Power and Politics in Requirements Engineering: A Proposed Research Agenda

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Abstract – **This vision paper considers the role of power and politics in requirements engineering (RE). It offers a working definition of both terms and reviews the existing literature both in RE and related disciplines. It argues that, given the increased complexity, uncertainty and organisational embeddedness faced by RE in practice, power and politics have become increasingly relevant factors that have not been adequately considered. Building upon recent relevant research, a research agenda is proposed that presents a methodological framework which examines power and politics through the *structure* of power relations and the *process* of decision-making. This framework will require validation through empirical research as a first step to developing models of power and politics that could be of practical use for RE. Although the potential problems faced by the study of power and politics in an RE context are acknowledged, it is argued that the potential benefits could be significant.**

Keywords – decision making; power; politics; requirements engineering; stakeholders

I. INTRODUCTION

Although notable work has been undertaken on the importance of social factors in RE, there has been relatively little direct consideration of the influence of power and politics [1][2][3][4]. Yet few practitioners would deny that they are factors that can have a serious impact on the success or failure of the development of information systems [5]. The requirements process is frequently derailed by political machinations, to the extent that treating it as a wholly 'rational' process can in practice be somewhat idealistic [6]. This paper argues that as power and politics can have a profound impact on the requirements process they are as a consequence worthy of study.

Fundamental shifts in the contexts within which RE operates, with the increasing scope and complexity of projects, uncertainty in the adoption of solutions, and entanglement with organisational change, have necessitated radical changes in approach to RE problems [7]. One consequence of this is that attempts to maintain a separation between RE as a 'technical' discipline and the wider 'social' context of organisations are increasingly untenable. This has been reflected in approaches to modelling RE. Yu argues that, as software systems become ever more complex and densely intertwined with the human social environment, there is a need for models that can reflect the social characteristics of complex systems [8].

A central argument of this vision paper is that power and politics need to be seen not as factors simply distorting or interfering with an underlying rationality, but that, in many circumstances at least, RE should be treated as a *socio-political* process which is inextricably embedded within an organisational context. It is also argued that power and politics should not be regarded solely as negative factors that should be minimised or avoided. On the contrary, they can be viewed as tools that, if harnessed correctly, could enable the delivery of better requirements and more successful solutions. Although it is acknowledged that the study of power and politics can be problematic in practice, a methodological framework is presented here that could provide a practical basis on which to base such study. Building upon some recent research developments, this framework approaches the study of power and politics in RE based upon analyses of the *structure* of power relationships between stakeholders in the RE domain and of the political *process* involved in the exercise of power through decision-making.

The paper begins by proposing a working definition of power and politics. It then presents arguments for the inclusion of power and politics in RE. This is followed by a review of power and politics in the literature on RE and information systems design (ISD) focusing on four themes: challenges to assumptions of rationality, exploring stakeholder relationships, decision-making in RE, and dealing with increasing complexity. The paper concludes with the presentation of a framework for the identification and modelling of power and politics, and a proposed research agenda for the study of power and politics in RE.

II. A WORKING DEFINITION OF POWER AND POLITICS

'Power' and 'politics' are terms that tend to be regarded with suspicion. In her classic text on organisations, Moss Kanter claimed that, "it is easier to talk about money – and much easier to talk about sex – than it is to talk about power. People who have it deny it; people who want it do not want to appear to hunger for it; and people who engage in its machinations do so secretly." [9] Yet power and politics have

long been a source of fascination, with contemporary writers on power citing a long tradition, from the Greek historian Thucydides through to Machiavelli, Hobbes, Nietzsche and Foucault [10].

As a first step, it is useful to provide working definitions for both terms.

Power can be viewed as a *potential* possessed by an actor, A, that can only be properly understood in terms of A's relationships with others. So, given a relationship between A and B, if A has power over B then one or more of the following are possible,

- A can get B to do something that B would not otherwise do, or prevent B from doing something that B would otherwise do.
- A can define reality in such a way that B will act in accordance with it.

The first of these assertions, the power to influence behaviour, is described by Dahl as an "intuitive idea of power", and by Lukes as a 'one-dimensional' view of power [11][12]. The second stems from a critique of the first, originally proposed by Bachrach and Baratz, and is characterised by Lukes as a 'two-dimensional' view of power. (Dowding prefers to use the terms 'power to' and 'power over' to characterise these two aspects of power) [13][14]. Simply put, one-dimensional power involves A telling B what to do and B complying. Two-dimensional power is where A is able to define an agenda which B will act in accordance with without needing to be asked. For example, within an organization this could be seen in a department where A has the power to determine both who attends decision-making meetings, and also to set the agenda for such meetings.

Lukes adds a further dimension to this understanding of power [12]. This third dimension can be characterised as the ability to determine values, norms and ideologies. This is the most potent dimension of power, as it is able to shape the social context in which power relations exist. An example of this, type of power would be the influence of religious faiths over their adherents.

