View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Kent Academic Repository

Proceedings of the Operational Research Society Simulation Workshop 2016 (SW16)
A.Anagnostou, K. Hoad, M. Kunc eds.

A FACILITATION WORKSHOP FOR THE IMPLEMENTATION STAGE: A CASE STUDY IN HEALTH CARE

Dr. Kathy Kotiadis

University of Kent
Canterbury, CT2 7NZ, UK
K.Kotiadis@kent.ac.uk

Dr. Antuela A. Tako

Loughborough University
Leicestershire, LE11 3TU, UK
A.Takou@lboro.ac.uk

ABSTRACT

Research on facilitation in discrete event simulation (DES) is gathering pace but there is still a need to put forward real examples to explain the process to newcomers. Most of the research has focussed on facilitation in the initial stages of the simulation modelling process. In this paper we focus on one of the postmodel coding stages. More specifically we focus on the implementation stage, the final stage in the modelling process. The primary contributions of this paper are the description of the process followed and the introduction of tools that can be used during this stage to support workshop activities. A real case study is provided describing the sequence of the interactions undertaken in the workshop. Extracts from the transcripts are also included, with the view to bringing evidence of the stakeholders' involvement and their mood during the workshop. The paper concludes with a discussion on the process followed and the importance of using tools in this stage.

Keywords: Facilitation, Implementation, Methodology, Workshops, Health Care

1 INTRODUCTION

This paper complements existing work on facilitated DES (Adamides and Karacapilides, 2006; den Hengst et al, 2007; Barjis 2011; Robinson et al 2012; Robinson et al 2014; Tako and Kotiadis, 2015) by describing a post model coding facilitation workshop and the tools used to support it.

A little over 10 years ago Taket (2002) noted that facilitation was emerging as a term and listed a number of existing books (e.g. Taket and White (2000)) and articles (e.g. Huxham (1991); Phillips and Phillips (1993); White and Taket (1994)), none of which included facilitated discrete event simulation, although Group Model Building (facilitated System Dynamics) had already established itself (Vennix 1996). The term facilitation has only been adopted in the last few years by the DES community (van der Zee 2007; 2011; Tako et al 2010; Barjis 2011; Tako and Kotiadis 2012a,b, 2015; Kotiadis et al 2014; Robinson et al 2014) but nevertheless ahead of other hard OR approaches (such as linear programming, combinatorial optimisation, etc.) that appear to have not yet explored the opportunities that facilitation has to offer.

Facilitation in discrete event simulation (DES) offers an alternative mode of engagement compared to the traditional expert mode of undertaking DES where the focus is on an individual client rather than on a group of stakeholders. The expert mode encourages the operational researcher(s) to use the simulation model to undertake an objective analysis of the client's problem and then recommend optimal or quasi-optimal solutions (Franco and Montibeller 2010). In facilitated DES the aim is for the operational researcher(s) to use the model in a workshop(s) with several stakeholders to enable a subjective analysis,

where the solutions are viewed as feasible and desirable, whilst taking into account environmental constraints.

Facilitated DES authors are in unison over the need for more real examples and/or methodological developments (Tako et al 2010; Tako and Kotiadis 2012a,b, 2014; Kotiadis et al 2014; Robinson et al 2012; 2014, Adamides and Karacapilides, 2006; den Hengst et al, 2007; van der Zee 2007;2011; Barjis 2011). We use a real case study in health care to describe the implementation workshop process and put forward tools to support the workshop. Our implementation workshop is about how the modellers engage with a group of stakeholders to narrow the solution space so feasible and desirable action can be taken. We have used extracts from transcripts to demonstrate the mood and interaction in such a workshop. Hence our contribution is twofold. Firstly, we contribute towards creating a larger pool of real examples of facilitated DES. Secondly, we contribute towards developing a methodology of facilitated DES by focusing on the process followed and tools used for the implementation stage. Indeed this paper complements our previous work where we have concentrated on premodel coding stages (Kotiadis et al, 2014) or on the overall PartiSim framework for facilitation (Tako and Kotiadis 2015). To give the reader a an overview of the PartiSim framework, it is formed of six key stages: Initiate simulation study, Define system, Specify conceptual model, Model Coding, Experiment with model and Implement Findings (Tako and Kotiadis, 2015; Kotiadis and Tako 2010).

