
Using rich pictures outside of soft systems methodology: a case study analysis

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Abstract: The aim of this paper is twofold. Firstly we will highlight how a problem structuring tool, namely the Rich Picture, is being used across many disciplines outside of the soft system methodology which has historically been its home. Secondly, we highlight the controversial presence of non-conforming Rich Picture research and an apparent reluctance to publish from the systems community. In this paper we provide examples of rich picture research used independent from methodology and focus on one case study that uses a novel method of content analysis to appreciate the significance of the stories within their pictures. We demonstrate the theoretical justification and efficacy of an innovation in the assessment of the Rich Picture and its use as a tool to discern issues of importance across mixed groups. We discuss the responses to this work and the implications for innovation within soft OR research. We propose that the Rich Picture should not be seen as sacrosanct just because it derives from a well-established and much respected methodology. We argue that the Rich Picture can be a flexible space where any practitioner can negotiate shared understanding without methodological constraint

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Comment [a1]: Author: Please note that per the Inderscience typesetting guidelines, only proper nouns are allowed to be in sentence case.

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1 Introduction

In this paper we introduce a tool – the Rich Picture (RP) that originates from a popular, influential and time served methodology (soft systems methodology, SSM). It is not the intention of this paper to undermine the methodology, indeed we are practitioners and admirers of SSM. Instead our intention is to highlight the use of RP and its ubiquitous diversity when used outside the boundaries of SSM. The case study we use (Just and Berg, 2017) is recently published research that does not use the RP in a traditional SSM context and provides an example of innovative content analysis (CA). We also wish to highlight the issues with publication when a community claims guardian ownership of methodology practise and tool purpose.

Let us firstly start with an introduction to RPs and SSM which will be discussed in further detail in the following section. The RP is a freeform diagram used for problem

structuring in complex situations (Deutz et al., 2010). In drawing a RP there are few rules applied (Checkland, 1981). Essentially, it should be as free of words as possible and involve visual metaphors to express meaning. These pictures are used primarily to help groups and individuals to understand complex contexts, be they natural, social, technical or cultural. The RP provides an unstructured way of capturing information flows, communication and in essence the human experience of complexity. These pictures can encapsulate meanings, associations and non-verbal communication and thus their purpose is to make pre-deliberative-analysis assessments, which can on occasion – by their spontaneity, serendipity and creativity – offer unforeseen and unbiased insight into differing perceptions. RPs has been contributing to the assessment of complex situations such as those found in the soft OR community contexts for many years. However, the early inspiration for the use of RPs in an overtly participatory manner is difficult to nail down, as they appear to gain their inspiration from a number of sources and almost ‘emerge’ fully formed from the literature (Checkland, 1972; Churchman, 1979). Arguments can be made for a variety of primary sources, but our research indicates that RPs as we know them today relate back to Checkland’s writings on Soft Systems in 1975 (Checkland, 1975). Soft Systems refers to the sort of complex and ‘messy’ existence through which we as humans live our lives.

Using diagrams to help with the thinking process is well established. The range of visualisation techniques includes mind maps (Buzan, 1992; Marguiles and Maal, 2002), road maps (Phaal and Muller, 2009) and a variety of graphic devices. The advantages of diagrams were also discussed in Checkland’s seminal book of 1981, although, interestingly, the only citation to RPs in the book is to a glossary definition of it on page 317 – there being no substantive use of the diagrams in the text itself.

Soft Systems has been an important medium for RP use and RPs are included in several later works by Checkland (Checkland and Holwell, 1998; Checkland and Scholes, 1990; Checkland, 1988, 981; Checkland and Poulter, 2006). Arguably the most important development for the wider appreciation of RPs themselves was provided by systems academics at the Open University, who both explored the use of the diagramming method in courses (Open University, 1987, 2000, 2004).

The RP purpose is usually to facilitate a pre-analysis assessment which can offer insight, often through amalgamating multiple and occasionally contradictory worldviews thus making it a powerful device in participatory processes. Checkland in his 30 years retrospective paper on SSM does not offer specific advice on RP guidelines however he does encourage skill development “users need to develop skill in making ‘RPs’ in ways they are comfortable with, ways which are as natural as possible for them as individuals” (Checkland, 2000). The RP is particularly useful as a device for groups with conflictual individual contexts and especially offering potential for allowing the voices of those in disadvantaged or marginalised communities to be heard (Bell et al., 2016a). Checkland primarily used the RP in health, military and information system situations however the popularity of SSM has led to many scholars and practitioners using both methodology and tools within a variety of different complex situations in differing disciplines.

In this paper we acknowledge the origin and role of the RP within its SSM context however in our research we apply the tool in an exploratory manner to investigate deeper into evaluation. By this application we argue that we somewhat detach ourselves from the legacy SSM methodology. The critic might argue that we are not using the RP within a SSM study that supports discussion and collective learning. This is true, but we argue that

we are using the tool, independent from the methodological process and underlying philosophy of soft systems, as a means to explore bigger picture analysis which may provide insight on issues and possible solutions.

The RP is generally agreed to work best as a community approach that encourages creative problem identification through visual understanding of complex socio-technical systems (Bronte-Stewart, 1999).

RPs are known to be highly versatile and hence applicable and useful in a wide variety of contexts (for example see: Sutrisna and Barrett, 2007; Bell and Morse, 2013a) but difficult to interpret in the sense of being problematic to 'read' and draw meaning from (Bell et al., 2016a, 2016b). It is this issue of interpretation that we will investigate further in this paper through the use of a RP case study developed outside of SSM.

As discussed in the abstract we also wish to address the issues regarding publication of standalone RP research within the systems community. This arises as a consequence of our research experience. In addressing these issues we draw comparison to the relative ease with which other disciplines adopt and innovate with the system tool. Nearly 20 years ago Bronte-Stewart (1999) noted such controversy,

“There has been considerable debate about the nature of rich pictures and their inception and use as part of soft systems methodology and their consequent use out with the methodology”.

Although Bronte Stewart (1999) concentrated in his research work on RP construction he did make some interesting observations regarding the SSM community and their proprietary position of the RP tool. He named certain groups as 'SSM purists' and described some SSM authors as 'developing harder views' regarding the use of the RP. Our experience would indicate that not much has changed over the years and there do seem to be limitations for authors who wish to publish their RP research within the soft operational research community and less limitation to publishing such work in other disciplines such as engineering, medicine and environmental sustainability. In the following section we provide citation examples of global standalone RP research. Our evidence for such proprietary belief comes from both personal experience (over 50 years RP experience amongst the authors) and the volume and diversity of the current standalone RP research presented in non-systems journals versus the distinct lack of such research in system journals. We suggest that there is evidence of a rigidity of belief in the SSM community that the RP remains the sole component of SSM. Further, it could be argued that the SSM community, knowing its popularity amongst practitioners, strives hard to retain and preserve the tool within the methodology in its purity. Building on this, we suggest that the RP is inherently ubiquitous and innovation is being restrained by such SSM purists. Essentially, academic advancement of the RP is being accepted and encouraged in many disciplines and rejected from within the place from which it originated.