It is impossible to consider the study of power without reference to Foucault, in whose writings it is elevated to critical force running through society [15]. Foucault is not really a theoretician of power *per se*, he is perhaps better viewed as a commentator on the subject. Some of his observations about power have, however, become hugely influential. He sees power relations as operating at all levels of society and in various directions (not just top-down). Consequently, he argues that the study of power should require the application of a sort of 'microphysics', or the study of the capillary circuits of power. He rejects the assumption that power is an entity, or a possession, arguing that it only exists in the context of a relationship. He also reacts against the Marxist assumption that power equals repression. To Foucault, power is certainly something that is dangerous, but it can be use to enable, as well as to repress. Finally, and perhaps most importantly, Foucault promotes a Nietzschean rejection of the notion that truth and power can be treated as independent of each other. Sometimes derided as a nihilist who characterised truth as no more than an effect of power, Foucault was rather interested in "trying to make visible the constant articulation…of power on knowledge and of knowledge on power".

If power is defined in terms of a *potential* force, then politics can be regarded simply as the study of power in action – or alternatively in terms of a "process of bargaining and negotiation that is used to overcome conflicts and differences of opinion" [16][17]. So, although we can say that A has power over B, it is only the practice of power that actually demonstrates it. Therefore, power can be viewed in terms of a *structure* of relationships, and politics as a decision-making *process* informed by that structure.

III. WHY SHOULD POWER AND POLITICS BE CONSIDERED IN REQUIREMENTS ENGINEERING?

Requirements engineering has tended to see the world from a rational, objective viewpoint. This is perhaps unsurprising, given its origins in software engineering [18]. From this perspective it is assumed that, for a given problem, a set of requirements can be definitively identified that can then be prioritised and negotiated with 'reasonable' stakeholders, resulting in a solution that can be verified as 'correct', transparent, and satisfactory to all parties. In contrast, power and politics, seen to be characterised by subjectivity, vagueness and a lack of transparency, are regarded as necessarily in opposition to, or at least outside of, this rational view. Problems of power and politics, where they are acknowledged, tend to be seen as organisational concerns rather than issues for RE to address [19].

The view of RE as a predominantly technical discipline has been frequently challenged. Of all the branches of software engineering, human factors have been seen to be of particular importance [20][21][22]. The need to involve users in requirements elicitation and prioritisation has led to the consideration of such factors as individual motivation, emotion, and conflict, and therefore to re-conceptualisations of RE as a socio-technical discipline, with a corresponding focus upon models such as i* that are centred on people and organizations rather than processes and systems [2][20][21][8]. This paper argues that such a socio-technical approach inevitably means that power and politics must be considered as potential factors in the RE process, as they tend to be present to a greater or lesser extent in the operation of any socio-technical system.

The rational approach to RE has been based upon assumptions of human motivation and organisational life that can be somewhat problematic. In the rational view, organisations tend to be seen as embracing common core goals where, as long as communication between stakeholders is successfully facilitated, all actors will collaborate to deliver successful outcomes [23][24]. However, empirical studies question this 'unitary' view of organisations [25]. In practice, many organisations are observed to be deeply political and characterised by *goal incongruence* – where stakeholders have interests and motivations that are not necessarily reconcilable through rational discussion [1].

Here it is argued that power and politics tend to become relevant in circumstances where,

- a range of individuals and groups with differing interests and motivations are involved
- there are differing views about the state of the world, and what the future holds
- decisions need to be made in conditions that are uncertain and/or complex

The problem areas faced by RE can increasingly be seen to fulfil all of these criteria.

Not only are power and politics factors that should be considered in RE, it can be argued that, in an uncertain world, power and politics are in fact critical to getting things done. Indeed, political action can be seen to embody "a vital form of rationality that is required to reach socially important decisions in conditions of incomplete information about the relationship between actions and outcomes"[1].

IV. A REVIEW OF POWER AND POLITICS IN RE AND ISD LITERATURE

Power and politics are not often mentioned directly in the RE literature, although arguments for the importance of other aspects of social behaviour in the RE process, such as emotion and trust, have been made [2][26]. However, a significant literature in information systems design (ISD), dating back to Markus in the 1980s, has highlighted the impact of power and politics in the design and deployment of information systems [27][28][29]. They have also long been regarded as important in the study of organisations and organisational change [9]. However, whereas writers on management and organisations, such as Pfeffer and Handy, have had some success in translating their findings into practical advice for managers, comparable work in ISD has had a limited impact among practitioners [17][30][31].

A few writers have explicitly called for the consideration of power and politics in RE. Andriole argues that requirements management can be viewed as a political rather than a technical process and Rost points to project failures that have been associated with political behaviour, highlighting that stakeholders are not necessarily rational players seeking the best outcome, as the potential of change can be seen by many as a threat to their power, status, and even their job [6][5]. However, only Bergman et al. have so far presented a comprehensive argument for reconceptualising RE as a political process [1].