The paper is structured into five further sections. The following section explores some of the existing literature relevant to post model coding facilitation in DES. Next we describe the case study followed by a description of the process followed in the implementation workshop in section four. A discussion follows on the contribution of facilitation to the stage of implementation in DES and the need for dedicated post model coding tools such as the ones we put forward. Section six concludes the paper.

2 POST MODEL CODING FACILITATION IN DES

In this section we will focus initially on the studies contributing to facilitation in the post-model coding stages and then we will explore the use of tools in these stages. Den Hengst et al (2007) reports on a collaborative simulation study for a Dutch airline carrier, that combines group support with simulation modelling. Post model coding workshops involved the management team and the equivalent implementation stage considered alternatives and choosing a direction for the future. Holm et al (2013) describe a study which involves developing a DES model of a surgical hospital unit within the SSM's seven stage process where postmodel coding facilitation focused on the desirability and feasibility of changes. Despite embedding workshops with stakeholders, the study does not consider in depth the aspect of facilitation, as it focuses primarily on developing a multi-paradigm multimethodoly for combining soft and hard methods. Robinson et al. (2014) provides empirical evidence of carrying out facilitated modelling with a group of healthcare professionals at an outpatients eye clinic, as part of a lean improvement workshop, called SimLean. The post model coding workshop involved presenting a simple model developed beforehand to discuss lean improvements. The authors put forward the steps followed during the process, however they focus mainly on developing simple models that can be used to help understanding.

We next focus our review on the use of tools in facilitation, particularly to support post-model coding facilitation in DES. Robinson et al (2014), also echoed by Barjis (2011), identify the need for premodel coding tools to assist the process of facilitation. Similarly, den Hengst et al (2007) suggest the need for developing aids and tools that can support the facilitation process and stakeholder engagement in the workshops. Kotiadis et al (2014) have put forward tools that aid the pre-model stages, that is conceptual modelling. These tools are not suitable for post-model coding stages because the outputs differ between the pre- and post- model coding stages. PartiSim tools have been designed to fit the outputs of the intended stage. Hence we will distinguish PartiSim tools from general facilitation tools used to record and enable general debate that could be used in theory at any stage. For example, Group Support Systems (GSS) used by den Hengst et al (2007) offer anonymity, parallel input and group memory. GSS are said

to support five different patterns of collaboration: divergence (e.g. brainstorming), convergence (clarify and reduce), evaluation, organization, and building consensus (Briggs et al, 2006). For more information on GSS we refer readers to look at the following (Nunamaker et al, 1991; 1997; Tyran et al, 1992; Fjermestad and Hiltz, 1998–1999; Davison and Briggs, 2000; Briggs et al, 2003; Adamides and Karacapilides 2006).

Unlike the pre-model coding stages (Kotiadis et al, 2014), the postmodel coding stages in PartiSim have not been explained in detail so it is not clear how they compare to the stages that other facilitated studies have put forward. Furthermore, no tools have been put forward that can specifically support the postmodel coding stage. Barjis (2011) makes the point that facilitated DES would benefit from the development of tools to support the whole process.

3 CASE STUDY

The case study context is the treatment of patients with morbid obesity for an obesity service that provides lifestyle, pharmacotherapy and surgery treatment options for the UK's National Health Service. For confidentiality reasons we will not refer to the centre by its name. At the time of this research (early 2010) the centre was just about meeting the demand. However, in the long term, they recognised that they would be running the risk of building long waiting lists, with patients experiencing long waits and risk breaching government directives, such as the 18-week target (patient maximum wait time from referral to first treatment) set by the Department of Health in the UK (Department of Health, 2004).

