Demystifying Facilitation: A New Approach to Investigating the Role of Facilitation in Group Decision Support Processes

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Abstract. We believe there are still gaps in our knowledge of the facilitator role in group decision support processes and these must be "de-mystified" if use of these methods is to become more widespread. We use the design and analysis of online group model building to form a better understanding of the facilitator role. Our experimental configuration makes use of Group Explorer (Decision Explorer), configured to be delivered across the Internet in a distributed manner. The facilitator is thus no more or less visible in the workshop as any other participant. Data from a workshop is analysed and the findings discussed in relation to the following works; (i) Callon on translation, (ii) Hiltz et al. on the problem of animating methodology, and (iii) White and Taket's "death of the expert". We conclude by discussing one possible end-point of this work – the rise of a participant-led group decision support process model.

Keywords: Group decision support · Group model building · Journey making · Facilitation · Ethnomethodology · Problem Structuring Methods (PSMs) · Group Support Systems (GSS) · Group Decision and Negotiation (GDN)

1 Introduction

Debates about the processes of Group Decision and Negotiation (GDN) generally focus on methodology, expertise and facilitation, often independently, but sometimes conflated. But on the rare occasion where they are held just so far apart as to bring forth insights on the need to explore the ideas further, the comments and conclusions appear all too apparent. We therefore seem no further forward in our understanding of the practices and processes that should be adopted in pursuit of improved GDN performance than we were following Eden and Radford's seminal collection of studies on group decision support for strategic action [1]. Noting the failure of interventions in the realm of management practices, Eden and others encouraged academics and practitioners to be wary of dismissing such interventions on a matter of principle, portraying failure as one purely due to implementation that necessitated more contextualized and nuanced consideration of GDN practices from a hard setting to a soft [2–5].

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We suggest, therefore, that there remains a research gap in terms of the need for theoretically informed empirical work to reflect the complexities of different processes for GDN; in other words, to employ more holistic approaches to process performance that reflect the many different demands that may be placed on a GDN intervention; and to review the complex relationships that may exist between GDN context and performance.

In particular, in this paper, we still see a large gap in our understanding and knowledge of the facilitator's role and that this must be understood and "de-mystified" as we consider the transition of GDN practices to a soft setting, as exemplified by the use of group model building in Problem Structuring Methods (PSMs). Our research focus is specifically on participant-to-facilitator interactions. Our context and opportunity arises from the need to facilitate stakeholder groups through a process of problem structuring where these groups are increasingly geographically dispersed. We base this on the evidence of requirements for four projects where the authors are either advising on the use of PSMs, or are directly involved as facilitators, where the staging of workshops with participants attending in person is proving difficult.

Building on the work of [6] we follow the idea of "*distributed interaction within a PSM process*", but still see the workshop as an important component of the process, at least virtually. With the general improvement in the quality of network connections and collaboration tools, coupled with low-cost easy to access cloud-based compute infrastructure we believe the means for exploring this way of working is now technically feasible and methodologically justifiable, hence the reality of *distributed* Group Support Systems (GSS) as a means of implementing group model building in a PSM. Naturally, the distributed nature of stakeholder interaction e.g. in the case of a charity with stakeholders spread between the UK and Asia, is itself part of the problematic situation and we are sensitive of the fact that distributed interaction within the PSM process cannot be separated from this. The empirical work we report in this paper is an exploration of the issue of facilitation as we establish a working environment in which to conduct such online, virtual workshops. The data we analyse is collected from one of these online workshops where we have demonstrated the capability to problem owners in organisations we are working with and where the presenting issue is in fact the question of how to make this distributed engagement work.

We adopt an experimental setup that makes use of Group Explorer (Decision Explorer), a GSS that is based on the Journey Making methodology [7–9], but delivered across the Internet in a distributed manner. Consequently, the facilitator is no more or less visible and involved in the workshop as any other participant by way of its distributed nature. Our analytical technique is based on ethnomethodology [10], which has recently been used to good effect to understand the micro-process of decision-making in workshops (e.g. [11–14]). In so doing, we make the following contribution to the literature. First, we build on the foundations established by [6], to form a better understanding of the role of the facilitator in this type of setting. In particular, our attention is focussed specifically on participant-to-facilitator interactions. We theoretically position our work in relation to the following: (i) the work of Callon [15] on translation and specifically how facilitation addresses the questions of problematisation and interessement [16], (ii) the work of Hiltz et al. [17] on distributed GSS and the problem of animating methodology, and (iii) the "death of the expert" [18].

This perspective enables us to take a broader and nuanced view of expertise, which gets to the heart of investigating the role of the facilitator as an expert in methodology. Finally, data from one of the workshops organised to demonstrate technical and methodological feasibility in this distributed manner is analysed and the findings discussed in relation to our theoretical expectations. In particular we examine the question of the possible demise of the expert facilitator and the rise of a technology enabled and participant-led group decision support process model.

The remainder of our paper unfolds as follows. First, we review the literature on facilitation in GDN, delineating the dimensions of facilitation, explain our theoretical underpinning, and then bring the two ideas together in developing our theoretical model. Second, we present the data and method we employ. Third, we present and discuss our results. In our final section we highlight our contribution to extant literature and suggest implications.

2 Literature Review on Facilitation

Classic work on facilitation follows the seminal work by [19]. Here the concern was on the facilitator as the 'helpful intervener'. Here, the intervener strives to improve group dynamics and decision making or provide a learning environment to help participants gain confidence of an interpersonal nature in order to help them transform the patterns of communication. Indeed, much of the work on GDN focuses on the facilitator that strives to influence situations toward desired goals in the human activity systems in which they intervene. Here the facilitator attempts to balance what is to be done with how it will be achieved; see for example [4, 6, 20–26].