Despite the limited direct references to power and politics in RE, this paper argues that there are several strands of recent research that could be seen to point towards both the theoretical case for the consideration of power and politics and to practical approaches to their study. These can be summarised as follows:

- Challenges to assumptions of rationality
- Questioning goal congruence
- Approaching RE as a decision-making process
- Dealing with increasing complexity, entanglement, and fragmentation

A. Challenges to Assumptions of Rationality

There has been a tendency in RE to assume that requirements somehow exist 'out there'; that they can be elicited from the environment and then refined into complete and consistent specifications. However, rather than viewing requirements as elements with an *a priori* and independent existence, it has been argued that they are, to a greater or lesser extent, socially constructed [3][32]. Goguen asserts that, "much of the information that requirements engineers need is embedded in the social worlds of users and managers…at its source, this information tends to be informal and highly dependent on its social context for interpretation" [3]. He views this 'situatedness' in requirements as something that is "emergent, local, contingent, embodied, open, and vague". Rather than objective facts that are waiting to be discovered,

requirements are seen as subject to negotiation, contestable, mouldable, and, therefore, arguably open to political action.

If requirements are seen as being constructed within a social context, then it is critical to understand how that social context can determine how requirements are created. Lin and Silva argue that the management of the adoption of information systems is a social and political process in which stakeholders frame and reframe their perceptions of such systems, and that social phenomena such as language, symbolic power, and communication processes should be seen as fundamental for understanding how these technological interpretations are framed [33]. Their arguments are based on Orlikowski and Gash's development of *technological frames analysis*. A *frame* can be understood as a cognitive device that enables individuals to comprehend, understand, and explain the world around them. Essentially they can be seen as sets of assumptions, understandings and expectations that are used by individuals to make sense of a complex world without the need to constantly analyse each new situation afresh. Crucially, frames tend to be shared by groups [33]. For example, individuals working within a finance department might share a set of assumptions about the numeracy of other members of their organisation. *Technology frames* can be defined as "that subset of members' organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations. This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts" [34].

Ovaska et al. propose the adoption of such *technology frames* as a way of explaining the RE process [35]. They argue that requirement shaping during a project can best be described as a process where attitudes and expectations, expressed through technology frames, are repeatedly *filtered*, *negotiated* and *shifted*. Using a case study based on an e-commerce platform development project, they observed that preconceptions, attitudes and expectations about systems development among project participants *filtered* their understanding of software requirements. *Negotiation* between participants resolved the issues resulting from this filtering and *shifts* in their attitudes and expectations facilitated changes in the understanding of the requirements.

It can be argued, therefore, that in these socially-constructed approaches requirements are not to be seen in terms of an underlying reality waiting to be discovered, but rather as elements in a contested and dynamic framing and reframing of understanding. As Lin and Silva identify, there is therefore a significant opportunity for the exercise of power and politics by actors seeking to mould other actors' understanding of reality [33].

B. Questioning Goal Congruence

The second assumption to be questioned is that of *goal congruence*; the assumption that all members of an organisation share the same underlying goals. Stakeholder theories and techniques have contributed to a fuller understanding of the behaviour of multiple actors in the requirements process [36][37][38]. However, such approaches have tended towards assumptions of goal congruence. For example, Macaulay situates the stakeholder approach in RE within an historical progression of increasing collaboration, where;

- Users are consulted

- Users participate
- Stakeholders participate
- Stakeholders cooperate [20]

Although such approaches acknowledge that stakeholders have a range of motivations and requirements that can sometimes conflict, adequate communication and rational negotiation are generally seen as being sufficient to resolve any issues that arise, as it is assumed that fundamental goals are essentially shared [20][39]. However, empirical work on organisations demonstrates that, wherever individuals and groups work together, power and political conflict resulting from fundamental *goal incongruence* is often not far away [25]. Indeed, studies in ISD have suggested that conflict can be as much based on political as on technical issues [40]. Whereas disagreement over requirements is seen as a legitimate part of RE, more fundamental 'organisational' conflict has tended to be viewed as out of scope [19]. This is reflected in the fact that stakeholder analysis in RE is generally approached from the point of view of a particular problem domain or project. This problem-centric view does not consider the relationships *between* stakeholders to be of particular relevance. However, any approach that regards politics and power as relevant has to view the relationships *between* stakeholders as important, as it is fundamentally within these relationships where power and potential political conflict lie.

Some writers have looked to explore the relationships between stakeholders using social network analysis techniques [41][42][43]. Following Pfeffer's contention that people's attitudes and perceptions are, to a large degree, derived from their social context, Ibarra argues that network factors can be seen to play an important role in shaping the attitudes and perceptions of stakeholders, as they can highlight the complex, multilayered and informal relationships between them [17][41]. Although in practice it may be only be feasible to take a snapshot of stakeholders' relationships at a point in time, the dynamic nature of these relationships should not be overlooked. In addition to approaches that focus on the topography of networks, Pouloudi and Whitley argue that analysis of the *nature* of the political and power relationships between stakeholders can provide an additional level of analytical depth [37].