A stakeholder group of around 12 had accepted the invitation to participate in the implementation workshop. The same group stakeholders had participated in previous workshops focussed on other stages of the modelling process. This workshop was organised in a 2 hour slot. The stakeholder group consisted of a wide representation of different parts of the obesity care system, including healthcare professionals (surgeons, doctors and nurses) of different seniority from a range of specialties such as general surgery, chemical biochemistry, anaesthetics and endocrinology as well as members of the senior management team. The modelling team at the workshop included three analysts, who took on either the role of the facilitator or recorder (note keeper) during the workshop.

It should be noted that in our interactions with the stakeholders as part of the pre-model coding stages of the study (Kotiadis et al, 2014), it was agreed that the aim of the study was to identify the impact that an increase in resources (surgeons and physicians) and/or a reduction of patient referrals (lower referral rates) into the service, would have on the 18-week target. The agreed simulation study objectives were:

Objective 1: To explore reducing the waiting list for the surgical clinics, pharmacotherapy clinic and patient education by incrementally increasing the number of surgeons and physicians to a maximum of three and two respectively as well as reducing first time referrals.

Objective 2: To explore reducing the percentage of patients that breach the 18-week target by incrementally increasing the number of surgeons and physicians to a maximum of three and two respectively.

Objective 3: To explore reducing the percentage of patients that breach the 18-week target by managing demand through a reduction in patient referral rates into the service.

The readers should note that in this paper we do not provide a lot of detail of the solution space as our aim is to describe the workshop experience and explain the tools used to support facilitation. Instead we provide some snippets of the workshop transcripts to provide readers with a sense of the interactions. However further information on the actual scenarios and the associated findings can be found in Tako et al (2014). The intervention took place over a period of about 6 months with the implementation workshop scheduled in the final month. We next describe the postmodel coding process followed.

4 IMPLEMENTATION WORKSHOP

The workshop was structured around three key aspects: 1) review of learning and changes implemented (during the study), 2) risks analysis and feasibility of change, 3) Agree action trail.

4.1 Review of learning and changes

The workshop started with a reminder about the aims of the study, refreshing stakeholders' memory on what had been already accomplished. Robinson (2014) suggests that one of the main benefits of DES studies comes from the learning generated during the modeling process; yet the modelers/facilitator may need to intervene in creating awareness of the learning achieved. If the clients understand their problem situation and are given support in developing actions to address this, then they are more likely to implement the proposed solutions.

The facilitator referred briefly to the problem statement, the objectives, ran the simulation model to remind the stakeholders of it and provided them with a table with the feasible and desirable scenarios, including the experimental factors (inputs) and the final model results. The briefing was only aimed as a warm-up to the workshop. A report had been compiled following an earlier workshop on experimentation, which had already been circulated to the stakeholders and most of them had already read it. Nevertheless, comments and extensive discussion took place during the workshop because the report described only the scenarios and model results but did not explain the behaviour of the performance measures. The stakeholders delved deep into the reasons for which these results were achieved. For example:

Stakeholder A: So how can this happen? I'm trying to understand. {referring to a result}
Stakeholder B: How does that work? I don't understand how that works {referring to a result}.
Project Champion[1]: It works by the number of referrals, when you cut your referrals down. So if you outsource [number purposely deleted] but you keep your referrals coming in at the same rate, you don't change that.
Facilitator: I completely understand what you're saying. It's because of how you introduce the resources in the second scenario. If you introduce the physician earlier by the amount that we've introduced it, what the physician does is they push loads of patients forward.
Stakeholder A: Oh I see.