In this heated and tense atmosphere, the 'keep calm and carry on' attitude of academia seems somewhat both a reassuring fixture and oddly out of place. The academic approach remains unshakable – in terms of research process and research method. If all else fails, we can rest assured that the indomitable granite of academia will hold true and continue to produce the repeatable, refutable, replicable outcomes which guarantee progress and assured veracity. This is an easy myth to bust. Peer review is widely accepted as the instrument for raising the quality of science. It works by seeking to eliminate papers which demonstrate poor repeatability, refutability and/or

replicability as well as all forms of methodological shortcoming, or poor craftsmanship. However, there is a growing body of evidence (see for example Bartko, 1982; Smith, 2006; Lee et al., 2013) suggesting the peer review process is no longer appropriate for the evaluation of controversial hypothetical science and can be little more than an opportunity for reviewers to express bias and prejudice. Radical new ideas and innovation are:

“Highly vulnerable to being filtered out or made to accord with conventional wisdom by the peer review process” (Steinhauser et al., 2012).

There has long been concern about the adequacy and fairness of peer review practices and many academics have experimented with paper re-submission of previously publicised work (see Bartko, 1982 for example).

The scientific process is bound to a charitable system of peer review – a system some thought broken from the start (Csiszar, 2016) and many now consider beyond the pale (Resnick, 2016). If the intention is to ensure the veracity of research then the process is at odds with the outcome desired. The anecdotes of individuals are growing into a global wave of shared experience. This cannot be contained by ‘keep calm and carry on’. For decades there has been grim evidence to suggest institutional affiliation, editor-author friendship and an old boys network still exists [for a small sample of the genre see Budden et al. (2008) and Orleans and Manchikanti (2015)] Blind review is not a reliable solution as authors can be formidably ingenious at finding ways to reveal their identity if they wish to do so. If truth is becoming harder and harder to identify and the research process is broken in terms of measure, other issues beset the seeker after meaning. Such issues include the rigidities which are the outcome of the proofs provided by the very research processes which is shown to be broken. Put simply, the system as it is allows for partial truths to be concretised in what often appears to be a terrified and slavish conformity. Once a ‘truth’ has been identified, it is a brave person who seeks to re-model, re-consider or even question. This is a core concern of this paper.

The authors of this essay are advocates (un-shamed) of the ad hoc approach to method application in problem structuring and the Zuckerberg advocated approach to progress – move fast and break things. This is an approach which probably has long standing philosophical origins in the work of Feyerabend (1988), expressed compellingly in his battle cry for method use: ‘anything goes’! and found expression in articles on the nature of methodological tyranny (Bell, 1994; Bell and Morse, 2011). Our work is all about what Bridger referred to as ‘starting where you are’. The ‘you’ in question is the human being at the root of the enquiry process. The ‘you’ of ‘how are you?’. Our obsession has been in attempting to find out more about this mercurial ‘you’ and to figure out what ‘you’ are thinking, experiencing, feeling.

For this purpose, method is vital and keenly engaged. Indeed, if we are to sense make from our research and if this sense making is to be something which we and others can replicate and even find refutable then there needs of necessity to be a viable method holding the enquiry process together. With respect we agree to differ on this matter with Paul Feyerabend.

The RP is a means to allow groups to collectively ponder and represent complex and worrisome ideas and issues in a manner which un-confines the process of presentation. By drawing rather than speaking or writing the group has the potential to set out what might otherwise be missing. This is not to say that processes of discussion, verbal enquiry and written testimony are not also important. Rather that the RP is an interesting and

additional means to enquire. As we said at the outset we are keen to find out where ‘you’ are and to learn in any manner which may help how that feels. The RP seems to help (an observation keenly represented in the literature, e.g., Bell and Morse, 2013a, 2013b; Campbell Williams, 1999; Bell et al., 2016a, 2016b; Berg, 2013). But a problem has emerged and one which Feyerebend would recognise – the dead hand of methodology.

Systemic and prospective sustainability analysis (SPSA) was the forerunner of an approach called Imagine (Bell et al., 2016a) which makes use of the RP. In previous explorations with RPs embedded in emerging methods like SPSA and Imagine, authors have run up against what might be considered to be a form of ‘push back’ from journal referees. Referees of earlier papers have suggested that RPs had their origin in SSM (Checkland, 1981) and that this point of origin means that RPs cannot and must not be used outside of this methodological context. So, for many in the soft systems community, the use of RPs in SPSA or Imagine is, de facto, ‘wrong’, as indeed is any attempt to use RP as a stand-alone analytical device to explore a context. The argument from such reviewers is quite simple – RPs can only be created in a ‘correct’ sense if done solely within the context of a SSM. Crudely put; the RP is part of SSM, so hands off!

From the original opus to the more recent work SSM is presented as coherent, responsive and elegant (Checkland and Poulter, 2006; Checkland, 1981) and the authors take no issue or present any significant arguments against SSM. We are practitioners and admirers. Our point has been the adaptation of method to fit new circumstances and the application and innovation of one specific element of the method as a means to provide a different kind and type of research evidence.

Put simply, the RP employed within its SSM origin is not only an analytical device but also in part an ice breaker and means to get the relaxed attention of a group. The RP in the context of SPSA /Imagine holds a similar value but this is subsequently extended. The attempt has been made to elevate the function of the RP as a means to elucidate meaning (from the various ‘you’ in the room) and to set this out in a manner which, tentatively speaking, might be measured and compared against other RPs. This hermeneutic approach to RP interpretation is the cause of much concern in the research community and, indeed we share this concern.

In what follows we set out how we got to our research, how the research advanced, our findings and the results of our experience of presenting these findings to the wider academic world.