One role that tends to be overlooked in stakeholder analysis is that of the requirements analyst. In the rational world-view, the analyst tends to be assumed to be an independent and objective actor. Even where politics is acknowledged to be a factor within the organisational context, the analyst is placed outside of the political arena. However, if the relationships between stakeholders are seen to be important, this presumed objectivity must be challenged. For example, where the analyst is employed by, and reports into, an organizational stakeholder, that stakeholder will generally defines the scope that the analyst is working within. The analyst may be seen by other stakeholders to be working for the 'management', or on behalf of a particular group. The analyst's background may also influence perceptions. For example, an analyst with a technical background may be seen as a threat by stakeholders who view technology as a threat [33].

It has been questioned whether the analyst should even try to avoid involvement in the political realm. Bergman et al. argue for "the rise of the political requirements engineer" [1]. Although they acknowledge that they are unlikely to be able to determine the outcome of negotiations or resolve conflicts, they do not think that analysts should stay out of the political arena, arguing on the contrary that they should use political skills to bridge the gap between the political and the technical.

C. Approaching RE as a Decision-Making Process

The exploration of stakeholder relationships can be a useful route to understanding the motivations and relationships of the actors involved in a particular RE domain. However, the RE *process* itself is, of course, where the impact of these relationships is played out. It has been argued that RE should not necessarily be seen to operate within a structured framework. Davidson characterises the RE process as "chaotic and non-linear" [44]. Ovaska et al. view requirements elicitation as "an ad-hoc and iterative process involving political, cognitive and social aspects that affect the interpretation of requirements during the whole project lifetime" [35].

Such challenges to the nature of the RE process have led Alenljung and Persson, and Aurum and Wohlin to attempt to reframe RE in terms of a *decision-making* process rather than as a structured approach, and to seek to integrate classical decision-making models with existing RE process models [45][46]. The latter argue that RE is "essentially a complex communication and negotiation process" to be seen within a context of political, social, organisational and cultural issues. Bergman et al. add an explicitly political dimension to this, asserting that requirements, for large-scale systems at least, are "constructed through a political decision process, whereby requirements emerge as a set of mappings between consecutive solution spaces", namely that the set of requirements that make up a solution is not built up one brick at a time, but rather sets of alternative solutions are considered in turn. Moreover, returning to the concept of *goal incongruence*, where stakeholders do not share common goals, Bergman et al. further argue that these alternative solutions can only lead to agreed-on specifications through the exercise of organisational power. Emphasising the uncertainty surrounding large-scale RE exercises, they assert that "since it is impossible to see the future, most complicated decisions fall into the class of issues that must be decided politically, while informed with technical analyses" [1].

D. Dealing with Increasing Complexity, Entanglement, and Fragmentation

RE clearly operates within, and is required to adapt to, wider trends in the development and adoption of technology by organisations. These have been characterised by ever-increasing scope, complexity, uncertainty and geographic dispersion [7]. Alenljung and Persson list several trends they regard as defining contemporary RE: ill-structured problems; uncertain, dynamic environments; shifting, ill-defined, or competing goals or values; time stress; high stakes; multiple player situations; and organisational goals and norms [45]. In addition to these factors, another important trend in RE has been an increasing emphasis on the inherently uncertain areas of creativity and innovation [48]. All of these factors can be argued to further challenge the view of RE as a rational, technical discipline searching for 'correct' solutions, and point towards approaches that are better able to deal with uncertainty and conflict. Bergman et al., citing Simon's theory of bounded rationality, argue that it is virtually impossible to find optimal solutions to complex problems in a reasonable

amount of time due to limitations in human processing, so that *satisficing* rather than *optimisation* is often the only feasible outcome [1]. Socio-political approaches could be useful in this context. Pfeffer actually defines organisational politics as "those actions and activities aimed at acquiring, developing, and using power and other resources to obtain one's preferred outcomes in a situation in which there is uncertainty or dissensus about choices" [17].

As well as the need to deal with increasing complexity and uncertainty, RE has become ever more entangled with wider organisational change, to the point that very often it is difficult to comprehend RE as a distinct process. Alenljung and Persson argue for an integrated approach to RE that covers strategic decision-making, requirements management, and road-mapping processes [45]. Again, such an alignment with the wider organisation makes it difficult to exclude the consideration of power and politics. The idea of requirements gathering as a discrete phase largely confined to the early stages of a project is also challenged, with Ovaska [35] proposing that requirements elicitation should be viewed as a "heterogeneous organizational process continuing the whole project lifetime."

RE can also be seen to operate within contexts that are increasingly fragmented. Contingent approaches need to be adopted that can begin to address this. Alenljung and Persson argue that, "a first step toward better decision support in requirements engineering is to understand the multifaceted decision situations of decision-makers" [45]. And Atkinson argues for a post-methodological era where "what emerges will be approaches with a capacity to deal with contingency and diversity" [47].