Churchman and Schainblatt (1965, p73) in their seminal paper emphasise the need for such an understanding to be reached 'For the proper communication to take place, the manager must understand what the scientist is trying to do and why he does what he does. Here the problem of implementation is the education of the manager. After a successful implementation, the manager himself becomes "more of a scientist".' Some of the stakeholder discussions about the results included assertions about their expectations and beliefs about the system. By getting the stakeholders to articulate these, the modelling team gauged the impact of the study and the learning gained by the participants. Some examples include:

[The numbers are] Slightly worse than we expected. [workshop participant]
I was very surprised that we actually, if we outsourced … [number purposely deleted] patients, it actually makes it worse. I think that was a real solution. I thought actually taking … [number purposely deleted] people out of the system would actually make the system better. Because it's … my starting point has always been if we can clear the backlog and we can get the system in balance, that's the solution. [project champion]

Next the stakeholders were prompted by the facilitator to report on any changes that might have already occurred in the system since the study started. From our communications with the stakeholders during the three month gap between the previous workshop and this one, we were made aware that additional surgical slots, equivalent to the addition of one surgeon, had been already introduced into the system. The model results demonstrated that this isolated implementation was found to be a poor decision because it led to bottlenecks when not combined with increases in other types of resources. The

[1] The project champion is a stakeholder that champions the process and has more involvement in the project compared to other stakeholders.

participants explained that it was a decision taken prior to the study and that the study would in fact influence the next decision they made. However prior to the study we were told that there were no imminent changes to the resources. Learning normally occurs gradually and the subjects themselves may not be aware of it happening as it changes the system of beliefs and attitudes, used to make judgements (Ajzen, 1991). In hindsight, a more indirect way of identifying change of attitude would have been more appropriate, such as administering before and after questionnaires, recording stakeholders' plans or any additions in their knowledge/ learning as the study went on (Monks et al 2014). When discussing the impact of the change already made to the system and in light of the scenarios previously shown, stakeholders commented that this was a pretty much quick fix of the waiting list for surgery:

... we can now pretty much meet our steady state capacity, ... so that is enabling us to, based on monthly referrals, keep the backlog as it is rather than grow larger. But we still have obviously this big balloon after ... [clinic name deleted for confidentiality purposes] at the moment (meaning a large waiting list further up in the system). [workshop participant]

Stakeholders recognised that there was a large waiting list further up in the pathway with patients waiting to be referred for surgery. The discussion that followed indicated that stakeholders understood that a more sustainable change needed to be implemented. This was clearly a learning point from the stakeholders' point of view during the review session, which provided evidence of the impact of such a decision (adding more surgeons) on the rest of the system.

4.2 Risks and feasibility of change

This part of the workshop focused on the most desirable scenario, and aimed to explore the factors that may hinder implementing the changes required. For example earlier in the workshop physical space was identified as an issue for implementation of any scenario:

Stakeholder A: I don't think this is working. I think this system internally, for us, having a third surgeon here, the third surgeon, the issue is not really physically, in terms of surgery, it's a case of space.
Stakeholder B: Beds and space.
Project Champion: We've assumed the space will just magically appear.
<Laughter>

The aim here is to narrow the solution to ideally one scenario that could be implemented. Out of the scenarios explored the third scenario was the best performing scenario for most performance measures. This was also the most preferred scenario by all stakeholders. The facilitator asked the stakeholders to consider how this scenario could be put in place and the inhibiting factors were discussed. It is recognised that factors such as psychological perceptions may hinder the stakeholders from taking action (Ajzen 1991). Ajzen (1991) maintains that communication that attacks believed constraints can produce changes in attitude towards a behaviour. Hence debate and discussion is considered important to challenge attitudes and perceptions towards change. To add to this line of argument for debate leading to implementation, Schultz et al. (1987) explain that debate and the unveiling of the diversity of opinions is likely to change future management strategy because discussions help to change management's own values, personal beliefs, and attitudes. Debate and discussion is important to challenge attitudes and perceptions towards a change, and communication and involvement can provide further support for change.