The role we are defining for the facilitator in this work is somewhat different. We begin to problematize the role as follows using group model building in a PSM engagement as the focus of our group decision support process. The question of facilitation seems to be situated within existing PSM practice, so the facilitator as a role is already there, has always been there in the process, and always originating from a *methodological* root. We imagine the written accounts of methodology as a product of first-hand experience in facilitating the methodology. There are many published methodologists, but they are all also practitioners. Is it therefore possible to theorise about PSMs without extensive practice-based experience? Problematisation seems to require us to break the bond between the roles of methodologist and facilitator and place our focus on deconstructing the latter; the thoughts of the methodologist are largely what we know already from the literature.

We can problematize the role in three ways:

1. Through isolating the facilitator by making them as on-par with a participant as possible, creating a laboratory to study facilitator interactions (online method);
2. By analysing case studies divorced from codified PSM methodology (and therefore the associated methodologist) i.e. deconstructing a non-codified case to tease-out the facilitation role (if any) (non-codified case method);
3. By distilling the essence of the facilitator role from the bulk of the PSM and GDN literature. To a certain limited extent this has been done in our literature review

here, but there is perhaps some further concentration that could be performed to tease-out nuances. However, it is unlikely to produce anything exceptional by way of results (literature method).

To some, the role of the facilitator seems tangled with questions of leadership and, worse, the notion of systems thinking [27, 28]. Not as anything precisely defined, and associated with any particular methodology, but as a quality of an individual that uniquely sets them apart to take on the role of facilitator when dealing with the sort of messy problems that PSM engagements are designed. We suggest that this is an unprofitable line of enquiry as it is unlikely to lead to any widely useful contribution. Our focus therefore remains with the performative i.e. what are facilitators actually doing when they facilitate a PSM engagement, and therefore preserve our theoretical underpinnings in ANT/Mangle [12]. Whilst it would be interesting to explore the analysis of the facilitator role in non-codified PSM use, precisely because it would be an analysis of facilitation by a non-methodologist in a PSM-like setting, we defer this to future work.

3 Theory

Recent focus drawing on pioneering work of Keys on the sociology of scientific knowledge [29–32], and recently work by OR scholars drawing on socio-materiality, particularly the works of Latour [16, 33, 34] and Pickering's Mangle [34, 35] attention has been paid to important agendas regarding theory, behaviour and outcomes pertaining to (particularly Soft) OR processes, including facilitation. We note that these studies have recognized that interventions are both temporally enacted affairs and concerned with becoming coordinated practices through the performance of using models as objects, but the studies are not adequate in addressing in full issues relating to facilitation in interventions. Therefore, some significant methodological and epistemological challenges remain [16, 36–38]. Relevant to our work on facilitation is an extenuation of socio-materiality from Callon [39]. He outlines a number of themes which we feel are relevant to our study, in particular, the Co-Production of Knowledge Model (CKM). In the CKM he recognises a persistently enriched contest between the production of standardised knowledge and knowledge that takes into account the complexity of local circumstances or context [39]. In the space between the two is the problem of facilitation. Callon's CKM notes that the typical mapping of the problem structuring onto an expert–lay divide – in which experts possess expertise and participants possess local knowledge that can challenge assumptions made by those applying expertise to particular contexts. The experts as facilitators do not capture the capacity of participants to be involved in all elements of knowledge production. Nor does it challenge understandings of a problem that may be as highly differentiated as those held by the expert. In the same way that experts question their understandings through practice, so must the participants. Thus, under CKM, knowledge is co-produced through a process of dynamic, collective learning involving those for whom an issue is of particular concern, whether as a result of their expertise, their personal position with respect to the problem at hand, or their personal experience of

the problem. This explicitly recognises more socially distributed, autonomous and diverse forms of collective problem structuring [6, 40]. Problem structuring is no longer a property of expertise [18], and the knowledge it produces is no longer accorded special privilege over other knowledge. This process does not eliminate the need for the involvement of expertise, rather it removes its privilege and emphasises that it is, on its own, insufficient.

Callon's CKM is useful in capturing a theme central to debates over expertise in decision-making. Expertise is more widely distributed than many might imagine. The question becomes how to mobilise and to diversify that expertise and what happens to the expertise of the facilitator during this mobilisation. By addressing this question new kinds of understanding may be generated that unsettle the taken-for-granted aspect of problem solving. Here, we introduce an experiment that explores distribution of expertise/facilitation to other people, things and places. To understand why this distribution of expertise is different.

4 Constructing the Experimental Setup

A standard Group Explorer installation was repurposed for deployment in a cloud-computing environment. Group Explorer provides a 'wrapper' to the Decision Explorer software – which is "*designed to record, analyze and present qualitative data argumentation relating to strategic policy issues and modelled as cognitive maps*" [8] – such that multiple participants can share in the development of a cognitive map in a facilitated workshop. The wrapper provides a web-based interface to participants and also manages the various phases of model development and the storage of data about its dynamic development to support the sort of analysis presented later in this paper. A sketch of the installation and deployment process for the Microsoft Azure cloud computing service is described in Appendix A. The motivation for choosing this type of internet-based hardware platform was to address the following needs:

1. To facilitate remote connection to the Group Explorer environment from any geographic location without having to deal with organisational firewalls and access limitations;
2. To avoid procuring and maintaining hardware, thus shifting costs from capital to operational, consistent with many organisations' strategies to migrate their IT infrastructure to cloud services;
3. To instantiate the software environment only when required for a workshop, thus further pushing operational expenses as low as possible by making best use of the pay-for-use model of the service provider;
4. To enable migration of configured Virtual Machines (VMs) to higher processor and memory specification hardware should there be a need for increasing performance. The management and configuration tools from the service provider are specifically designed to monitor for performance issues and enable migration.