E. Implications for the role of power and politics in research and practice

The preceding review of literature has explored some challenges that have been made to common assumptions underpinning RE, namely,

- Challenges to assumptions of rationality
- Questioning goal congruence
- Approaching RE as a decision-making process
- Dealing with increasing complexity, entanglement, and fragmentation

From this, the following key arguments can be presented,

Socially constructed requirements: Requirements can be viewed as socially constructed and *situated* in a social context. Interpretation of requirements can therefore be both contentious and contestable, opening them up to political action.

Technological frames: Individuals and groups can be seen to make sense of the world through *technological frames*. RE can be viewed as a political process involving the filtering, negotiating and shifting of these frames.

Goal incongruence and power relationships: Individuals within organisations often do not share common goals. In these cases, the RE process cannot overcome conflicting requirements simply by promoting collaboration and communication. In such political arenas, the nature of power relationships *between* stakeholders is critical, and the requirements analyst needs to be regarded as an actor within this network of stakeholder power relationships.

Politics played out as decision-making: If politics is power in action, then politics can be seen to be exercised in RE through decision-making processes.

All of the above arguments are rendered more important in contexts marked by complexity and uncertainty, and where innovation and creativity are seen to be increasingly critical factors. It is clear that RE is increasingly bound up with wider organisational change, therefore requiring more heterogeneous approaches. It also can be seen to operate within an increasingly fragmented set of domains, necessitating contingent approaches to solutions.

In the remainder of this paper we introduce theories, techniques, and representations from outside of the software engineering discipline with which to describe, analyse and diagnose power and politics in RE projects, as the foundation for a new research direction in RE. The following section outlines one method that considers these theories, techniques and representations, as well as the challenges that requirements researchers and practitioners will need to overcome to utilise them effectively. We then introduce a broader set of research challenges to form an agenda to integrate the study of power and politics into RE research.

V. A FRAMEWORK FOR THE STUDY OF POWER AND POLITICS

A. Describing Power

Power is popularly viewed as an attribute possessed by an actor. For example, we say that 'B is powerful'. However, in reality it only really makes sense to view power in terms of a *relationship* between two or more actors. Power relationships can also be seen to imply dependency – if A has power over B then B is in some sense dependent on A – so that power is in fact a relationship in which both parties are required to participate. As previously noted, stakeholder analysis has not tended to be concerned with modelling the relationships between stakeholders; however it has been used to consider measures of power. These can be modelled using a *power/interest grid* [49] as seen in Figure 1, where A to F are stakeholders in a domain. The grid graphically illustrates the relative power and attitudes of key stakeholders in a particular problem area. Although it can be created with relatively little effort during the stakeholder analysis phase, it does not attempt to describe the nature of power relations *between* stakeholders in a domain.
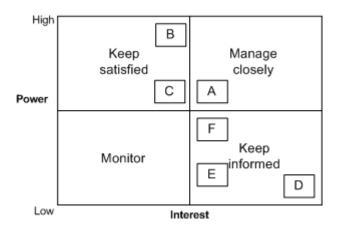

Figure 1: power/interest grid [49]

In order to explore the relationships between stakeholders, social network analysis approaches can be used. Social

network analysis is concerned with understanding the linkages between social entities (actors) and the implications of these linkages. Actors can be discrete individuals or collective social units, and are linked to one another by social ties that can represent different types of relationship, such as friendship, association in an organization, or behavioural interaction. A network of such relationships builds up into a *topology* that be analysed to explore the nature of the relationships within the network. Such network measures as *centrality* and *proximity*, which measure the degree of connectivity of actors within the network can be used as proxies for power [50]. However a simple social network does not explicitly indicate power relationships. Such models need to be enhanced to be able to do this. For example, the presence and direction of power relationships can be indicated by the addition of arrows onto a network diagram, as shown in Figure 2. The nodes represent actors in a very simple network. The illustrative example here looks at an IT department within an organisation. Figure 2 shows that the actor B has power over actors A and C. A in turn has power over E and F. Considering all of the relationships within the network in this example, B can be seen to be the most powerful and D the least.
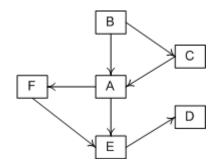

Figure 2: Social network with power relations

Although Figure 2 identifies the existence and direction of power relationships, it does not describe anything about the *nature* of these relationships. A number of typologies have been presented to describe the nature of power relationships; one of the most commonly used is French and Raven's *sources of power*,

- Legitimate – formal authority
- Reward – the ability to bestow rewards
- Coercive – the ability to punish
- Expert – possession of skill or knowledge
- Referent – from personal characteristics [53]

The model presented in Figure 2 can therefore be further enhanced by defining the type of power relationship existing between actors using French and Raven's categorisation. These sources of power have been added to Figure 3.
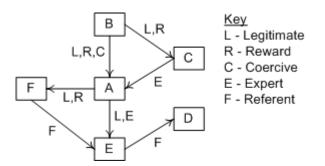

Figure 3: Social network with sources of power

The most straightforward of the relationships described in Figure 3 are the *legitimate* links between actors, as these reflect the formal power structure in the organisation as described in organisational charts. Thus, the actor B can be seen to have authority over A and C, and A manages F and E. The remaining power relationships within this simple network, however, are not based upon formal roles. For example, C has power over A by means of *expertise* only - perhaps C might control the production of reports required by A. F has power over E through *referent* power - based upon interpersonal skills rather than any formal authority.