The facilitators used the "Feasibility and risks scale" Tool (Figure 1) to identify the reasons for which this scenario was feasible and the reasons for which it was not feasible. The outcome was to weigh up its feasibility. The tool was designed prior to the workshop by the authors and the facilitator followed the process to construct it with the stakeholders. All stakeholders were encouraged to contribute to the discussion. The facilitator put forward two columns, one for reasons supporting the feasibility of the

scenario and the other for reasons against it and recorded on a flipchart. The points made were listed and the scale was constructed by drawing a slopping line, dipping in this case on the not feasible side of the scale. This particular scenario was deemed to be not feasible in the short term because of the timescale of adding new resources in the real system. In the real life system, a delay of a few months in introducing the additional resources would not guarantee its results. As the admissions and waiting lists in the real system would be increasing it would take longer to reach equilibrium in the system, where key targets are not breached. As a result of this analysis, it was accepted that this scenario was not feasible mainly due to timing issues. A number of staggered scenarios that would ultimately lead to the same resources in the longer term were subsequently discussed using the same tool and process.

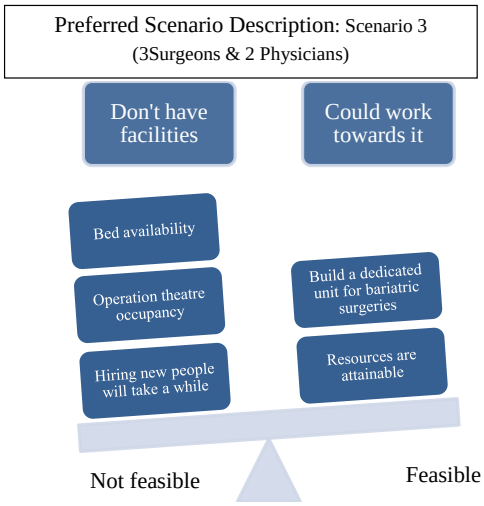

Figure 1: *Feasibility and risk scale*

4.3 Agree Action Trail

The participants next concentrated on other indirect resourcing issues such as: improving referrals so they are appropriate; introducing dedicated space with additional surgical theatres; outsourcing some part of their work elsewhere (to a different hospital) and the financial impact of such a decision. The stakeholders were handed the following form to record their thinking and actions for change (Figure 2). The forms were theirs to keep and take forward in a move to hand over implementation and action back to the stakeholders.

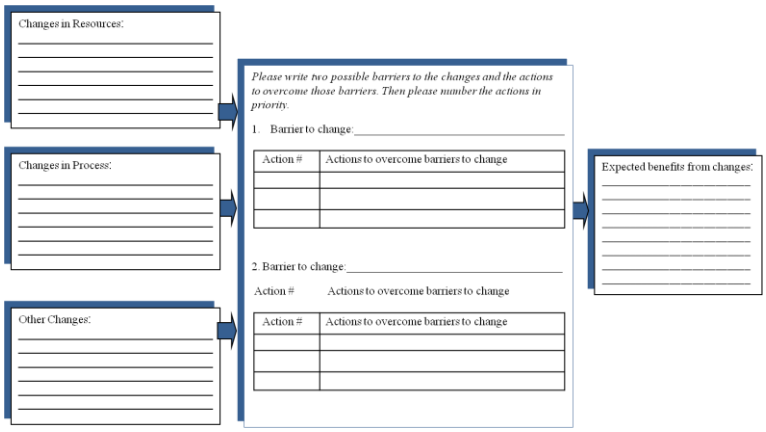

Figure 2 *Recording tool of actions for change*

The workshop came to an end with the facilitator asking the participants to comment on the modelling approach and process as well as fill in a brief survey. An extract from the conversation follows:

Project Champion: We've had good involvement.
Facilitator: It doesn't have to be good! [the extract follows from a series of positive comments so the facilitator is suggesting here that other less positive views can be expressed]
<Laughter>
Stakeholder A: I agree with … [name removed] in that I think we knew there was a problem, we knew where the problems were. What you've done is you've actually put it in black and white and we can actually see that it is clear, it's there, and that we need to do something about it. But I think what it's shown is every time we correct something, actually the problems work in.
Stakeholder B: It's the quantification and the clarification of the problem, quantified and clear. This I would say will increase, you can put numbers, it's quite an important thing to plan the resources… this process is proper process, this is the standard, proper process. You have a pathway and then you have a model and you validate the model in the workshop and see where the model ends up, so this process is a good process. There's a good process there….