A single online collaboration tool was used to provide both the audio conferencing capability and the means to share the screen of the computer hosting the Decision Explorer modelling software. Feasibility was tested with both TeamViewer and Citrix

GoTo Meeting products. For the feasibility workshops reported in this paper the usual two facilitation roles of a Group Explorer workshop were replaced by a single facilitator, who was both facilitating the group and also controlling the modelling using Decision Explorer.

4.1 Conducting Experiments

The experiments reported in this paper were conducted with the main purpose of (i) establishing the technical feasibility of conducting Group Explorer workshops in a distributed online setting, and (ii) furnishing sufficient data to begin to analyse the facilitator role. Having agreed to take part in the testing of an online workshop the *technical* means to join the workshop was managed carefully with the clients. To help in the process of demonstrating feasibility to clients three documents were prepared and circulated to participants a few days before the workshop was due to take place. In addition to a data collection permission form, based on a standard template we use for normal workshops, we also provided a document with detailed instructions about how to join the meeting online, including what to do if technical problems are encountered, and a document describing an online connection *etiquette*, designed to deal with mitigating problems with dropped or failed connections. Note that due to the nature of the data recording process for analysis purposes any participant who feels unable to give consent is excluded from participating in the workshop. The online connection etiquette guide is shown in Appendix B, redacted to remove client identity and phone numbers.

The experimental setup is complicated with many procedural steps required to make sure all of the components are working correctly prior to the workshop start time. Consequently, a checklist was developed for use by the facilitator to orchestrate the workshop setup and an actual example is shown in Appendix C. Refining this checklist over time as experience has developed has also led to a realisation of the steps in the instantiation of an online PSM environment that could be automated in the future. A question we return to later.

4.2 Data Collection

Our approach is based on recording and analysing participant-facilitator interaction during an online PSM workshop. The data consist of audio transcripts and the Excel Spreadsheet created from the SQL Server Export Wizard report generated from the workshop data held in the Group Explorer database. The two datasets are linked together by timestamps.

5 Data Analysis

Three online group model building workshops to demonstrate capability were held as follows:

1. 2–5th October 2015. Initial experimentation between authors addressing the issue "*Making Group Explorer usable in a distributed mode*".
2. 23rd October 2015. Bristol-based charity with a stakeholder group spread between the UK and Asia. Feasibility workshop addressed the issue of "*Defining the effectiveness for a charitable sustainable energy programme*".
3. 27th October 2015. InnovateUK/NERC funded project to explore the impact of adverse climate events on the delivery of health services across a UK city. Feasibility workshop addressed the issue of "*Improving the resilience of healthcare provision in Bristol to extreme weather events*".

The first workshop was focussed on the issue of <*Making Group Explorer usable in a distributed mode*> and where it first became apparent that the experimental setup was providing a means of precisely examining what it was that the facilitator was doing during a group model building workshop[1]. The fact that the facilitator was now connected to Group Explorer in much the same way as a workshop participant meant that facilitator-participant interaction was as open to examination from the data as any other. Whilst the research focus on facilitation emerged from this first workshop and thus set the focus for data collection in the second and third workshops, at the same time these were still addressing the ostensible purpose of testing the technical feasibility of the online setting with clients.

The model from the first workshop was used to distinguish those aspects of <*Making Group Explorer usable in a distributed mode*> that were technical and/or methodological in nature from those relating solely to facilitation. The audio data from the third workshop was used to demonstrate the transition from facilitator led participation to a phase where the participants were able to model without facilitator intervention. The data from the second workshop are not analysed here, but it does represent the first distributed use of Group Explorer with a client and the lessons learned informed the setup for the third workshop.

The second and third workshops were deemed successful in the sense of warranting the conclusion that the online capability was *operational*, that having demonstrated feasibility the approach could now be used for future client workshops. We have deferred the question of evaluating the online approach, using techniques such as described by [38, 41], to further work.

5.1 Distinguishing Technology and Methodology from Facilitation

The model that emerged from the first workshop is shown in Fig. 1.

[1] The initial issue explored was how to support asynchronous modelling too. The Group Explorer setup was left running all weekend, hence the date range, to enable issues to be added and connected in the model without the facilitator being present at the client console. Whilst it worked technically, it was decided fairly quickly that this mode of working would not be explored further. However, we already have requirements for distributed workshops that will involve stakeholders separated by many time zones and the methodological issues raised by periods of un-facilitated participation could thus be investigated with the same experimental setup.