The network model of power described in Figure 3 implies a fairly straightforward top-to-bottom exercise of power. Clearly, most RE projects involve relationships that can be more complex than this, and often power relationships are not unidirectional. Operational staff can have disproportionate power in the uptake of software, for example ambulance crews refusing to use new equipment as expected or air traffic controllers exercising safety concerns.

Whereas Figure 3 illustrates power relationships *between* actors, previously we have seen that some actors can have wider power over a domain. To recap Lukes' three-dimensional view of the operation of power,

- First dimension – this describes the ability of an actor to prevail in observable conflicts
- Second dimension – this describes the ability of the powerful to decide which issues are decided upon
- Third dimension – This is Lukes' 'radical view'. Here power is exercised by the manipulation of desires and the definition of ideologies [12].
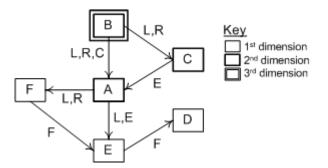

Figure 4: Social network with dimensions of power

Figure 4 builds upon the previous models and in addition attempts to represent this *domain* power. As it is assumed that any actor with power over another has the ability to use the first dimension of power, whereas only certain actors are able to call on the second and third dimensions, only the second

and third dimensions need to be modeled here. Figure 4 demonstrates that the actor A can call upon the second dimension of power, being sufficiently powerful to be able to control the agenda for decision-making. For example, A may be able to determine who attends, as well as the agenda for, decision-making meetings. Actor B, however, the overall head of the department, possesses power associated with the third dimension, allowing for a much more pervasive influence over the rest of the department, namely the ability to determine the terms of the debate. For example, B might be an enthusiastic advocate of an Agile approach to system development, and has the ability to ensure that this approach is generally accepted within the larger team without the requirement to enforce it explicitly through the use of power.

We believe that it is possible to describe important types of power relationship from the relevant literature with such relatively simple concepts and notations. Describing important power relationships using such descriptive models represents one likely outcome of RE research into power and politics. Such models can be seen to extend existing stakeholder modelling approaches such as Alexander's Onion Model [51] with syntax and semantics that are able to describe and diagnose power and politics.

However, such notations are really only useful if we are able to diagnose power in the first place, as explored in the next section.

B. Diagnosing power

The diagnosis of something that, as previously noted, is highly contentious and often hidden, and which moreover can be only be seen to exist as a 'potential', rather than an observable force, is clearly problematic. However, Pfeffer points out that, in practice, it is something that is done all the time [17]. He cites the example of sales people who need to be able to quickly diagnose power relationships in an organisation to work out not only who has the power to make a decision, but also who else is able to influence that decision.

Pfeffer provides a useful three-step approach to diagnosing power that could be utilized for RE research and practice. The first step is to identify the individuals or groups who are relevant. He emphasises that it is important to look beyond formal groups. Informal groupings, such as patterns of friendship, cultural similarities, gender, age, academic background, and geographical location can also be very important. Acknowledging the range of possible scenarios, Pfeffer concedes that there could be many ways of drawing such maps of power relationships, although he does identify the use of social network analysis as one potentially useful technique.

Once the relevant actors and groups are identified, Pfeffer's second step involves coming up with four indicators of power and applying these to assess the relative power ranking within this topology of relationships. These are,

Reputational indicators: Simply asking actors to identify who is important may seem to be problematic, but Pfeffer points to studies that have found great consistency in responses to such questions, indicating that they are reliable. However he does point out that, "it is often the case that politically adept actors attempt to keep the extent of their power secret. This means that those most likely to be in the know, who also happen to hold the most power, are precisely those with the least incentive to divulge what they know about the organization's power distribution."

Representational indicators: This can be membership of committees and boards, and other posts that wield power.

Observing the consequences of power: One way of determining who has power is simply to look at who benefits from contested decisions.

Symbols of power: These can involve such things as the amount of physical space an individual or department is accorded, and even such trivial-sounding issues such as availability and location of car-parking spaces.

Pfeffer's third step involves looking at the patterns of dependence and interdependence between actors and groups, on the basis that it is impossible to understand power without understanding patterns of influence. For example, referring back to Figures 2, 3 and 4, the decision to sign off a particular piece of work may lie with actor A, but he might be unwilling to do so without advice from C.

Therefore, one key RE challenge that necessitates both conceptual modelling and empirical evaluation is to understand to what extent Pfeffer's indicators can be used to diagnose power relationships and their consequences in RE projects. We are keen to explore this because, inevitably, such indicators are unlikely to describe all aspects of power and its application, and other approaches will also need to be researched, as we describe in the next section.