As an immediate outcome of this study the Trust decided to add more surgeons to the service instead of adding physicians alone. Following the workshops, the Centre involved and the Primary Care Trust, engaged into discussions about changing the local eligibility criteria for this type of surgery, which eventually led to a reduction in the number of referrals to the centre. A decision to build a new operating theatre was also made as the management team realised that additional capacity was needed in order to achieve aspired service levels and operation volumes.

5 DISCUSSION

Implementation of findings in PartiSim is quite different to expert mode DES where the aim is to go as far as documenting, presenting and using the results (Law 2007). Using the results in expert mode is explained as 'Results are used in decision-making process if they are both valid and credible'(Law 2007, p70). Elsewhere it is explained as implementing the findings; implementing the model and implementation as learning (Robinson 2014). In PartiSim, this stage is undertaken in a workshop setting, where a learning process is undertaken. The process aims to move the stakeholders away from the model and its findings towards gaining an understanding of the present and future implications of each scenario, so that both feasible and desirable solutions can be identified, in order to enable action to be taken.

We will now explore what facilitation aims to bring to the stage of implementation. To do this we use Franco and Montibeller's (2010) four underlying assumptions of facilitated OR. The first assumption is that problems are socially constructed entities rather than real entities. The workshop venue is able to support the different opinions of the participating group through discussion or brainstorming. The second assumption is that subjectivity is unavoidable and that the facilitator should try to externalise these and represent them in a model. The workshops focus is on the opinions of the stakeholders about the problem and system rather than on our ('modellers') view or opinions of the real system. The third assumption is that clients want satisficing solutions rather than optimal solutions. Indeed during PartiSim's implementation workshop the stakeholders explore the feasibility of the preferred scenario rather than simply focusing on the improved performance measures. The final assumption is that participation increases the commitment for implementation rather than believing that implementation of scientifically-based analysis is straightforward. A dedicated workshop is aimed at discussing implementation which intends to get the stakeholders to move away from the simulation model towards identifying an action trail for change. Separating out the workshop, among other things, is meant to demonstrate to the stakeholders the importance of implementation and generating outcomes.

Other facilitated DES approaches use Group Support Systems (GSS) (den Hengst et al, 2007) that could be used at any stage of the modelling process. PartiSim post-modelling tools like GSS are aimed at supporting patterns of collaboration such as divergence (e.g. brainstorming), convergence (clarify and reduce), evaluation, organization, and building consensus that will ultimately lead to each workshop output. However these do not always offer anonymity or parallel input because that would require equipment and/or software for each participating member, which may not be available. The idea in PartiSim is that tools should be accessible. They are designed so that facilitators and participants are not reliant on expensive equipment, to ensure that the facilitative approach is widely adopted.

6 CONCLUSION

PartiSim (Kotiadis and Tako 2010; Tako and Kotiadis, 2015) is formed of six key stages. The key stages include: Initiate simulation study; Define system; Specify conceptual model; Model Coding; Experiment with model and Implement Findings. The least explored aspect of PartiSim are the post-model coding stages, which include experimentation, i.e. searching the solution space, and implementation, i.e. establishing action to be taken. This paper focused on the latter of these two stages. Extracts from the workshop were provided to illustrate how a workshop was structured around three key aspects: 1) review of learning and changes already implemented (during the study), 2) risks analysis and feasibility of change, 3) Agree action trail. The extracts have captured the mood of the workshop and the engagement of the stakeholders. Additionally we proposed two simple paper based workshop tools dedicated to this stage of implementation. The aim of this paper is ultimately to encourage debate and more research to improve the implementation of DES findings through workshop participation and the development of dedicated tools for this stage.

ACKNOWLEDGMENTS

This study was supported by the UK Engineering and Physical Sciences Research Council (EPSRC) grant EP/E045871/1. Kathy Kotiadis additionally acknowledges the support and sponsorship of the Daphne Jackson Trust Fellowship and the University of Kent in the dissemination of this study.

