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# A Problem Structuring Method implemented using a Group Support System

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My presentation covers some preliminary findings arising from the implementation of a problem structuring approach on a Group Support System platform to support group work for the fulltime and executive MBA programme that was switched to online delivery at short notice during the first lockdown of the pandemic in early 2020 and then subsequently for a more deliberate online delivery in the first term of the 2020/2021 academic year. Ethical Approval was sought from the University to collect data from the delivery of the core module managing strategic resources and operations and individual consent was obtained from respondents to a survey administered during the delivery of the course.



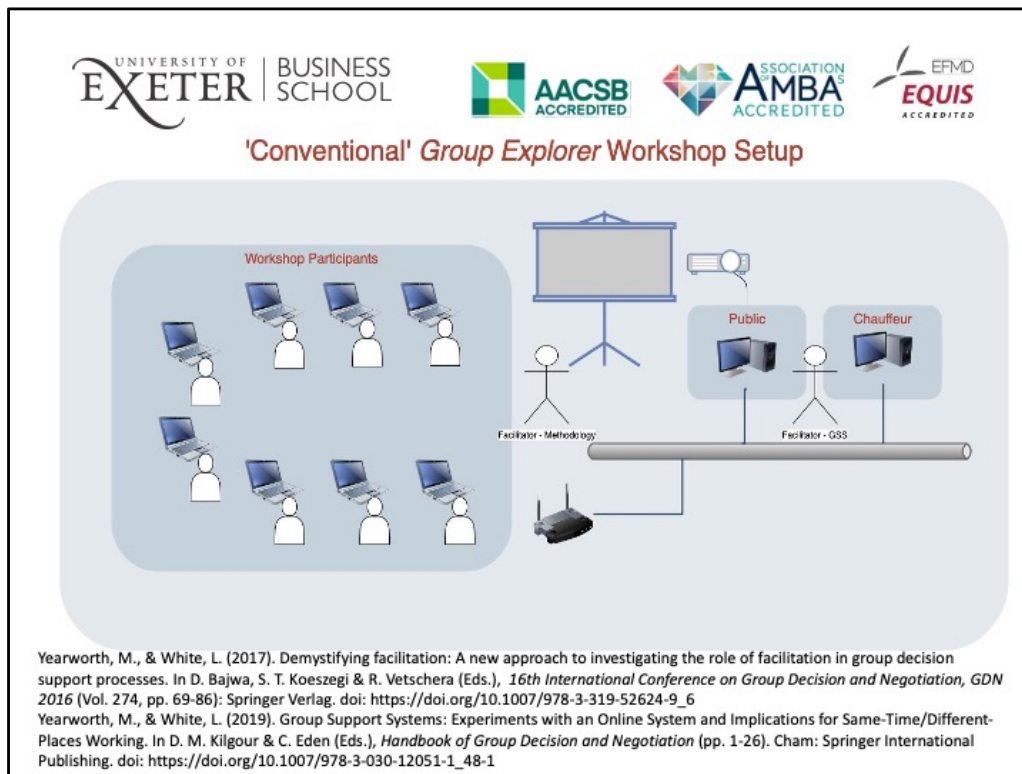
The purpose of the group support system, in conjunction with the conferencing system Microsoft Teams, was to support a formal systems modelling approach that in the past would have been achieved using fairly basic workshop tools such as whiteboards, flip charts, post-it notes and sharpie pens. For many facilitators this 'old fashioned' same time/same place workshop with participants clustered around flipcharts is still the easiest and most effective way of getting a stakeholder group or leadership team to work on a problem. It is also an approach that would normally have been used by students working in break-out groups on a transformation task set for them during the delivery of the course on the MBA programme. However, the pandemic necessitated a switch to an online method. Of course, Problem Structuring Methods have already evolved in their use of Group Support Systems to offer same time/different places workshop capability in response to many drivers not least eliminating the travel time costs of attending workshops and CO2 loading of same place workshops.