C. Describing and diagnosing politics – the exercise of power

We have proposed that the modelling of power relationships can be a useful tool in understanding the context of how decisions get made in an organization. However it does not explain the decision-making process itself. We propose that the analysis of the *structure* of power relationships could be accompanied by modelling the actuality of the decision-making process through *process-centred*, politically-focused techniques. This involves approaching the requirements process in terms of a series of decisions [45][46], and exploring the impact of politics on that decision-making process. Pfeffer [17] argues that where, or at what level, decisions are made is important, and that power is involved in decision-making to different degrees. For lower-level decisions, power may not be involved at all, but it is more likely to be so for higher level decisions and wherever there is uncertainty or complexity. Also, power is used more frequently when there are higher levels of interdependence between actors. The implication here is that it is not sufficient to simply characterise an organisation as 'political' or 'rational', but that the degree of 'political-ness' needs to be related to decision-making at the most granular level. Returning to the IT department cited in the previous section, if, for example, they are commissioned to create the requirements for a new piece of software, an analysis of the decision-making process might reveal that decisions relating to data structure tend to be made at a level where a rational process prevails as this is not a contentious area, whereas decisions relating to user-interface design might involve a range of actors with conflicting interests, and therefore require political action in order to resolve them.

Of course, describing power relationships and the exercise of such relationships in RE processes necessitates some form of social modelling – the construction and analysis of models that describe different actors, work tasks and types of relationship in a work context. Such social modelling approaches have already been the subject of research in RE.

The next section indicates how the research into power and politics in RE can build on these existing methods.

D. Integrating the framework into the i* approach

The social modeling of requirements is addressed by the i* framework, which provides a goal-based approach to the modelling of relationships between stakeholders through the use of Strategic Dependency and Strategic Rationale models [8]. It is an approach that accepts the messiness and uncertainty of the social world and that does not necessarily assume an underlying rationality. It can be used to model domains as they are and also as a design tool to model new solution spaces. That said, one limitation is that i* is normally used to model human actors who will fulfill important roles in the future system - typically the actors in that system. However such actors are often only a subset of the people and organisations who have a stake in a system directly being analysed, and pragmatics dictate that other influential stakeholders are often not described in i* models.

Another current limitation of i* is that of addressing directly power relationships in the domain of analysis. An illustrative example Strategic Dependency diagram in Figure 5, depicting a system for the monitoring of HIV/AIDS new diagnoses and deaths, [52] shows a number of actors, together with the dependencies between them, both in terms of hard and soft goals. Hard goals are states in the world that one actor in the dependency relationship can either attain or not, whilst soft goals are states in the world that the actor can achieve more or less. In Figure 5 it can be seen, for example, that the Scientist relies on the Information Officer for accurate information (soft goal) and that the Information Officer depends on the Inputter for completed forms (hard goal). Such models can provide a rich description of how organisations work, and, as a tool used for the requirements process, can be used to describe how a new system should work.
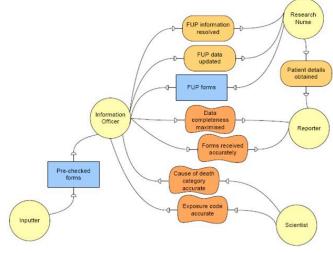

Figure 5: Fragment of SD model

Although the model in Figure 5 describes the functional dependencies between actors, it does not directly address the power relationships and political realities of the domain. Figure 6 attempts to illustrate how the dependencies between actors shown in the SD model can be translated into power relationships as in Figure 4 (although here the shape assigned to actors is a circle in order to fit more closely to the SD

model). We can see, for example, that the Scientist, whilst lacking legitimate power over any of the other actors, nevertheless controls the agenda (second dimension power) and possesses expert power over the other actors (except for the Inputter). Yet the Scientist, dependent upon the relatively powerless Information Officer for accurate data, may still not be able to achieve the goals described in the Strategic Dependency diagram.
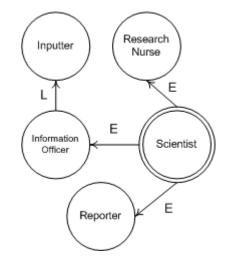

Figure 6: Mapping power relationships onto SD fragment

One research direction might be to explore extensions to social modelling approaches already in use in RE to describe and analyse power and politics in RE projects. Work in this direction has already been reported, such as Thew and Sutcliffe's [54] method aimed at improving the elicitation and analysis of 'soft' issues such as values, motivations and emotions.

VI. A WIDER RESEARCH AGENDA FOR POWER AND POLITICS IN RE

It has often been noted that RE lacks a substantial body of empirical research [55][56]. However, much of the recent literature in ISD and RE that touches upon power and politics has been grounded in real-world case studies [31][57][45][35][1][40]. This is perhaps not surprising, considering that the study of power and politics tends to focus on the 'messy' world as it really is rather than seeking to develop top-down models and methodologies. As Flyvberg [10] argues, any examination of the relationship between rationality and power requires "empirical depth as well as attention to detail." It should be noted, however, that most of the studies cited have been limited to single case studies, and therefore have been required to acknowledge the danger of applying their conclusions more broadly.