REFERENCES

Adamides ED and Karacapilidis N (2006). A knowledge centred framework for collaborative business process modelling. Business Process Management Journal 12 (5), 557–575.

Ajzen I (1991). "The theory of planned behaviour." Organisational Behaviour and Human Decision Processes 50: 179-211.

Barjis J (2011). CPI Modeling: Collaborative, Participative, Interactive Modeling. In: Jain, S., Creasey, R.R., Himmelspach, J., White, K.P., Fu, M. (Eds.), Proceedings of the 2011 Winter Simulation Conference. IEEE, Piscataway, NJ, pp. 3099–3108.

Briggs RO, Kolfschoten GL, de Vreede GJ and Dean DL (2006). Defining key concepts for collaboration engineering. In: Garcia I and Trejo R (eds). Proceedings of the 12th Americas Conference on Information Systems, Acapulco, Mexico, pp 121–128.

Briggs RO, de Vreede GJ and Nunamaker Jr JF (2003). Collaboration engineering with thinklets to pursue sustained success with group support systems. Journal of Management Information Systems (19): 31–64.

Churchman CW and Schainblatt AH (1965). The researcher and the manager: a dialectic of implementation. Management Science 11 (4), B69–B87.

Davison RM and Briggs RO (2000). GSS for presentation support. Communications of ACM 43: 91–97.

den Hengst M, de Vreede, G J and Maghnouji R (2007). Using soft OR principles for collaborative simulation: a case study in the Dutch airline industry. Journal of the Operational Research Society 58 (5), 669–682.

Department Of Health (2004). The NHS Improvement Plan: Putting People at the Heart of Public Services. Publication. SERIES: Cm 6268 ISBN 0-10-162682-7. TSO. London. UK.

Franco L and G Montibeller (2010). "Facilitated modelling in operational research." European Journal of Operational Research 205: 489-500.

Fjermestad J and Hiltz SR (1998–1999). An assessment of group support systems experimental research: Methodology and results. Journal of Management Information Systems 15: 7–149.

Holm L B, Dahl F A and Barra M (2013). Towards a multimethodology in health care–synergies between Soft Systems Methodology and Discrete Event Simulation, Health Systems (2):11–23.

Huxham C (1991). Facilitating collaboration: issues in multiorganisational group decision support in voluntary, informal collaborative settings. Journal of the Operational Research Society 42:1037-1045.

Law A M (2007). Simulation Modeling and Analysis, 4th ed. McGraw-Hill, New York.

Monks, T, Robinson, S and Kotiadis, K (2014) Learning from discrete-event simulation: exploring the high involvement hypothesis. European Journal of Operational Research, 235, (1), 195-205.

Nunamaker JF, Dennis A, Valacich J, Vogel D and George JF (1991). Electronic meeting systems to support group work. Commun ACM 34: 40–61.

Nunamaker JF, Briggs RO, Mittleman DD, Vogel DR and Balthazard PA (1997). Lessons from a dozen years of group support systems research: A discussion of lab and field findings. Journal of Management Information Systems 13: 163–207.

Phillips L D and M C Phillips (1993). "Faciliated Work Groups: Theory and Practice." *Journal of the Operational Research Society* 44(6): 533-549.

Kotiadis, K, Tako A.A. and Vasilakis C (2014). A Participative and Facilitative Conceptual Modelling Framework for Discrete Event Simulation Studies in Healthcare, Journal of the Operational Research Society, 65(2): 197-213.

Kotiadis K and Tako AA (2010). PartiSim User Guide to Facilitation. Technical Report, ResearchGate, DOI: 10.13140/RG.2.1.3659.1201

Robinson S (2014). Simulation:The Practice of Model Development and Use, (2nd Edition), Wiley & Sons.

Robinson S, Worthington C, Burgess N and Radnor Z J (2014). Facilitated modelling with discrete-event simulation: Reality or myth? *European Journal of Operational Research*, 234 (1): 231–240.

