers, for example, might already have systems that implemented one or more of the additional planned phases of development and could offer these at little extra cost. Similarly, it would be important to be aware of any hardware restrictions that might make future development difficult. Another concern was the ease with which changes could be made. If a supplier offered a new product then it could be matched closely to requirements but if based on an existing product, with current customers, then change would involve negotiation with those customers. All of the major relevant factors were identified and turned into questions for inclusion in the tender document. This was of direct benefit to the client group and ultimately in the interests of the suppliers.
- *Offering flexible requirements*. Some in the EH client group saw the development of the computer system as similar to buying a house, requiring detailed 'plans' to be produced in advance. Indeed one person had drafted out a few screen shots before I joined the project, thinking that the complete user interface had to be specified for suppliers. In developing options for mutual gain it seemed desirable to leave some parts of the specification flexible to permit suppliers to offer creative solutions. Data needs were defined exactly but all required functions were left relatively open as indicated in Table 2.
- *Build on existing equipment*. Environmental Health Departments operated out of District Council Offices, each of which had reasonable computing facilities. These facilities had spare capacity and were listed in the tender in case they could be used for the EH system, so reducing overall costs for the suppliers and clients.

Insist on Objective Criteria

When negotiations are likely to be difficult it is beneficial to negotiate on the process before considering the substance of the negotiation (Fisher and Ury, 1981). Some in the EH group expected me to select the 'best' computer system from the tender submissions. Realising that there was doubt about my independence I insisted that *they* made the decision with me facilitating the process. This was achieved by agreeing the criteria for selection in advance, asking specific questions in the tender to make the assessment of these criteria relatively straightforward, and presenting the assessments in grid form for the client group to debate. I also emphasised that the criteria need not be considered equally important and so could not be combined into a single overall score. Indeed, for some, cost might be the only criterion on which the decision rested.

In early 1992 an invitation to tender for phase one of an EH computer system was released. After a relatively small number of clarifications with potential suppliers, seven responses were received. Having worked out the assessment procedure in advance the analysis was completed quickly, with very few difficulties, despite the responses often being quite different in nature.

One proposal emerged as a clear leader, which was a pleasant surprise. This meant that all four EH Groups selected the same supplier. In many respects this was an ideal outcome for the cost and operational reasons mentioned already. It also meant that the EH procurement committee could continue to work together (CDRC: Computer Development and Review Committee) to introduce further elements of the evolving system. This was beneficial to the

supplier (a local company) who saw the potential of working through a coordinated group rather that dealing with each site individually.

The main requirements analysis phase was completed on acceptance of the tender but collaborative work on the EH system continued for a further eight years. By then the sites had gained significant expertise in IT and were ready to make their own procurement decisions. This resulted in fragmentation, accelerated by a Government change giving greater decision-making powers to individual Council—moving away from the previous group management structure.

The computer system is required to support:

1. the maintenance of an up-to-date record of all relevant commercial premises, organised by District.
2. the registration of food premises (a subset of 2.1) as required by the Food Safety (Northern Ireland) Order 1991.
3. access to basic food premises registration information by members of the public, as required by the Food Safety (Northern Ireland) Order 1991.
4. access to full food premises registration information by police constables and authorised environmental health officers, as required by the Food Safety (Northern Ireland) Order 1991.
5. the organisation of premises inspections based on risk assessment, as outlined in Codes of Practice nos. 8 and 9 of the Food Safety Act 1990.
6. the organisation of other visits to premises as identified in Appendix 3.
7. the maintenance of an action diary for each inspector, summarising his or her planned actions.
8. the recording of food samples taken and the results of their examination.
9. the recording of food complaints and their outcome.
10. the recording of prosecutions and their outcome.
11. the production of standard letters/notices.
12. time accounting for environmental health staff, covering all of their activity but in particular identifying time spent on handling complaints, performing inspections, training, sick leave and holiday leave.
13. the production of the MAFF Official Control of Foodstuffs: Inspection Statistics forms A to D.
14. the production of reports on any data held.
15. a mechanism to enable a library of standard report definitions to be developed.
16. a mechanism to enable District Offices to send reports to Group Headquarters (or other site).
17. controlled access from one District Office or Group Headquarters to data held at any other environmental health site with the same system installed.

Table 2. Functional Requirements of Environmental Health System

Lessons Learned

The world is a very messy place (Ackoff, 1999) and the difficulties of managing the soft issues in any human endeavour cannot be underestimated. Principled Negotiation offers one important way of bringing more control to such messes and was certainly valuable in the environmental health project. General lessons learned from the use of Principled Negotiation in that project included the following.