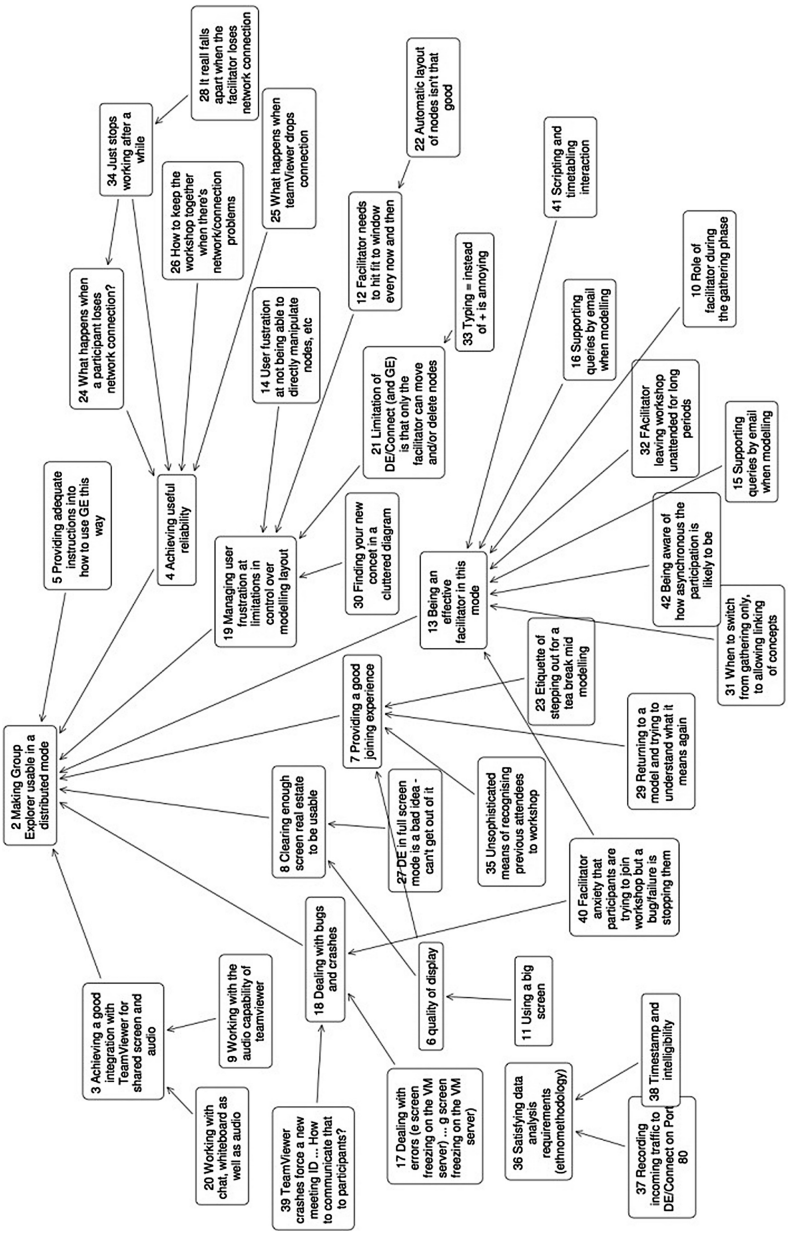

Fig. 1. Making group explorer usable in an online mode.

Themes emerging from this initial workshop can be broken down into the following categories:

1. Instructing participants in the use of the online systems (Group Explorer and the screen sharing and audio conferencing software);
2. Getting participants used to the way in which the modelling is designed to work e.g. entering and linking concepts;
3. Dealing with issues of poor and broken connections and technical limitations e.g. not seeing concepts immediately appear on the shared screen due to delays in providing a good layout for the participants;
4. Managing the process of participants modelling, enacting the script.

Themes 1–3 are mainly procedural arising from the technology, and methodology indirectly, and are thus candidates for automation and/or provision of better documentation to participants in the future. Theme 4 is the essential process of facilitation that we are trying to examine.

5.2 Detecting Transitions

The audio recording from the third workshop was analysed to demonstrate the feasibility of the approach for more detailed future analyses of facilitator-participant interaction and is shown in Table 1. The focus of the data presented here was the phase leading up to the first transition, from the workshop being facilitator led to one where the participants were able to focus on modelling from their own position of expertise without the facilitator's intervention. In the interests of space, the data and analysis of subsequent transitions is not presented.

Table 1. Data from the initial phase of the third workshop up to the first transition.

N_{event}	T_{start}	Description
1	0:00	Facilitator is greeting participants as they appear on the audio conference and dealing with questions. One participant asks if there is enough time to "*go and make a cup of tea*" before the start, which they then proceed to do
2	9:16	Facilitator introducing the purpose of the workshop. Explaining something about PSMs generally, group model building and an overview of the technical means of how the workshop is being delivered. This is described in contrast to how the workshop would have been delivered in a conventional setting with the participants attending in person. During this time the preliminary model is being displayed via the shared-screen facility. After the preliminaries the facilitator explains the semantics of the model. In this case the 'blobs' are being interpreted as processes in a Hierarchical Process Model (HPM) and the 'links' as meaning 'part-of' relationships [42]. The model can thus be read as a system to achieve the purpose of "*improving the resilience of healthcare provision in Bristol to extreme weather events*", much like a Purposeful Activity Systems (PAS) model in Soft Systems Methodology (SSM) [43]. The facilitator explains a simple linguistic game to constrain the verbs to gerunds, an important feature of HPM. During this time there are no interjections from the participants

(*continued*)

Table 1. (*continued*)

N_{event}	T_{start}	Description
3	14:19	A participant comments that their connection dropped for about two minutes "*I may have clicked the wrong thing*". The facilitator has not noticed the absence or anything amiss with the connection to the conferencing software and reassures the participant that they are 'back' in the meeting
4	15:14	Facilitator returns to the explanation described above
5	16:01	Facilitator now returns to explaining the preliminary model
6	17:29	Facilitator opens a new View in Decision Explorer to show a new process being created and explains how to use the web interface to Group Explorer to add new processes to the model. The facilitator starts by adding a new process via the Decision Explorer console on Public "*you should see a new process there, 17?*". Confirmed by a participant. "*Give me your ideas about how we can do this*", and reminds participants to play the gerund language game
7	18:48	Participant: "*Have you got mine there?*". Facilitator looks "*I can't see it at the moment*" and resizes the display to bring the new process into view
8	18:55	Participant "*Can you put up a view of the bigger diagram please*" – wants to see the original model. Facilitator switches display. Checking that the new process has been 'received'
9	19:44	Facilitator then switches View back
10	20:04	Participants first start reacting to each others' inputs to the model
11	20:45	Facilitator says "*OK, yes*" then is followed by a period of silence (keyboard noise heard) as the participants add processes to the model
12	21:35	Facilitator breaks silence by saying "*OK, this is all good stuff*"

The start time corresponds to the announced meeting *connect* time, 15 min before the workshop was due to start. As can be seen below, 9 m:16 s of the 15 min allowed were required to establish attendance and connectivity.