## GSS Requirements

- Support for MBA case study groupwork for groups ( $N_{\text{members}} \leq 7$ ) of geographically distributed MBA students
- Implementing a 'self-facilitated' Problem Structuring Method (PSM)
  - Self-scheduling of groups to manage workload and time zones (same time/different places)
- Supported by 'conventional' conferencing and team support system i.e., MS-Teams in this case
- Each case study required a 'pitch' from each group to lead a business transformation in a client organisation
  1. Traditional Supermarket moving to a new online delivery service
  2. Servitising & circularising a furniture business
  3. Integrating management analytics into a University migrating to online delivery of programmes via a content platform
- Presenting the system model of the transformation was a requirement to 'show working'

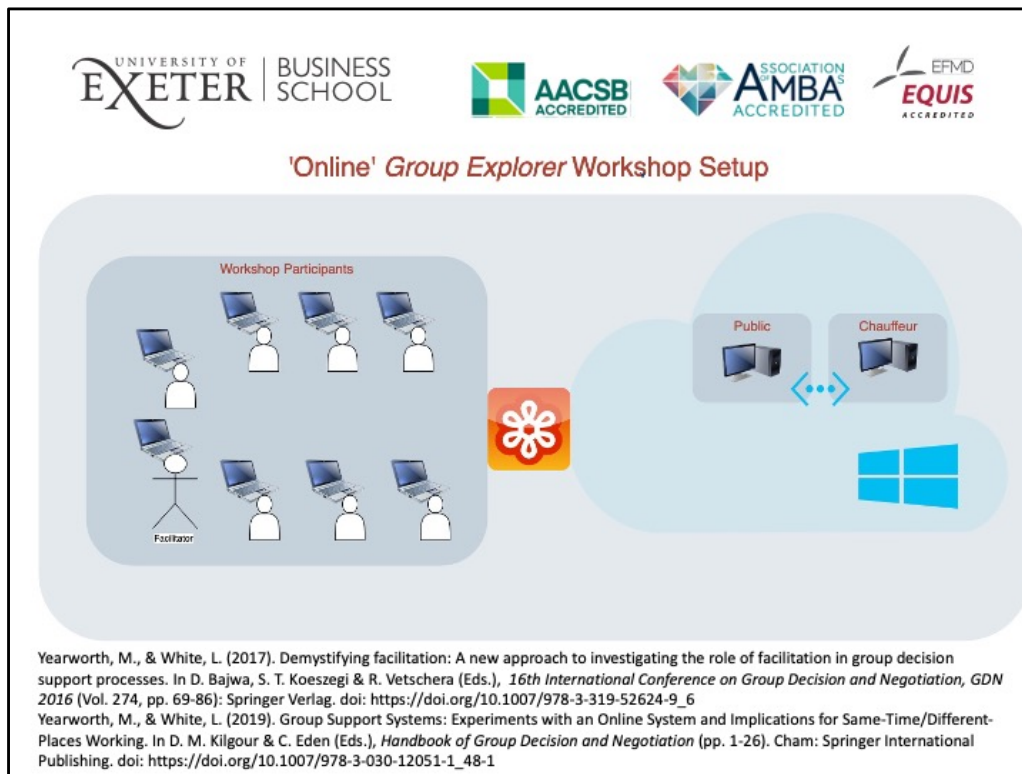
To support the case study group work that would be part of the normal delivery of the MBA Programme we required a group support system that could satisfy a number of requirements and constraints. Whilst the cohort size was not large we wanted to provide a system that would support students that were widely geographically separated covering -8 to +10 hours time difference and where each group was relatively close in time zone (and therefore roughly the same time) but no more than 7 students in the group. Due to the wide time zone difference and the need for multiple groups to self-schedule group working sessions at mutually convenient times it was decided that these sessions would have to be self-facilitated. Therefore, a training course was devised such that the students could self-facilitate their way through the systems modelling approach.

Each group was tasked with the same business transformation and throughout the term 3 different transformations were approached. Presenting the system model of the transformation was a requirement to 'show working'. Whereas in conventional on campus group work I could drop-in to groups whilst they are working in this online setting the time zone differences and self-scheduling nature of the group workshops meant that this was not easily achieved and in fact for the purposes of experimenting it was decided to see what could be achieved through self facilitation.



For those of you experienced in the use of the Group Explorer system then this schematic for a 'conventional' same time/same place workshop setup should be familiar. Participants in the room are sat in front of a tablet with the chauffeur interface presented. The model is projected onto a screen from Decision Explorer running on the public server such that it is visible to all participants. Two facilitators are shown – one focussed on facilitating the workshop participants through their task and the second facilitator focussed on managing the layout of the model, such as presenting sub-views, and controlling the sequencing of Group Explorer through its different phases, such as gathering and preferencing.