- Principled Negotiation proved relevant to every aspect of the project and particularly important for handling requirements as the stakeholders had to share and agree them.
- An appreciation of Principled Negotiation and a conscious effort to follow its guidelines improved the requirements engineering process for the person applying it and also for many of the other stakeholders involved. It did, however, require practice, patience and continual vigilance to avoid falling back to a more forceful confrontational approach. Also, there was a tendency to 'relax' as the project proceeded, which increased the likelihood of problems appearing.
- People rarely change. If they are initially difficult they usually continue that way. They are typically not open to principled arguments, such as 'majority opinion' or 'greater good', and generally want their ideas implemented regardless of the implications. The principled approach still seems the best option in such cases, making use of the various tactics for difficult people suggested by Ury (1991).
- A facilitator using Principled Negotiation should, ideally, act fairly for both sides. In practice, of course, the requirements engineer is rarely independent, as the client or supplier will be their employer. This creates a barrier to being fair and hence in fully embracing the principled approach. For example, while acting for the client it would be difficult to suggest that a price quoted for a piece of work was *too low*. Low prices, however, can be a problem for the client if the supplier later has to cut corners or, at the extreme, goes out of business.
- It is desirable to identify all stakeholders at the outset and find ways of engaging them in the requirements engineering process. The environmental health project used a small committee, relying on its members to communicate with the stakeholders in their group. This wasn't always successful and a significant number of stakeholders felt excluded from the development process. If starting the same project today, more workshops would be arranged initially, and a web site used to keep everyone informed of developments.

Principled Negotiation and Soft Systems Methodology

As a general tool, Principled Negotiation need not be a formal part of a requirements engineering methodology. Nevertheless, to achieve maximum benefit, it seems desirable that the ethos of the methodology be sympathetic to the principled approach. One relevant technique is Soft Systems Methodology (SSM) (Checkland, 1999; Wilson, 2001). SSM, like Principled Negotiation, is well established, with a reputation stretching back over twenty years. Indeed the first major text on each technique appeared in the same year (1981).

SSM can be described as a *goal-driven* approach to organisational improvement. In simple terms, illustrated in Figure 1, its strategy is to first build a vision for an organisation (the target system), identifying why it exists and what it must do to achieve its purpose. This vision is captured in *conceptual models* that are then used to analyse the way that the organisation currently operates (current system). Differences between the modelled vision and the current situation help identify where improvement is desirable.

With that brief overview, the following gives an indication of the ways that SSM might support Principled Negotiation:

- *Separate the people from the problem*: SSM emphasises the need to take a broad approach to analysis, covering all relevant issues, including the many soft factors present in any human activity system. In effect, however, its approach separates the people from the

problem by building visionary abstract models of relevant activity that initially ignore how (and indeed if) such activity is currently performed. The standard texts do not stipulate how such models should be developed but typically these are constructed with stakeholders in a collaborative way, so fully involving them in the analysis process.

- *Focus on interests, not positions*. By building abstract models, stakeholders are initially discouraged from thinking about the current situation and any opinions (positions) they have with respect to that situation. They are freed from any consideration of constraints currently present in the situation, such as financial budgets, the pool of available staff, current goals, and so on.
- *Invent options for mutual gain*. SSM takes a very creative thinking approach to envisaging a possible target situation. Indeed it has been offered as a support technique for business process re-engineering (Hammer and Champy, 1993). Typically, it helps develop a long-term view of any situation and in doing so identifies a substantial number of potential improvements. This gives many options from which to develop change plans.
- *Insist on objective criteria*. SSM provides a basic framework for defining change but is not prescriptive about how that change should be defined and agreed. This provides flexibility within which more specific techniques can be developed.

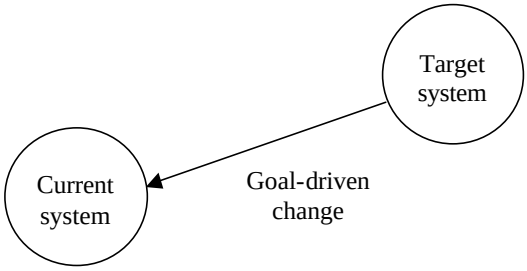

Figure 1. SSM in essence

The author has been involved in the development of a requirements engineering methodology that builds on SSM (Bustard *et al*, 2000) and so provides a reasonably sympathetic context for the use of Principled Negotiation. Future work will consider how Principled Negotiation might be integrated more directly into the methodology.

Conclusion

This paper has outlined the main concepts of Principled Negotiation and described a very positive experience of its use in a requirements engineering project. As indicated, the technique is a general tool that can be applied in all circumstances where negotiation is necessary. In that respect, it is particularly valuable in project management and indeed in many areas of business and personal life. This generality more than offsets the small effort required to understand and build expertise in its use.

Acknowledgements

The author is very grateful to the many Environmental Health staff who contributed to the IT procurement and development project—especially those who were involved at the beginning and provided support over many years, including Patrick Cosgrove, Brian Oliphant, Alistair Morgan, Angela Gardner and Ian Patterson. The author is also grateful to the anonymous

referees for their constructive comments. The development of this paper was supported by the Centre for Software Process Technologies (CSPT), funded by Invest NI through the Centres of Excellence Programme.

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