2 RP history and analysis

In terms of both quantitative and qualitative data capture the RP has the advantage of having few formal rules and is usually a physical picture drawn by a variety of hands to encourage discussion and debate. The RP is an unstructured way of capturing information flows, communication and human activity. Words can be too powerful and open to misuse whereas a picture can encapsulate meanings, associations and non-verbal communication such as unconscious emotion and feelings. The RP is particularly useful as a low tech dialogic tool offering a platform to aid a thinking process. The visuals of the RP offer can encapsulate meaning associations and nonverbal communication such as emotions and feelings. The RPs do not necessarily convey *more* meaning than text but they do manage to provide a wide or broad area for capturing all elements of a situation as seen by the creator(s). RPs have been widely used for many years and applied to a

range of projects (Haynes, 1989; Stamper and Kolkman, 1990; Callo and Packham, 1997; Probert, 1998; Mingers, 2001; Winter and Checkland, 2003). They are also used in information systems planning and development (Avison and Fitzgerald, 2006). But, beyond the information and systems domains and detached from SSM, RPs have been put to use in a variety of for a; from nursing (Ballard, 2007), social care (Fougner and Habib, 2008), the construction industry (Mazijoglou and Scrivener, 1998), creativity (Proctor, 1995) landscape visualisation (Boedihartono, 2012) and engineering (Sutrisna and Barrett, 2007) to name just a few. In all cases, the RP is applied as a robust means to address contexts of complexity and multiple-interpretation of contentious issues. In this paper we fully acknowledge the origin and role of the RP within its SSM context, but here we illustrate how the tool can provide the material for a CA to explore common themes and issues as well as differences which emerge between groups (or individuals) asked to analyse the same topic. CA is a widely recognised qualitative assessment tool primarily used in the social sciences and humanities. Elo and Kyngäs (2008) provide clear instruction to the use of both inductive and deductive CA “inductive CA is used in cases dealing with phenomenon or when it is fragmented. A deductive approach is useful if the general aim was to test a previous theory in a different situation or to compare categories at different time periods”. Hsieh and Shannon (2005) suggest there are three distinct approaches of CA application; conventional, directed and summative. They delineate analytic procedures specific to each approach and provide techniques to address ‘trustworthiness’. Graneheim and Lundman (2004) in nursing research also propose measures to achieve trustworthiness in CA; credibility, dependability and transferability. CA is used to identify patterns and relationships within a variety of materials such as interview transcripts, video, audio and pictures. In essence CA looks for patterns and themes that can be clustered to make sense of complex and often bulky/messy data and it is important to note that applying a CA to RPs does not necessarily impinge or disrupt the use of RPs within an SSM or indeed any process. The CA of RPs is something that could be undertaken outside of the SSM context to provide some useful insights into the complexity that the groups/individuals are exploring. This is important as undertaking a CA of RPs within the SSM process would arguably be highly disruptive and hence not desirable. But once an SSM has been completed and participants have left the engagement space it would be possible to use CA on the RPs.

RPs are known to be highly versatile and hence applicable and useful within a wide variety of contexts (for example see: Sutrisna and Barrett, 2007) but difficult for ‘outsiders’ (i.e., those who did not create the RP) to interpret in the sense of being problematic to ‘read’ and draw meaning from (see for example: Carrizosa, 1999; Bell and Morse, 2013a). The RP, as an artefact, is complex to interpret by anyone who was not involved in its creation or who did not engage with those who created it. We discuss this in much more detail in our recent book (Bell et al., 2016a) but, suffice to say in our experience the messages, stories and emotions within the RP can be drawn out, or *educated*, by making use of an approach we call educative interpretation (EI). EI is a form of CA that provides a refined, systematic (sequential and methodological) and systemic (inclusive) way of analysing RP workshops and the resulting pictures and conversations – assisting groups in reflecting on and looking specifically at their RPs in terms of differences, similarities and relationships. CA is concerned with analysing the content of qualitative (non-numerical) in contrast to the statistics which are characteristically applied in analysing quantitative (numerical) data (Berelson, 1971). CA in various guises

could be said to have been around as long as social science itself – as the primary means to observe social and cultural exchanges. There are overlaps here, of course, as CA can involve the generation of quantitative information such as how often issue A is linked to issue B and software such as NVivo has been developed to help facilitative coding within material as well as how the codes relate to each other. But, of course, it is humans who are doing the coding – not the machine – and there are inevitable challenges of coder-bias; a desire (conscious or unconscious) by the coder to focus on certain things and exclude others. The literature on coding and how best to minimise such problems is vast and does not need to be covered here, but needless to say that this issue has been well-explored. It also has to be noted that traditional CA says nothing about the quality of the material it is analysing. The old adage of ‘garbage in – garbage out’ is perhaps blunt but does capture the essence of the problem very well. No computer programme in the world will transform transcripts from a badly conducted set of interviews into high quality, although in our experience it can sometimes be a challenge to convince students of this! Indeed, what do we mean by quality in this context? If the material consists of letters, minutes of meetings, video and audio recordings then speaking of quality is largely meaningless. But when it comes to interview transcripts much can depend on the quality of the transcription as well as how the interviewer did his/her job. A good interviewer will follow-up and invite the interviewee to delve deeper and elaborate, perhaps also to make the links between points. A poor interviewer will follow more of a check-list approach and make little effort to go deeper and look for connections and elaboration. CA as a process can be applied to the material in both cases but will arguably reveal much more in the first case than the second.

A RP is a record, even if it consists of a picture rather than text and thus it would seem consistent to apply the ideas of CA to RPs, especially as CA has often been applied to audio-visual material. Examples of applying CA to RPs are rare but one recent example is provided by Cristancho and Fenwick (2015). The situation with RPs is more complex in the sense that we can imagine two potential scenarios:

- 1 An analysis of a RP in isolation from those who created it. Here the CA does not have the advantage of being able to include the narrative linked to the RP and has to rely solely on the content of the picture.
- 2 An analysis of the RP where the person analysing was able to engage with the creator(s) of the RP, even if this amounted to a one-way process whereby the creator(s) presented the RP to others and explained the content and reasoning. In this case the CA would be of both the RP (including a Type 1 analysis) and the text-based narrative that surrounds it; in effect the CA would be on an ‘entanglement’ of the two and in theory would allow for a richer analysis.

Essentially CA has two main types; type 1: conceptual analysis and type 2: relational analysis (Wilson, 2011). Conceptual Analysis looks at the existence and frequency of concepts; mostly repetition of text or phrases. In an RP analysis of Type 1 above this would need to focus on the use and repetition of icons and analogous metaphors relating to a similar theme or type. In the Type 2 RP analysis above this would be extended to include a focus on the narrative of the creator(s) perhaps as a transcript but critically how this linked to content within the RP. Video recording the group talking and pointing out elements of their RP is one way to achieve the joining of picture and verbal data however video can be an intrusive and disruptive within a workshop environment. Audio

recording can work well if the facilitator takes good observation notes during the group discussion. Relational Analysis (RA) usually looks at the other words or phrases that appear close to certain words that can change or determine meaning. In the Type 1 analysis this would mean investigating what additional icons are beside (or linked in some way) to other icons to provide insight into complex models of thought process. With the Type 2 analysis above this would look at how the creator(s) related concepts with their RP as expressed via their narrative and interaction with the RP. RA requires the researcher to have a clear understanding on what concepts are being coded before analysis. This can be difficult when applying to a multidimensional RP within a Type 1 context. However, when done well RA can offer a high degree of statistical rigor (Wilson, 2011).