We had already developed some experience in same time different places workshops through a migration of the Explorer System to an online implementation on the Microsoft Azure cloud platform.



Here we replaced the projection screen by a conferencing system that could share the public screen from the cloud and the participants were connected to the chauffeur via the internet

In this configuration, we started to address some of the questions concerning the role of facilitation in such settings - the de-mystification of facilitation in same time/different places workshops, and we published this work in a previous Group Decision and Negotiation conference paper and through our contribution of a chapter in the Handbook of Group Decision and Negotiation. Note that amongst the many changes that this schema enforces is the appearance of the facilitator as just another participant in the system – a de-centring of the facilitator role that is actually a central feature of our ongoing research.

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strategyfinder.  
ONLINE CRAFTING OF YOUR STRATEGY

Who we are

What we do

**Our goal and our experience:**

Our goal is to support the development of your strategy.

We created a method and tool (Software) that helps guide a manager and their team through the process of crafting a realistic strategy. The software is called strategyfinder.

The software has been constructed from years of experience in supporting managers and top management teams develop their strategy. And the software development has been managed by the same team that developed the highly successful "formfinder" software (see [www.formfinder.at](http://www.formfinder.at)).

<https://strategyfinder.pro>

Professors Eden and Ackermann have also been extremely busy evolving the Group Explorer system and have embarked on a startup with business partners to develop the strategyfinder platform that encapsulates their tremendous range of experience gained through many years of research with partners and workshop participants. Their presentation at OR62 in 2020 provided an excellent overview of the long evolution of their strategy making approach leading to this new platform. This is a completely custom built evolution of the group explorer system and is properly designed around the use of customer dedicated server-based delivery to workshop participants that solves the legal problems associated with use of cloud-based solutions. More details can be obtained at the website [strategyfinder.pro](https://strategyfinder.pro). They have very kindly made a version of the platform available to us at the University of Exeter to evaluate its performance in group work sessions with students on our MBA programme.

## System Modelling using Hierarchical Process Modelling (HPM)

- A system represented by a Directed Acyclic Graph
- The whole graph and each of the vertices are conceived as transformational entities, as processes
- The edges describe *part-of* or *decomposition* relationships i.e., processes contain or are made up of sub-processes, hence HPM
- Interpretation
  - Sub-processes provide an answer to *how* a process can be realised
  - Superior processes provide an answer to the question *why* a sub-process exists
  - *Anything* can be modelled as a process

Davis, J., MacDonald, A., & White, L. (2010). Problem-structuring methods and project management: an example of stakeholder involvement using Hierarchical Process Modelling methodology. *Journal of the Operational Research Society*, 61(6), pp.893-904. doi: <https://doi.org/10.1057/jors.2010.12>

Yearworth, M. (2022). Hierarchical Process Modelling and its Contribution to Problem Structuring Methodology. In M. Yearworth (Ed.), *Systems Practice in Engineering: Problem Structuring Methods and the Emergence of Soft Engineering*. Chichester, UK: John Wiley & Sons Ltd.

Our problem structuring approach is based on the use of hierarchical process modelling. This systems modelling technique has been under development at the University of Bristol since the early 1990s as a functionalist approach to modelling engineered systems with explicit representation of uncertainty. Over time, Hierarchical Process Modelling (HPM) has gradually been incorporated into an approach to problem structuring where it fulfils a similar role to a model of purposeful activity in SSM. Its first appearance in this guise was published in 2010 in JORS. The sort of graphs that strategyfinder supports can also be interpreted as hierarchical process models and thus this technique was explained to the students in a collection of training material made available to them prior to the start of their group work.

Quite simply, HPM has a strong process ontology such that a system can be modelled by a network of vertices (or nodes) and edges (or links), where each vertex is a transformational process and edges described part-of or decomposition relationships. Therefore, Processes *contain* sub-processes and Sub-processes provide an answer to *how* a process can be realised. Superior processes thus provide an answer to the question *why* a sub-process exists. Also, in this schema almost *Anything* can be a modelled as a process.