6 Conclusions

Our work has focussed attention on shedding more light onto a subject that has remained equivocal. The process of developing an online group model building capability for projects with widely distributed stakeholders has given us an experimental framework to investigate the problem of facilitation at a micro-level. The attention to practical development of capability that could entail the decentring of the facilitator avoids the trap or descent into the purely critical and keeps the work at an empirical level.

The viewpoint piece [44] suggests that the development of group decision support has been by a number of '*gurus*' and reflects on their legacy and succession. As pointed out in the literature review this status of guru is associated with the *combined* role of facilitator and methodologist, although it is mainly knowledge about the latter that is reported; the healthiness of the field is evidenced by the continual development of methodology without much or any reference to the role of facilitation. Recent work by [45] provides hard data that can be used to refute any suggestion of stagnation "*When combined with other recent survey evidence, the use of PSMs and Business Analytics is apparently extending the scope of OR practice*", but the question remains whether these

hints of a problem emerged because of something lacking in the area of facilitation, or more specifically in the facilitator as the *sine qua non* of methodological knowledge.

Our review of theory suggests that the role of facilitator, as *purveyor* of methodology in decision making engagements, is just another form of expertise that can be critiqued and potentially decentred from the essential business of group decision support. Our preliminary experiments have been light on methodology, both in terms of explanation to clients or in anything particularly creative in methodological design. The use of Group Explorer with a simple modification to the conventional use of Decision Explorer, coupled with its delivery online via a cloud service and with the workshop glued together by a reasonably sophisticated audio conferencing and screen sharing system provided a lot of the *scaffolding* for the group model building. In effect by implementing a distributed GSS that could be considered pre-packaged and largely separate from the process of facilitation. However, from the point of view of Callon on translation [15], and specifically how facilitation addresses the questions of problematisation and interessement [16], it was still the facilitator that initiated the workshops and who was essential on the conference call to explain how the process would work.

In the extract presented in Table 1 it is not until 20 min into the workshop that the facilitator stops being the expert in methodology and steps back to allow the participants to get on with the process of engaging with the problem. With regard to Callon's CKM we see that at this point the facilitator has been able to momentarily relinquish the expert role and allow the participants to be the experts in what they know. A translation where one sort of situated expertise (facilitator/facilitation) is transferred to another (participant/problem domain). The time spent up to this point was taken up by the facilitator translating expertise in methodology into practical explanation of process so that the participants could use it to enable their own expertise to become visible.

With regard to the work of Hiltz et al. on distributed GSS and the problem of animating methodology [17] our distributed group modelling capability is clearly not autonomous. The scaffolding might be there to enable self-animation on the part of the participants, but there was nothing in the preliminary guidelines that were circulated prior to the workshop that suggested participants could begin to model without the facilitator giving permission. Perhaps if the same group were to convene online in a subsequent workshop they might. However, even if Group Explorer had been started up in Gathering mode, the Chauffeur component of Group Explorer still requires a facilitator with access to the Chauffeur console to manually change configuration from Gathering to Preferencing to Voting. We can ask the question of whether a briefing note on the modelling process and some visual clues provided by a modified Group Explorer software itself would have been enough to get the stakeholder group modelling without the facilitator; but the question of who would have instigated the online workshop still remains. The question of animation, and particularly initiation and transition, is crucial to unpicking how a methodology plays-out in a group workshop and further analysis is required to fully understand this. Whilst we appreciate this would help us to improve group decision support processes generally, and is a worthwhile and perhaps necessary task, we also admit to the following agenda inspired by ideas of the "*death of the expert*" [18]. What if through further research we could understand the role of facilitator sufficiently well so that it could be *coded* into a software platform like Group Explorer? Rather than being puzzled by the question of whether a PSM engagement functioned

because of the skill of the facilitator or because of a property of the methodology we would have sufficiently separated the two to gain clarity that the question of function could be investigated solely as a property of methodology. Although of course begging the question as to meaning of *function*. For the purposes of current experiments and future work our meaning is simply that of whether the group decision support process started at all and led to decisions being made.

We acknowledge the limitations in our work. Our analysis centres on the methodological, procedural and expert role of the facilitator, especially as initiator of process and enabler of lay expertise, mainly from the broad perspective of ANT. This has been at the expense of detailed micro-analysis using theories of behaviour such as Activity Theory [11]; however this is further work that can be carried out now that the experimental framework has been made operational and the method of data collection simplified. An additional strand of work we envisage is to return to the question of facilitator as initiator and how this role comes about, and an examination of the trust that must come into being in the relationship between the client and the facilitator.