Analysing an RP within the Type 1 context above is a challenging and complicated process where one needs to take into consideration many factors:

- *Culture*: Every culture has artistic traditions and differences with symbol user perception. These can range from reading direction to metaphor meaning, context, experience and aesthetics.
- *Connection and boundaries*: Relationship representations are depicted using arrows and lines in varying degrees of thickness and style. Sometimes connections are strong and sometimes weak or even broken. Boundaries bind understanding and show reductionism allowing complexity to be divided into understandable parts.
- *Shape and form*: Hard shapes can deliver hard, exacting comment whereas soft shapes might be more conceptual and show tacit emotional features. Sharp and jagged shapes radiate noise waves or broadcast raw feeling and emotion.
- *Metaphor and humour*: comedic depiction using metaphor can either dampen strong or controversial messages or, through the use of satire, enhance a problem situation. Extremely negative icons drawn using humour, (we call these pathological icons) depict a very anxious situation or feeling; devil icons, blood, gun firing)
- *Orientation*: what is seemingly drawn upside down is likely to be drawn by a participant who accessed the paper at different angles. RPs often needs to be read in a 360 degree rotation.
- *Colour*: Colour and has huge cultural communication significance showing both positive and negative associations. This been documented extensively in the thesis of Berg (2013)
- *Isolation*: In correlation with 'Connection and Boundaries' the representation of relationship can also be shown as absent and thus not all icons will be related with others. These can show visual significance of importance but can also be private, not group, opinion. Blank space can be just as meaningful as the complex busy parts of the RP.

EI as suggested here is, in effect, a form of *CA for visualisation and subsequent conversation transcript analysis*. EI takes a holistic approach to analysing the RP workshop as a whole and all resulting data derived. This is discussed in great detail in Bell et al. (2016). For EICA, importance is placed on many influential factors and not just the resulting pictures. For example:

- workshop set-up and facilitator involvement
- group dynamics such as age, gender, role, numbers in each group
- workshop environment such as room, external noise, drawing tools available (including coloured pens)
- observation of groups working together during the picturing session and during the after-picture discussions
- recording of after-picture conversations (formal or informal).

Recording the after picture discussions is significant as the discussion transcripts can provide vital understanding to the pictures that have been drawn. The authors of this paper have facilitated hundreds of RP workshops over many decades and have discovered what works well and does not work and we continue to learn and grow from such discovery. We know that the pictures provide a safe platform to *show* concerns, viewpoints and possible solutions however for some participants what has been drawn is solely an icon on a picture that represents a much larger story. The after-picture conversations give valuable context to the RP and moreover can provide intriguing group discussion. Most importantly the RP is a great way to get people drawing, thinking, discussing and sharing solution ideas and whether this comes out in the pictures or the after picture discussions is not important. What is important is having many voices heard. The case study, as described in the following section, investigates the whole workshop as part of the study and applies CA to both pictures and discussion. The authors preferred to audio record and write observation notes rather than video their group as the narratives were both sensitive and of a highly personal nature and audio was deemed less invasive.

The authors have been making use of education and educative methods for many years (Bell et al., 2016a), but despite the widespread use of the term *educere* its meaning is often misunderstood. In referring to systemic learning approaches as long ago as 1998 *educere* was described as follows:

“Education comes from *educere* which in turn is derived from the Latin word *educere* which means ‘to draw forth’” [Bell and Lane, (1998), p.632].

Drawing forth as a concept requires a little development. In previous research (Ibid), we argue that the RP is a means to draw forth the collective thinking of a group. By means of the relaxed and provoking atmosphere of the group process the RP can form. Once the RP has been developed it can subsequently be assessed for meaning using an interpretative form of CA. In terms of EI the ‘message’ of an RP can be drawn out (*educere*) by making use of an approach we call *educative interpretation* [EI – for a more developed argument see Bell et al., (2016a), pp.167–168, 208–211]. This approach can lead to enlightened understanding of the pictures that provides a refined and systemic form of CA of RPs designed to look for similarities, differences and relationships.

To attempt to capture this diversity we suggest a method and, given the early stage of analysis, a placeholder title: the IE model of CA or EICA (Bell et al., 2016a; Bell et al., 2018). To clarify some terms:

- By CA we mean the assessment of diagrammatic content produced by groups in the form of a RP being wary of the various traps including apophenia
- By Eductive we mean to 'draw forth' or to find the inner emergent property contained in a RP.
- By Interpretation we mean the individual or collective assessment of meaning.

3 RP case study using EICA

We introduce and discuss a recent study which provides a good example of the use of EICA for the analysis of RPs. In this study the authors (Just and Berg, 2017) highlight issues of online protection for autism spectrum disorder (ASD) children. Just and Berg report on the results of two RP workshops with 16 parent caregivers of children with ASD. They used the RPs to identify online concerns and protection methods. The researchers were looking to answer the following research questions:

- 1 How do caregivers characterise the online behaviour of their ASD children and what characteristics affect the children's online security
- 2 What are the challenges that affect caregiver's ability to protect their ASD children online.

More can be found regarding the specifics of the recruitment and study procedure when reading the case study however we are using this study because it uses RPs as an innovative understanding of the problem situation and moreover as a tool that is detached from the complete SSM. Just and Berg do not explicitly state that they are using EICA in their research however the case study is an example of a RP use out with the SSM and applied CA using IE.

In this study the authors conducted their workshops using RPs and the transcripts of group discussions. Each carer participated in one of two identically-run four-stage sessions. In Stage 1, once participants read a short project description and signed a consent form, they collected age and gender information and asked participants to provide the age of the persons with ASD who they care for and their relationship to them.

In Stage 2, they introduced the purpose of the session by presenting two questions they wanted the caregivers to consider, under the heading 'internet security':

- Q1: What are your concerns related to the security of the person you care for?
- Q2: What do you currently do to protect the person you care for?