This paper argues that a serious consideration of the impact of power and politics in RE is required, and that this will entail detailed empirical research. A research agenda is proposed that builds upon recent relevant literature to present a methodological framework that approaches the study of power and politics from two perspectives. The first examines the *structure* of power relations between actors in the requirements domain by building upon existing work on

stakeholder identification and mapping by extending social network analysis techniques to explore the existence and nature of power relationships between stakeholders. The second perspective analyses the political reality of RE by exploring the *process* of decision-making, by building upon recent literature on decision-making in RE [45][46]. It is proposed that the approach could be superimposed on, or more closely integrated with, the existing i* framework, in order to complement the richness and actor-focused aspects of that approach. The framework will need to be tested through empirical research to judge whether it could be both useful and practical to capture and describe the action of power and politics within the RE process, and to assess how the diagnosis of these factors could assist researchers and practitioners working in RE.

Power and politics do not readily lend themselves to investigation. They tend to be a hidden and informal part of organisational culture, often bearing little relation to the official and formal aspects of organisational life [58]. Individuals are naturally reluctant to openly discuss their political motivations. Indeed, the fugitive nature of such factors may mean that the actors themselves may not even be fully aware of their existence. Within organisations power and politics tend not to be explicitly discussed, even informally; often 'stories' or other indirect channels are used as proxies for open debate [58]. As Flyvberg points out [10], the post-hoc rationalisation of decision-making is common, so that the 'real' motivations behind decisions are often obscured after the event. Moreover, if we accept Foucault's analysis, power has the ability to distort knowledge. So not only might the powerful have the ability to control the dissemination of information, by, for example, restricting access to reports, but they are able to distort the information that is made available. For example, in the aftermath of a project, reports are written that may hide problems or conflicts that had been encountered, or highlight the contribution of one group over another.

Such issues may mean that the methods and techniques traditionally used in RE, such as face-to-face interviews, and the review of documents, may not in themselves prove sufficient for such research. However, there are a range of other approaches that could be used. Ethnography, the study of individuals within their environment, has been explored within RE research [60]. Accepting that much knowledge within the workplace is tacit, it focuses on what individuals do rather than what they say they do. It is an approach that could be successful in exposing power relationships and political manoeuvring that might otherwise remain hidden in organisations. Discourse analysis, the analysis of written and spoken language based on the assumption that not only can speech only be understood in context but also that it is context defining [59], has been used by Irestig [40] to explore political conflict in the development of a health information system.

It has been conceded that ethnography and other similar approaches are time-consuming and might therefore be of limited practical use for RE [61]. This could also be argued to be the case with identifying and analysing the power relationships between stakeholders using social network analysis [60][43]. This of course is in the context that a frequently cited problem with RE in the field is the lack of time made available for the requirements process [7]. There is therefore an understandable preference for the use of lightweight methods and techniques such as interviews with key stakeholders. However, it is argued that the research agenda proposed in this paper could build upon existing social modelling approaches already used in RE to deliver empirically-based insights into the requirements process that could lead to the development of tools and techniques that would be of practical use in the field.

Perhaps a more fundamental problem than lack of time, however, would be the implications for RE as a practice of deploying such 'intrusive' approaches into the field. It could be argued that the very fact of attempting to uncover power and politics within organisations would, rather than aid the requirements process, actually act to undermine the 'illusion' of rationality that tends to exist in organisations (and perhaps is critical to their functioning) and simply serve to stir up trouble – not least for the requirements analysts themselves. Pettigrew notes that one of the reasons for the relative lack of empirical studies dealing with power (as opposed to a wealth dealing with decision making) was the problem of gaining access to organizations.

VII. CONCLUSIONS

Requirements engineering is not a discipline that is able to determine its own context, one which is subject to ever-increasing complexity and uncertainty, encompassing organisational change as well as demands for innovation and creativity. This paper argues that it is not possible to face these challenges without at least an understanding of how power and politics impact on the RE process. Moreover, it contends that assumptions that power and politics are extraneous and negative factors best to be avoided need to be rethought. On the contrary, it could be argued that they can be useful tools that could potentially be harnessed to produce better requirements and more successful end solutions. In this paper a framework has been proposed that could potentially be integrated with, and complement, existing social modelling approaches in order to provide an additional richness to frameworks that are focused on actors and organizations rather than on processes and systems.

The context of RE has changed to the extent that it can be argued that it is no longer useful to treat it as a discrete process within software engineering. Indeed, it is perhaps difficult to regard it as distinct from wider organisational change and strategy. It is perhaps preferable to describe it as a heterogeneous engineering exercise that spans the whole project lifecycle; one that impacts on, and is impacted by, all aspects of organisational life including power and politics. As Bubenko notes, RE is not normally related to business visions and objectives. It should be [55].

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