To conclude, in our new experimental setting the facilitator has been literally decentred, the visual clues of being the centre of attention in the workshop have been removed and the facilitator is just another voice on the conference call. What if the audio cues could be replaced by software cues, perhaps supported by rule engine? This is speculation and perhaps where the development strands of GSS and PSM come together in a general group decision support process, but further understanding and de-mystification of the facilitator role may open the door to a proliferation of PSM/GSS application platforms. Whilst this may be technically feasible, this speculation brings us back to the essential puzzle of a PSM engagement; the initial problematisation and interessement [16]. Is this at all possible without a facilitator regardless of the properties of methodology and technical enablement of stakeholders?

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Appendix A Installation Notes for Group Explorer in MS Azure

These notes are designed to help installing Group Explorer in Microsoft's Azure cloud computing environment using Windows Server 2008 R2 SP1 Virtual Machines (VMs) and refers to Group Explorer V2.1 User's Guide v2.1.3 and install files PublicSetup-v2.exe dated 28th March 2013 and ChauffeurSetup-v2.exe dated 9th December 2012.

Part 1 – Creating the VMs, network, and assigning correct IP addresses

- Create a suitable Microsoft Azure subscription
- Create a virtual network
  - Name: netnameXXXX
  - start address 192.168.0.0
  - CIDR/24(251) - creates a submask of 255.255.255.0
- Create the first virtual machine to host the Public computer
  - Compute->Virtual Machine->From Gallery->Windows Server 2008 R2 SP1
  - Name: PublicXXXX (whatever is needed to guarantee a unique name)
  - Region/Affinity: netnameXXXX
  - Endpoint: HTTP
  - Endpoint: GroupExplorerXXXX 8085
- Download the RDP connection file for PublicXXXX
- Connect to PublicXXXX
- Install dropbox
- Install Azure Powershell
- Shutdown Public
- Create the second virtual machine to host the Chauffeur computer
  - Compute->Virtual Machine->From Gallery->Windows Server 2008 R2 SP1
  - Name: ChauffeurXXXX (whatever is needed to guarantee a unique name)
  - Region/Affinity: netnameXXXX
  - Endpoint: HTTP
  - Endpoint: GroupExplorerXXXX 8085
- Download the RDP connection file
- Install dropbox
- Install Azure Powershell
- get credentials
- Configure IP address of PublicXXXX using Azure Powershell
- Shutdown ChauffeurXXXX
- Startup Public
- Check IP address of PublicXXXX
- Connect PublicXXXX
- Configure IP address of ChauffeurXXXX using Azure Powershell
- Startup ChauffeurXXXX
- Check IP address of ChauffeurXXXX

Part 2 – Installing Public

- On PublicXXXX
- Find the SQL Server 2008 R2 installer download page on the Microsoft website
- Download the installation file SQLEXPR_x86_ENU.EXE
- Start the SQL Server 2008 R2 install process by running SQLEXPR_x86_ENU.EXE
- Kill the install process to preserve extracted distribution
- Find and copy the extracted distribution tree for SQL Server 2008 R2 to Downloads
- Start Public Install as per the Group Explorer Install Manual

- When Group Explorer Installer starts the SQL Server installer change location of source to Downloaded file
- Let Public install finish

Part 3 – Installing Chauffeur

- Login to ChauffeurXXXX
- Start Chauffeur Install as per the Group Explorer Install Manual
- Let Chauffeur install finish

Appendix B Joining Instructions for an Online Meeting

University of BRISTOL

Online Workshop Etiquette

Dr Mike Yearworth
16th November 2015

Joining the meeting

1) On the day of the workshop you will be sent an email with the subject "ONLINE WORKSHOP: organisation | time". The email will contain two links. The message will look like:

   15 minutes before the workshop is due to start please join the conferencing system by clicking on this link: http://go.teamviewer.com/v10/mXXXXXXXX
   Meeting ID: mXX-XXX-XXX

   If you have any problems connecting please call Mike on +44XXXXXXXXX

   At the time of the workshop please click on this link:
   http://chauffeur.cloudapp.net/groupexplorerconsole/

2) If anything happens that is making it difficult or impossible to continue participating in the workshop

   Please announce over the audio channel. This is experimental work so please let all the participants know what the problem is

3) Please use the private chat facility in TeamViewer sparingly, if at all.

   Ideally all communication should be mediated via the facilitator and/or model. Note that the chat channel is also recorded as part of the workshop.

Technical problems

1) If your internet connection drops

   Send an SMS to Mike on +44XXXXXXXXX saying who you are, that your connection has dropped, and an estimate of how long it will take to re-establish a connection and re-join the workshop

2) If TeamViewer doesn't connect to the meeting

   Send an SMS to Mike with a summary of the problem

3) If TeamViewer drops the meeting connection

   Attempt to re-join using the teamViewer meeting ID provided on the day of the meeting. If this doesn't work send an SMS to Mike with a summary of the problem

4) If Group Explorer is not allowing you to connect

   Let everyone know over the audio channel of TeamViewer

Data collection

1) See the separate document "Permission for workshop data collection."

   The audio channel and any chats between participants will be recorded for analysis and publication purposes. Note that no individual will be identified in any published work. A permission form will have been sent before attending the workshop. Anyone who has not agreed to these recording requirements will not have been sent a Team Viewer meeting ID number.