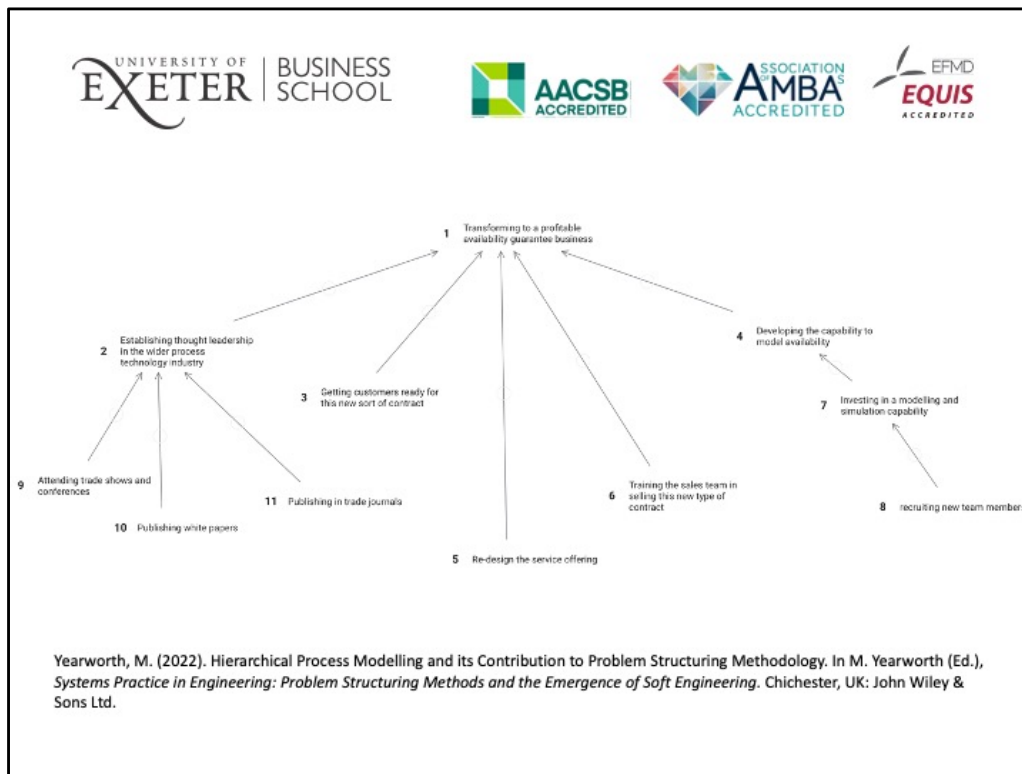
## Soft System Modelling

- 'System' is used as an intellectual device to think about the world
- Using conceptual models that consist of processes, described by verbal-nouns (gerunds)\*, structured into a hierarchical arrangement by decomposition, and representing the minimum processes in a system required to achieve the transformational *purpose*

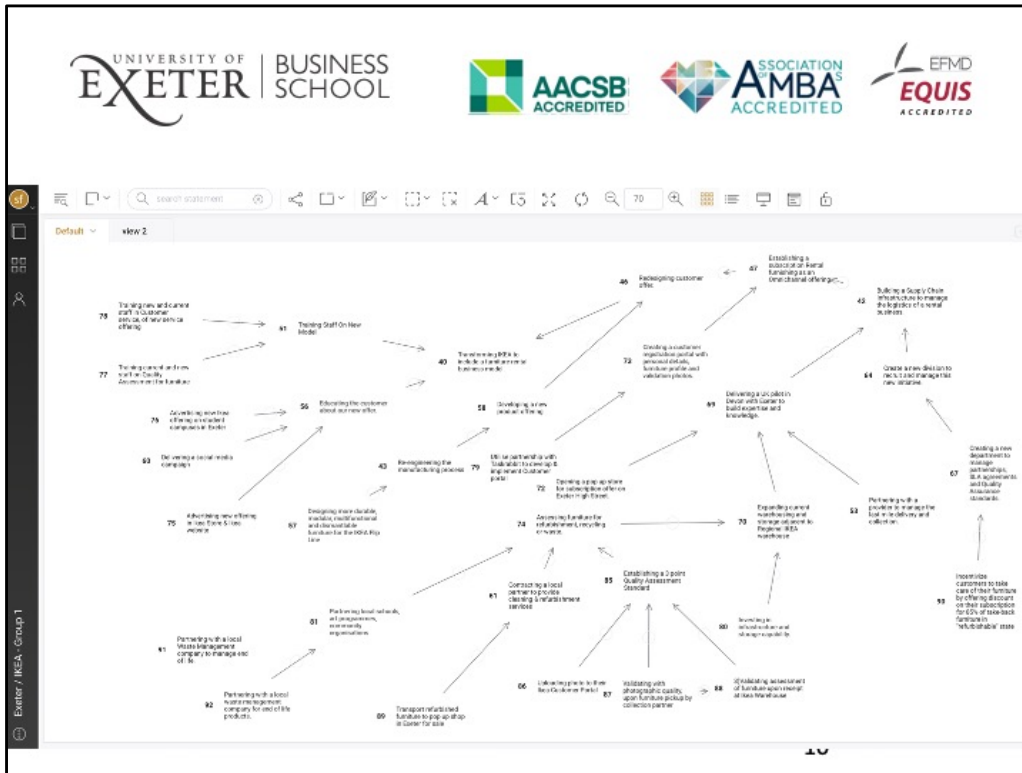
Checkland, P., & Holwell, S. (2004). "Classic" OR and "soft" OR - an asymmetric complementarity. In M. Pidd (Ed.), *Systems Modelling: Theory and Practice*. Chichester: John Wiley & Sons, Ltd.