To stimulate input the authors made some initial suggestions on areas that groups might consider exploring: passwords, sharing accounts, posting online, making friends and purchasing online. Caregivers were asked to respond to the questions by drawing their answers with pictures and 2-3 examples of previous RPs (from areas unrelated to security or child protection) were briefly shown to participants. Participants were split into small groups of 3-4, lead to separate rooms and groups were provided with a number of coloured markers and a flip chart.

In Stage 3 each group of caregivers drew their RP responses to the two questions. Sessions were facilitated with limited practitioner input to encourage discussion amongst

group members, an approach termed 'educative observation' (Bell et al., 2016a) An example of one of the RPs produced from the sessions is shown in Figure 1.

In Stage 4 the authors brought all groups into in a single room and asked each group to gather beside their pictures, which had been pinned to a wall and discuss what they drew and why. Each group did this in succession. This discussion was facilitator-led with caregivers encouraged to share stories and verbally enhance their picture drawings. The discussion was audio recorded and later transcribed.

Figure 1 RP (size: 32 × 23”) example from workshops (see online version for colours)



Analysis of transcripts (from Stage 4) and RPs (from Stage 3) was achieved by first logically separating the data for each into two key analysis themes, based on the two questions that were posed to the caregivers: caregiver concerns and caregiver protections. The transcripts were then analysed and coded under agreed upon categories that best captured the theme type. In table one the categories for caregiver concerns were; bullying

online, meeting online, posting online, lack of solutions and inappropriate behaviour. In table two the categories for protections were control access, monitor and instruct. Each of the two researchers first independently reviewed and coded the transcripts in order to ensure inter-coder reliability (Lombard et al., 2002) once for concerns and once for protections. The researchers then met to agree on a colour coding system, after which they re-coded the transcripts. The researchers met again to agree on the final transcript coding, after which the final codes were recorded.

The RPs was also coded using the same colour coding system. Icons were isolated and categorised when they represented an issue, action or emotion that was particularly significant, expressive, sensitive or descriptive. One researcher took notes during the sessions that were later used to link each RP with different discussions from the transcript. The researchers looked specifically for instances where the pictures communicated additional knowledge to the transcribed description. For each transcript code, they recorded which had a RP associated with it and which did not.

The researchers produced detailed CA on carer concerns, carer protections and carer RPs. For our concerns and protections, they highlighted some of the individual carer pictures and included quotes from group members of the discussion surrounding their pictures. Tables 1 and 2 provide their results. The quotes can be seen in the resulting publication (Just and Berg, 2017)

Table 1 Carer concerns

<i>Category</i>	<i>Concern area</i>	<i># of coded concerns</i>	<i>RP</i>	<i>No RP</i>
Buying online	Inappropriate spending, getting access, independent spending	20	10	10
Meeting online	Meeting strangers, being bullied	15	11	4
Posting online	Posting inappropriately: family, friends, self	10	9	1
Lack of solutions	Lack of caregiver skill, inadequate solutions, unable to protect	26	11	15
Inappropriate behaviour	Inappropriate accounts, accessing material, and spending, posting	32	18	14

Notes: 'RP' = # codes with rich pictures and 'No RP' = # codes without rich pictures.

Table 2 Carer protections.

<i>Category</i>	<i>Protection approach</i>	<i># of coded protections</i>	<i>RP</i>	<i>No RP</i>
Control access	Physical control, hidden information, filters, disable accounts	27	14	13
Monitor	Specific observation, shared space or passwords, first pass, general observation	21	6	15
Instruct	Rules, teaching, conditional	21	8	13

Notes: 'RP' = # codes with rich pictures and 'No RP' = # codes with no pictures.

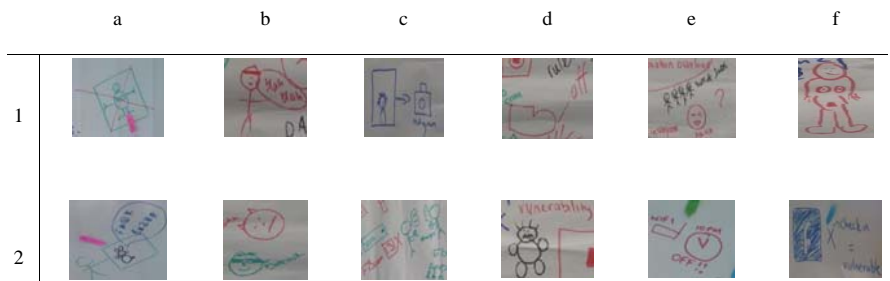
The researchers in the case study noted that protections were more demanding to illustrate than concerns. Carer concerns such as posing material online and meeting

strangers online were easily visualised whereas themes such a controlling and monitoring their ASD children’s online behaviour were hard to illustrate.

“Of the 103 concerns we coded from the transcripts 57% (59/103) drew an image associated with the concern. In terms of protections, 40.5% (28/69) of the 69 protections that were coded from the transcripts had a rich picture associated with a protection” (Just and Berg, 2017).

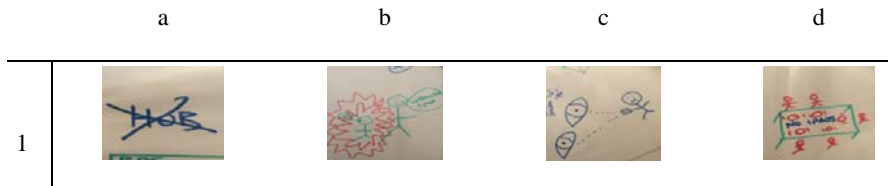
Figures 2 and 3 are image samples drawn within the six RPs from the workshops. Figure 2 expresses concerns and Figure 3 provides some examples of protections. The researchers noted, “there were some images that highlight and provide added insight to a concern or protection which was discussed orally. In some instances these images more readily offered enhanced clarity, more tacit understanding and stress the magnitude of the issue compared to the descriptive words” The researches go on to provide evidence of this relating to some of the images in Figures 2 and 3. For example:

Figure 2 Example concern images (see online version for colours)



- “Figure 2(d2) depicts a monster preying on the vulnerable. This is a powerful image that enhances the magnitude of the issue described vocally by C13 as “there are people out there who know what they are doing, victimisation and obviously our kids are an easy target”.
- Fig. 3(b1) illustrates a child saying no when an iPad is confiscated. This illustrates high level anxiety and distress by the two layers of jagged red lines encompassing the child. The vocal description contributed by C5 was “If I confiscate the iPad it’s a minor explosion” (Just and Berg, 2017).