Appendix C Online Meeting Configuration Checklist

University of BRISTOL

Online Workshop Checklist

Workshop Client: CSE
Date/Time: 29th January 2PM
Meeting ID: 312-525-197

Item	Notes	Time/Value
Approximately 6 hours before workshop...		
Startup GroupExplorer VMs	$ ./Public.sh then $./Chauffeur.sh	07:57
Check status	$ ./Status.sh	08:02
Check current balance	https://account.windowsazure.com/Subscriptions	07:45
Connect to `Public` using RDC		8:49
Connect to `Chauffeur` using RDC		8:49
Check for updates & install/restart	Chauffeur: none Public: none	8:50
Create workshop dropbox	CSE-20160129	8:51
Start GoToMeeting on `Laptop`	312-525-197	8:52
Copy GoToMeeting ID number		9:01
Start GoToMeeting on `Public`	Use Public:Decision Explorer as participant name	9:04
Start Decision Explorer on `Public`	Load correct model for workshop, early joiners will see this model	9:04
Transfer meeting host from `Laptop` to `Public`	Check that workshop model is shared OK	9:05
Disconnect RDC clients from VMs		9:10
Disconnect `Laptop` from meeting		—
Email meeting participants		9:10
Approximately 30 minutes before workshop...		
Check status	$ ./Status.sh	13:24
Re-connect `Laptop` to meeting		—
Connect to `Public` using RDC		13:24
Connect to `Chauffeur` using RDC		13:24
Kill Decision Explorer		13:32
Start GroupExplorer components* on `Public` and `Chauffeur`	1)`Public`:GE Remote Service, 2)`Public`:Decision Explorer, 3)`Chauffeur`:Group Explorer, 4)`Public`: GE Public	13:32
Load correct model for workshop		13:32
Immediately before workshop start...		
Start GoToMeeting recorder	Record screen and audio	13:44
After workshop cleanup...		
Stop GoToMeeting recording		15:03
Convert GoToMeeting AV file and move to workshop dropbox	CSE-20160129.MP4	15:07
Stop Group Explorer components		15:03
Export `Chauffeur` log file to workshop dropbox	Chauffeur-CSE-20160129.txt	15:08
Export SQLServer database on `Public` and save report to workshop dropbox	CSE-20190129.xls	15:16
Save Decision Explorer model file to workshop dropbox	CSE-Model1.MDL	15:10
Disconnect RDCs from VMs	~~waiting for MP4 upload to dropbox...~~	15:35
Shutdown `Public` VM	$ ./ShutdownPublic.sh	16:09
Shutdown `Chauffeur` VM	$ ./ShutdownChauffeur.sh	15:56
Check status	$ ./Status.sh	16:12
Check current balance	https://account.windowsazure.com/Subscriptions	17:48
About 3 hours after workshop...		
Check VM usage stats	https://manage.windowsazure.com	17:43
Check current balance	https://account.windowsazure.com/Subscriptions	17:45

* Group Explorer v2.1 User's Guide v2.1.3
Dr Mike Yearworth
25th January 2016

References

1. Eden, C.E., Radford, J.E.: Tackling Strategic Problems: The Role of Group Decision Support. SAGE, London (1990)
2. Rosenhead, J.: What's the problem? An introduction to problem structuring methods. Interfaces **26**, 117–131 (1996)
3. Eden, C., Ackermann, F.: Where next for problem structuring methods. J. Oper. Res. Soc. **57**, 766–768 (2006)
4. Bell, S., Morse, S.: Groups and facilitators within problem structuring processes. J. Oper. Res. Soc. **64**, 959–972 (2013)
5. Joldersma, C., Roelofs, E.: The impact of soft OR-methods on problem structuring. Eur. J. Oper. Res. **152**, 696–708 (2004)
6. Morton, A., Ackermann, F., Belton, V.: Problem structuring without workshops? Experiences with distributed interaction within a PSM process. J. Oper. Res. Soc. **58**, 547–556 (2007)
7. Montibeller, G., Shaw, D., Westcombe, M.: Using decision support systems to facilitate the social process of knowledge management. Knowl. Manag. Res. Pract. **4**, 125–137 (2006)
8. Eden, C., Ackermann, F.: Cognitive mapping expert views for policy analysis in the public sector. Eur. J. Oper. Res. **152**, 615–630 (2004)
9. Ackermann, F., Eden, C.: Making Strategy: Mapping Out Strategic Success. SAGE, London (2011)
10. Garfinkel, H.: Ethnomethodology's program. Soc. Psychol. Q. **59**, 5–21 (1996)
11. White, L., Burger, K., Yearworth, M.: Understanding behaviour in problem structuring methods interventions with activity theory. Eur. J. Oper. Res. **249**, 983–1004 (2016)
12. White, L., Yearworth, M., Burger, K.: Understanding PSM interventions through sense-making and the mangle of practice lens. In: Kamiński, B., Kersten, Gregory, E., Szapiro, T. (eds.) GDN 2015. LNBIP, vol. 218, pp. 13–27. Springer, Heidelberg (2015). doi:10.1007/978-3-319-19515-5_2
13. Tavella, E., Franco, A.L.: Dynamics of group knowledge production in facilitated modelling workshops: an exploratory study. Group Decis. Negot. **24**, 451–475 (2015)
14. Franco, A.L., Greiffenhaggen, C.: Unpacking the complexity of group problem structuring. In: Kamiński, B., Kersten, G., Szufel, P., Jakubczyk, M., Wachowicz, T. (eds.) 15th International Conference on Group Decision and Negotiation Letters, pp. 33–34. Warsaw School of Economics Press, Warsaw (2015)
15. Callon, M.: Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In: Law, J. (ed.) A New Sociology of Knowledge?, pp. 196–229. Routledge, London (1986). Power, action & belief
16. White, L.: Understanding problem structuring methods interventions. Eur. J. Oper. Res. **199**, 823–833 (2009)
17. Hiltz, S.R., Dufner, D., Fjermestad, J., Kim, Y., Ocker, R., Rana, A., Turoff, M.: Distributed group support systems: theory development and experimentation. In: Olson, G.M., Malone, T.W., Smith, J.B. (eds.) Coordination Theory and Collaboration Technology. Psychology Press, UK (2013)
18. White, L., Taket, A.: The death of the expert. J. Oper. Res. Soc. **45**, 733–748 (1994)
19. Schein, E.H.: Process Consultation: Lessons for Managers and Consultants, vol. 2. Addison-Wesley, Boston (1987)
20. Tavella, E., Papadopoulos, T.: Expert and novice facilitated modelling: a case of a viable system model workshop in a local food network. J. Oper. Res. Soc. **66**, 247–264 (2015)