Robinson S, Radnor Z J, Burgess N and Worthington, C (2012). SimLean: utilising simulation in the implementation of lean in healthcare. European Journal of Operational Research 219, 188–197.

Schultz R L, Slevin DP and Pinto JK (1987). Strategy and Tactics in a Process Model of Project Implementation, 17(3): 34-46.

Taket A R (2002). "Facilitation: some contributions to theorising the practice of operational research." *Journal of the Operational Research Society* 53(2): 126-136.

Taket A R and White L A (2000). Partnerships and Participation: Decision making in the Multiagency Setting. Wiley: Chichester.

Tako A A and Kotiadis K (2015). PartiSim: A Framework for participative simulation modelling. *European Journal of Operational Research*, 244 (2): 555–564. DOI: 10.1016/j.ejor.2015.01.046.

Tako AA, Kotiadis K, Vasilakis C, Miras A and le Roux CW (2014). Improving patient waiting times: a simulation study of an obesity care service study. BMJ Quality and Safety. 23, pp. 373-381.

Tako AA and Kotiadis K (2012a). 'Facilitated conceptual modelling: Practical issues and reflections', Proceedings of the 2012 Winter Simulation Conference. C. Laroque, J. Himmelspach, R. Pasupathy, O. Rose, and A.M. Uhrmacher, eds, Berlin, IEEE, Germany. http://dl.acm.org/citation.cfm?id=2430284

Tako AA and Kotiadis K (2012b). 'Proposing a Participative Modelling Framework for Discrete Event

Simulation Studies,' HICSS, 2012 45th Hawaii International Conference on System Sciences, Maui, Hawaii, USA. pp.207-215 ISBN: 978-0-7695-4525-7. DOI: 10.1109/HICSS.2012.489

Tako AA, Kotiadis K, Vasilakis C, (2010). 'A Participative modelling framework for developing conceptual models in healthcare simulation studies'**,** Proceedings of the 2010 Winter Simulation Conference, B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan, and E. Yücesan, eds. IEEE, Baltimore: Maryland USA. pp.500-512, ISBN: 978-1-4244-9864-2 DOI 10.1109/WSC.2010.5679135.

Tyran CK, Dennis AR, Vogel DR and Nunamaker Jr JF (1992). The application of electronic meeting technology to support strategic management. Management Information Systems Quarterly 16: 313–334.

van Der Zee D J (2007). Developing participative simulation models: Framing decomposition principles for joint understanding. *Journal of Simulation*. 1, 187-202.

van Der Zee DJ (2011). Developing participative simulation models: Framing decomposition principles for joint understanding. In Conceptual modelling for discrete event simulation, S. Robinson, R. Brooks, K. Kotiadis, and DJ. Van Der Zee, Eds. CRC Press. Boca Raton, FL. 103-132.

Vennix J (1996). Group Model Building: Facilitating Team Learning Using System Dynamics. Wiley: London.

White L A and Taket A R (1994). The death of the expert. Journal of the Operational Research Society. 45: 733-748

AUTHOR BIOGRAPHIES

KATHY KOTIADIS is a Daphne Jackson fellow at the University of Kent. She is a former assistant professor at the University of Warwick and has a PhD from the University of Kent. Her research interests include the process of modelling, conceptual modelling, discrete-event simulation, Soft Systems Methodology (SSM), facilitated approaches in healthcare and developing Self Adaptive Discrete-Event Simulation. Her publications can be found on https://www.researchgate.net/profile/Kathy_Kotiadis

ANTUELA A. TAKO is a Lecturer in Operational Research at the School of Business and Economics, Loughborough University. She holds a PhD in Simulation and an MSc in Management Science and Operational Research from the University of Warwick. Her research interests include the comparison of simulation approaches (discrete-event simulation and system dynamics), facilitated and participative simulation modelling and conceptual modelling. She is an Associate Fellow of the Operational Research Society (AFORS). Home page: www.lboro.ac.uk/departments/sbe/staff/profiles/takoantuela/tako-antuelaanthi.html.