Figure 3 Example protection images (see online version for colours)



The case study provide a discursive section where the authors examine the types of visualisations the caregiver used to represent their views noting there were some very strong visual images using a strike through prohibition sign to indicate what is

inappropriate or not allowed [Figures 2(a1) and 3 (a1)]. Other examples they highlight were the high instance of pictures relating to meeting strangers online Figures 2(a2), 2(b2), 2(d1), 2(e1), 2(f1), 2(f2) and posting of inappropriate photographs Figure 2(c1). In this case study it is of interest to see that the RP provides a safe space to visualise an uncomfortable concern which can be explored later through discussion “Across all RPs we had two pictures depicting naked bodies [Figures 2(a1) and 2(f1)] which, when described, allowed the carer to vocalise a private and possibly difficult concern to openly discuss with others in the workshop (Just and Berg, 2017).

The RPs that came from this case study were highly visual, colourful and descriptive. The transcript that accompanies the pictures provides individual experiences and stories highlighting particular areas of online safety concern. The authors found that “caregivers enjoyed sharing experiences with other caregivers and learning the successes and failures of other caregivers, in a supportive sense and to learn new protection approaches for caring for their own children, e.g., C7: “I’ve learned an awful lot from different parents, more than I’d ever learn from the internet.”

4 Discussion: can and should the RP Workshop be analysed?

As previously stated, the case study offers an example of EICA in action where a detailed and robust analysis of content (both transcript, pictures and workshop facilitation) provides one attempt at a comprehensive understanding of the concern areas within the study. We do note that there are other approaches to ‘comprehends’ understanding – for example in the psychodynamic fields of groups analysis – e.g., see: (Bell and Morse 2013a). The case study authors note the effectiveness of using pictures for problem identification in an emotive and highly personal field of study:

“Overall, caregivers provided more pictures to illustrate their concerns than their protections and in some cases communication was enhanced by the pictures. Many of the stories the caregivers shared with us were private and personal and we found the pictures provided a safe and friendly platform for non-intrusive group engagement. In several cases, pictures said in one simple drawing what a carer struggled to articulate with words alone” (Just and Berg, 2017).

In the case study the researchers decided to complete a detailed analysis of the RPs by matching each transcript discussion and observation notes with specific icons. In doing this they produced a dataset of indicative information which was then themed and categorised into specific areas. They applied the colour coding largely in line with the suggested EICA method in Bell et al, (2016a, p174). EI is usually applied using colours to identify key themes however in the Just and Berg case study the visual and transcript data was vast and complex and required layers of interpretation. Colour coding was applied in the early analysis through the use of coloured post-it notes [see Figures 2(a) and 2(f2)] however a more sophisticated coding incorporating colour, numbers and letters was later used to develop categories based on properties and dimensions.

We suggest that the EICA approach to RP analysis could be found to be relevant in a wide variety of contexts and that it has emerged in social terms as part of the dynamic which links researcher, context and resulting method. We do however acknowledge the innovation of this approach, not least in our separation from the legacy of the RP in SSM but also that there may well be interpretive ambiguity in the assessment of the RP. As a

consequence, some may have good reasons to be sceptical or perhaps nervous of this RP innovation. However, we suggest that interventions that encourage exploration and discovery should be embraced and explored but most certainly fairly critiqued on the merits of the innovation and not purely as a consequence of the legacy. We tentatively suggest, drawn from the limited research to date, that through the use of EI, stakeholders can gain some enhanced control and leverage over their representation, have more chance to accurately represent their realities (in diagrammatic and narrative form) and become advocates in their social emancipation. By understanding the deeper meanings emerging from the RP and the social/ group issues (often subliminal to the group and/ or obscure and/ or ignored due to a lack of understanding of their importance to group function) implicit in it, social forces in context can be more roundly understood and addressed. The 'social life of methods' (Savage, 2013) ensures that socially constructed action plans can follow from socially constructed diagnosis. Coherence emerges from early divergent thinking, nuanced generalisation can be made from subjective insight and the direction of subsequent community/ group OR can be enhanced and focused. There are of course disadvantages to the EI approach. Firstly, analysis at this level can be seen as rather complex and will take considerable time to complete. There is, scope for inaccurate understanding and oversight of important issues. EICA is not prescriptive and there is a requirement for the analyst to have in-depth knowledge of the area of investigation to enable appropriate theme classification.

As discussed earlier we return to the issues surrounding misinterpretation and the problems of making links and assumed connections where there might indeed be none: *apophenia*. Apophenia is a great worry for those interpreting the creative works of others. Seeing random associations of incorrect meaning can totally change the whole nature of the intended story or visual intention. Given that Type 2 (conceptual CA) analysis is extended to include a focus on the narrative of the creator(s) perhaps as a transcript but critically how this linked to content within the RP, we suggest that there would be less chance of Apophenia or Confirmation bias (the tendency to find what is desired to find) when analysing under Type 2. There are also well explored issues that arise when applying CA to any qualitative material as there is inevitably a degree of subjectivity and potential bias here.

We argue there is value in evaluating, appraising and critiquing the RP from outside the group. Our rationale for making this case is that the RP can say a lot about the thinking of a group primarily in terms of the breadth and depth of the exploration.

5 Conclusions

The RP exists and flourishes because it has proved its value both within and outside SSM. The value of visual metaphors in problem structuring has been demonstrated across different literatures.

The experience of research as set out in this paper indicates that collective evidence of the experiential use of RPs is demonstrative of certain observations.

- The RP is a platform for group imagination, sharing stories, discovering truths (and falsehoods); consensus and conflict.
- The RP allows group members to immerse themselves in imaginative thought experiments about all manner of potential futures.

By this means a RP has the potential to address the occult, hidden and ‘elephant in the room’ concerns. This was very much the case in the case study we present as the caregivers were sharing stories that were deeply personal and highly emotive. Separating out the use of a RP from a research methodology within which it is commonly embedded (such as soft systems or triple task) is, on the face of it a trivial task but, in actuality it is a challenge because, as we discussed in section one, it is perceived as a method-use-error in the eyes of some exponents of SSM. Our experience indicates that there is a mindset common to some academic referees which perceives certain forms of innovation of method (e.g., the abstraction of a tool and its reformulation in a different use and method context) as a form of illegitimate adaptation.

Applying IE as a form of CA would seem to be a less contentious form of innovation. This may be because it makes no claim with regard to quality nor does it involve critiquing or adapting the basic premise of the RP.