21. Scott, R.J., Cavana, R.Y., Cameron, D.: Recent evidence on the effectiveness of group model building. Eur. J. Oper. Res. **249**, 908–918 (2015)
22. Ventura, A., Dias, L., Clímaco, J.: On facilitating group decision making processes with VIP analysis. In: Zaraté, P., Kersten, G.E., Hernández, J.E. (eds.) GDN 2014. LNBIP, vol. 180, pp. 246–253. Springer, Heidelberg (2014). doi:10.1007/978-3-319-07179-4_28
23. Rouwette, E.A.J.A.: Facilitated modelling in strategy development: measuring the impact on communication, consensus and commitment. J. Oper. Res. Soc. **62**, 879–887 (2011)
24. Rouwette, E., Bastings, I., Blokker, H.: A comparison of group model building and strategic options development and analysis. Group Decis. Negot. **20**, 781–803 (2011)
25. Papamichail, K.N., Alves, G., French, S., Yang, J.B., Snowdon, R.: Facilitation practices in decision workshops. J. Oper. Res. Soc. **58**, 614–632 (2007)
26. Belton, V., Harvey, P., Rouwette, E., van Zijderveld, E.J.A., Morrill, N., Shaw, D.: Transferring PSM craft skills in a 2 hour session. In: 49th Annual Conference of the Operational Research Society, OR49, pp. 93–105 (2007)
27. Henning, P., Chen, W.C.: Systems thinking: common ground or untapped territory? Syst. Res. Behav. Sci. **29**, 470–483 (2012)
28. Buckle-Henning, P., Wilmshurst, J., Yearworth, M.: Understanding systems thinking: an agenda for applied research in industry. In: 56th Meeting of the International Society for the Systems Sciences, San Jose, USA (2012)
29. Keys, P.: OR as technology: some issues and implications. In: Keys, P. (ed.) Understanding the Process of Operational Research: Collected Readings. Wiley, Chichester (1995)
30. Keys, P.: On becoming expert in the use of problem structuring methods. J. Oper. Res. Soc. **57**, 822–829 (2006)
31. Keys, P.: OR as technology - some issues and implications. J. Oper. Res. Soc. **40**, 753–759 (1989)
32. Keys, P.: OR as technology revisited. J. Oper. Res. Soc. **49**, 99–108 (1998)
33. White, L., Burger, K., Yearworth, M.: Big data and behaviour in OR: towards a 'Smart OR'. In: Kunc, M., Malpass, J., White, L. (eds.) Behavioral Operational Research: Theory, Methodology and Practice. Palgrave Macmillan, Basingstoke (2016)
34. Yearworth, M., White, L., Ormerod, R.: The performative idiom and PSMs. In: 27th European Conference on Operational Research (EURO 2015), Glasgow, Scotland (2015)
35. White, L., Yearworth, M., Burger, K.: Understanding PSM interventions through sense-making and the mangle of practice lens. In: Kamiński, B., Kersten, G., Szapiro, T. (eds.) 15th International Conference on Group Decision and Negotiation (GDN 2015). Warsaw, Poland (2015)
36. Connell, N.A.D.: Evaluating soft OR: some reflections on an apparently 'unsuccessful' implementation using a Soft Systems Methodology (SSM) based approach. J. Oper. Res. Soc. **52**, 150–160 (2001)
37. Packer, M.J., Goicoechea, J.: Sociocultural and constructivist theories of learning: ontology, not just epistemology. Educ. Psychol. **35**, 227–241 (2000)
38. White, L.: Evaluating problem-structuring methods: developing an approach to show the value and effectiveness of PSMs. J. Oper. Res. Soc. **57**, 842–855 (2006)
39. Callon, M.: The role of lay people in the production and dissemination of scientific knowledge. Sci. Technol. Soc. **4**, 81–94 (1999)
40. White, L.: Behavioural operational research: towards a framework for understanding behaviour in OR interventions. Eur. J. Oper. Res. **249**, 827–841 (2016)
41. Midgley, G., Cavana, R.Y., Brocklesby, J., Foote, J.L., Wood, D.R.R., Ahuriri-Driscoll, A.: Towards a new framework for evaluating systemic problem structuring methods. Eur. J. Oper. Res. **229**, 143–154 (2013)

42. Davis, J., MacDonald, A., White, L.: Problem-structuring methods and project management: an example of stakeholder involvement using hierarchical process modelling methodology. J. Oper. Res. Soc. **61**, 893–904 (2010)
43. Checkland, P., Scholes, J.: Soft Systems Methodology in Action: Including a 30-Year Retrospective. Wiley, Chichester (1999)
44. Westcombe, M., Franco, L.A., Shaw, D.: Where next for PSMs - a grassroots revolution? J. Oper. Res. Soc. **57**, 776–778 (2006)
45. Ranyard, J.C., Fildes, R., Hu, T.-I.: Reassessing the scope of OR practice: the influences of problem structuring methods and the analytics movement. Eur. J. Oper. Res. **245**, 1–13 (2015)