The attempt to make a form of objective critique of the content of RPs has been the element of our research which we have previously struggled to establish a legitimate with some journal referees. The subject of the criticism made against our research appears to be that we have tried to see whether a group of RPs (Type 1 or Type 2) generate commonalities of insight. This is variously seen as bogus (not possible), flawed (not necessary) or illegitimate (not ‘right’). To be clear, our research has been to suggest that it is valuable to take some time to understand what has been drawn (and voiced if transcripts are available) and draw forth meaning which might provide both facilitator and group with a degree of confidence that they have found areas that require further investigation. We do not see this as revolutionary, rather as procedural commonsense.

The RP is a representation of the analysis undertaken by the group and there usually is some reflection by the group after the drawing session. Type 2 (RP analysis with focus on the creator narrative) is our preferred method of RP workshop because it provides more data and more evidence of group temperament and objective. It is useful to record and observe a group talking about their RP and their representations, linkages and boundaries. Taken together this information can provide a large amount of evidence, education and knowledge regarding the situation under examination.

There is little doubt that RP diagrams are a popular problem-structuring tool for analysts to use during the early stages of investigation to help ‘make sense’ of a problem. Although RPs are one of the most memorable and reusable tools within SSM there are, still to this day, no clear guidelines for their production and no requirements for after-picture analysis. It is not necessarily new to science to have RPs being used out-side SSM (Bronte-Stewart, 1999) however it is interesting to see how few of the current research papers using the RP tool are being published in system journals.

There does seem to be a division on the science/art nature of the RP. Questions emerge such as, are RPs models of a commonly understood, ‘real world’ or merely personal sketches of different worldviews? Are they valid personal definitions of context or does their subjectivity mean that they are prejudiced beyond value? Our research to-date indicates that the aspiration of the RP can be one of personal or collective group insight or ‘truth’. Analysis in this context is therefore less about appreciation of artistry, arrangement or form but about meaning and expression though communicating, understanding and human experience.

It is not our intention to argue the importance of RP's as we believe the current literature already does this very well. Rather, the intention is to explore the diversity of RP practise and the innovation by which the tool is being applied to different situations.

References

- Avison, D. and Fitzgerald, G. (2006) *Information Systems Development: Methodologies, Techniques and Tools*, 4th ed., Maidenhead: McGraw Hill.
- Ballard, E. (2007) 'Improving the discharge planning process: a systems study', *Journal of Research in Nursing*, Vol. 12, No. 6, pp.687–688.
- Bartko, J.J. (1982) 'The fate of published articles, submitted again', *Behavioural and Brain Sciences*, Vol. 5, No. 2, pp.199–199.
- Bell, S. (1994) 'Methods and mindsets: towards an understanding of the tyranny of methodology', *Public Administration and Development*, Vol. 14, No. 4, pp.323–338 [online] <http://dx.doi.org.proxy.lib.sfu.ca/10.1002/pad.4230140401> (accessed 10 May 2018).
- Bell, S. and Lane, A. (1998) 'From teaching to learning: technological potential and sustainable, supported open learning', *Systemic Practice and Action Research*, Vol. 11, No. 6, pp.629–650.
- Bell, S. and Morse, S. (2011) 'Indicators: The tyranny of methodology revisited', *Consilience: The Journal of Sustainable Development*, Vol. 6, No. 6, pp.222–239.
- Bell, S. and Morse, S. (2013a) 'An approach to comparing external and internal methods for analyzing group dynamic', *Group Dynamics*, Vol. 17, No. 4, p.281.
- Bell, S. and Morse, S. (2013b) 'How people use rich pictures to help them think and act', *Systemic Practice and Action Research*, Vol. 26, No. 4, pp.331–348.
- Bell, S. Berg, T. and Morse, S. (2016b) 'Rich pictures: sustainable development and stakeholders – the benefits of content analysis', *Sustainable Development*, Vol. 24, No. 2, pp.136–148.
- Bell, S., Benatti, F., Edwards, N.R., Laney, R., Morse, D.R., Piccolo, L. and Zanetti, O. (2018) 'Smart cities and M3: rapid research, meaningful metrics and co-design', *Systemic Practice and Action Research*, Vol. 31, No. 1, pp.27–53.
- Bell, S., Berg, T. and Morse, S. (2016a) *Rich Pictures: Encouraging Resilient Communities Earthscan*, Taylor and Francis, London.
- Berelson, B. (1971) 'Population policy: personal notes', *Population Studies*, Vol. 25, No. 2, pp.173–182.
- Berg, T. (2013) *Understanding Iconography: A Method to Allow Rich Picture Interpretation to Improve*, Heriot Watt University, Edinburgh.
- Boedhihartono, A. (2012) 'Visualizing Sustainable Landscapes: Understanding and negotiating conservation and development trade-offs using visual techniques', Gland: International Union for Conservation of Nature [online] www.iucn.org/publications (accessed 10 May 2018).
- Bronte-Stewart, M. (1999) 'Regarding rich pictures as tools for communication in information systems development', *Computing and Information Systems*, Vol. 6, pp.85–104.
- Budden, A.E., Tregenza, T., Aarssen, L.W., Koricheva, J., Leimu, R. and Lortie, C.J. (2008) 'Double-blind review favours increased representation of female authors', *Trends in Ecology and Evolution*, Vol. 23, No. 1, pp.4–6.
- Buzan T. (1992) *Use Your Head*, BBC Publications, London.
- Callo, Y. and Packham, R. (1997) 'Soft Systems methodology: its potential for emancipatory development', in *Australia and New Zealand Systems Society Conference*, Institute of Continuing and TESOL Education, The University of Queensland, Brisbane, Australia.
- Campbell Williams, M. (1999) 'Rich pictures on the path towards systemic being', *Systems Research and Behavioural Science*, Vol. 16, No. 4, p.369.

- Carrizosa, A. (1999) 'Rich pictures, metaphors and stories as mechanisms to improve collective actions', in Castell, G., Gregory, A.M., Hindle, A.J., James, G.A., Ragsdell, M.E. (Eds.): *Synergy Matters: Working with Systems in the 21st Century*, pp.43–48, Kluwer Academic Publishers, New York [online] <http://libezproxy.open.ac.uk/login?url=http://www.springerlink.com/content/gh20u753nu2p2755/>.
- Checkland P.B (1972) 'Towards a systems based methodology for real-world problem solving', *Journal of Systems Engineering*, Vol. 3, No. 2, pp.87–116.
- Checkland P.B. (1988) 'Information systems and systems thinking: time to unite?', *International Journal of Information Management*, Vol. 8, No. 4, pp.239–248.
- Checkland P.B. and Holwell S. (1998) 'Action research: its nature and validity', *Systemic Practice and Action Research*, Vol. 11, No. 1, pp.9–21.
- Checkland, P. (2000) 'Systems thinking, systems practice: includes a 30-year retrospective', *Journal-Operational Research Society*, Vol. 51, No. 5, pp.647–647.
- Checkland, P.B. (1975) 'The development of systems thinking by systems practice – a methodology from an action research program', *Progress in Cybernetics and Systems Research*, Vol. 2, pp.278–283.
- Checkland, P.B. (1981) *Systems Thinking, Systems Practice*, Wiley, Chichester.
- Checkland, P.B. and Poulter, J. (2006) *Learning for Action: A short definitive account of Soft Systems Methodology and its use, practitioners, teachers and students*, John Wiley and Sons Ltd., Chichester.
- Checkland, P.B. and Scholes, J. (1990) *SSM in Action*, Wiley.
- Churchman CW. (1979) *The Systems Approach: Revised and Updated*, New York, Dell.
- Cristancho, S. and Fenwick, T. (2015) 'Mapping a surgeon's becoming with Deleuze', *Medical Humanities*, p.medhum-2015-010735 [online] <http://mh.bmj.com/lookup/doi/10.1136/medhum-2015-010735> (accessed 10 May 2018).
- Csiszar, A. (2016) 'Troubled from the start: pivotal moments in the history of academic refereeing have occurred at times when the public status of science was being renegotiated', *Nature*, Vol. 532, No. 7599, pp.306–309.
- Deutz, P., Neighbour, G., McGuire M. 2010. Integrating sustainable waste management into product design: sustainability as a functional requirement. *Sustainable Development* 18(4): 229–239.
- Elo, S. and Kyngäs, H. (2008) 'The qualitative content analysis process', *Journal of Advanced Nursing*, Vol. 62, No. 1, pp.107–115.
- Feyerabend, P. (1988) *Against Method*, Verso, London.
- Fougnier, M. and Habib, L. (2008) 'If I had a rich picture: insights into the use of 'soft' methodological tools to support the development of interprofessional education', *Journal of Interprofessional Care*, Vol. 22, No. 5, p.488.
- Graneheim, U.H. and Lundman, B. (2004) 'Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness', *Nurse Education Today*, Vol. 24, No. 2, pp.105–112.
- Haynes, M. (1989) *A Participative Application of Soft Systems Methodology: An Action Research Project Concerned with Formulating an Outline Design for a Learning Centre in ICI Chemicals and Polymers*. University of Lancaster.
- Hsieh, H.F. and Shannon, S.E. (2005) 'Three approaches to qualitative content analysis', *Qualitative Health Research*, Vol. 15, No. 9, pp.1277–1288.
- Just, M. and Berg, T. (2017) 'Keeping children safe online: understanding the concerns of carers of children with autism', in *IFIP Conference on Human-Computer Interaction*, Springer, Cham., September, pp.34–53.
- Lee, C.J., Sugimoto, C.R., Zhang, G. and Cronin, B. (2013) 'Bias in peer review', *Journal of the Association for Information Science and Technology*, Vol. 64, No. 1, pp.2–17.

- Lombard, M., Snyder-Duch, J. and Bracken, C.C. (2002) 'Content analysis in mass communication: assessment and reporting of intercoder reliability', *Human Communication Research*, Vol. 28, No. 4, pp.587–604.
- Marguiles, N. and Maal, N. (2002) *Mapping Inner Space*, Corwin, Thousand Oaks, CA.
- Mazjoglou, M. and Scrivener, S. (1998) 'The rich picture of design activity', *Automation in Construction*, Vol. 7, Nos. 2–3, p.157.
- Mingers, J. (2001) 'An idea ahead of its time: the history and development of soft systems methodology', *Systemic Practice and Action Research*, Vol. 13, No. 6, pp.733–756.
- Open University (1987) *T301 – Complexity Management and Change: a Systems Approach*, Open University Systems Group, Milton Keynes.
- Open University (1997) *Management Information Systems T843*, Milton Keynes.
- Open University (2000) *T552: Systems Thinking and Practice: Diagramming*, Open University, Milton Keynes.
- Open University (2004) *T851 the Information Systems Toolkit*, Open University, Milton Keynes.
- Orleans, L.A. and Manchikanti, L. (2015) 'Medical journal peer review: process and bias', *Pain Physician*, Vol. 18, pp.E1–E14.
- Phaal, R. and Muller, G. (2009) 'An architectural framework for roadmapping: towards visual strategy', *Technological Forecasting and Social Change*, Vol. 76, No. 1, pp.39–49.
- Probert, S. (1998) 'A critical analysis of soft systems methodology and its (theoretical and practical) relationship with phenomenology', *Systemist*, Vol. 21, pp.187–207.
- Proctor, T. (1995) 'Computer produced mind-maps, rich pictures and charts as aids to creativity', *Creativity and Innovation Management*, Vol. 4, No. 4, pp.242–250.
- Resnick, B. (2016) *One Reason Peer Review is Broken: it's Biased in Favor of Prestigious Authors*, 29 November [online] <https://www.vox.com/science-and-health/2016/11/29/13770988/peer-review-bias-authors> (accessed 10 May 2018).
- Savage, M. (2013) 'The 'social life of methods': a critical introduction', *Theory, Culture and Society*, Vol. 30, No. 4, pp.3–21 [online] <http://tcs.sagepub.com/cgi/doi/10.1177/0263276413486160> (accessed 8 November 2013).
- Smith, R. (2006) 'Peer review: a flawed process at the heart of science and journals', *Journal of the Royal Society of Medicine*, Vol. 99, No. 4, pp.178–182.
- Stamper, R. and Kolkman, M. (1990) 'Soft systems techniques with a sharp(er) edge: unit systems and systems properties', in *Presented at the International Conference on Systems Management 90*, Hong Kong.
- Steinhauser, G., Adlassnig, W., Risch, J.A., Anderlini, S., Arguriou, P., Armendariz, A.Z. and Baumgartner, M. (2012) 'Peer review versus editorial review and their role in innovative science', *Theoretical Medicine and Bioethics*, Vol. 33, No. 5, pp.359–376.
- Sutrisna, M. and Barrett, P. (2007) 'Applying rich picture diagrams to model case studies of construction projects', *Engineering, Construction and Architectural Management*, Vol. 14, No. 2, p.164.
- Wilson, V. (2011) 'Research methods: content analysis', *Evidence Based Library and Information Practice*, Vol. 6, No. 4, pp.177–179.
- Winter, M. and Checkland, P. (2003) 'Soft Systems: a fresh perspective for project management', *Civil Engineering*, Vol. 156, No. 4, pp.187–192.