Over the years, Hierarchical Process Modelling has evolved in its usage away from its original functionalist roots and Following Checkland and Holwell is now mainly used to develop conceptual models aligned with a soft operational research stance – that is the modelling is Oriented to learning, where Systemicity lies in the process of inquiry into the world. Systems models are therefore intellectual constructs to help debate, they are epistemologies not ontologies. Philosophically such modelling is phenomenological and Sociologically interpretivist.

The hierarchical process model is thus a conceptual model that consist of processes, described by verbal-nouns (or gerunds, in English these are words ending in *-ing*), structured into a hierarchical arrangement by decomposition, and representing the processes in a system required to achieve a transformational purpose. This can be arrived at using a similar approach to soft systems methodology – i.e. using CATWOE and a root definition.



As part of the training material for the students, I provided them with part of a model developed for a client in a consulting engagement looking at the transformation of a processed food plant supplier attempting to implement a servitising strategy by moving to an availability guarantee business, away from a conventional break-fix product support model. A transformation not too dissimilar from the one that Rolls Royce went through to get to the delivery of its TotalCare service to airlines - also known as “power by the hour”. This simple hierarchical process model shows a top level process **Transforming to a profitable availability guarantee business**. Reading backwards down the arrows we find successive answers to the how question, where each sub-process is ‘contained’ with its superior process.



This is an example model produced by one of the groups working on the IKEA case study. On the whole, each group managed to develop a system model that conformed to the rules set out in the training material. Generally, models were all acyclic graphs with processes labelled using the verbal noun, or gerund, construct and could be read according to the rules of Hierarchical process Modelling. Whilst the modelling was designed to support problem structuring it was not the final output from the group work – this was the ‘pitch’ each group made to the whole class in an attempt to ‘win’ the business to lead the transformation. The class was asked to peer rate each presentation and therefore the modelling contributed to structuring the group approach to achieving the transformation. Although not yet analysed in depth, the immediate impression from the total of 15 models and presentations developed (that is, 5 groups and 3 case studies) was that that coverage was appreciated more than depth – participants were wowed more by the breadth of concerns addressed rather than any high degree of decomposition - although no specific guidance was offered about how broad or deep to go with the modelling. Available time was the only limiting factor.

## Evaluation

- **Based on Midgley et al (2013) augmented by considerations of the online setting**
  - Context Purposes, Method, Outcomes
  - Plus Technical & Social Environment
  - Delivered via online survey – 43% completion rate (N=15)

Midgley, G., Cavana, R.Y., Brocklesby, J., Foote, J.L., Wood, D.R.R., & Ahuriri-Driscoll, A. (2013). Towards a new framework for evaluating systemic problem structuring methods. *European Journal of Operational Research*, 229(1), pp.143-154. doi: <https://doi.org/10.1016/j.ejor.2013.01.047>

A lightweight evaluation was carried out based on the Context, Purposes, Methods and Outcomes framework described by Midgley and others in their 2013 EJOR paper. A short questionnaire was devised and delivered by an online survey administered during the course. It is understood that this framework is being used somewhat out of context in that the problem structuring method intervention was a manufactured problem loosely based on background case study material and the artificial construction of a management consulting engagement. The framework was extended to address specific issues about the technical and social environment associated with different places working.

## Preliminary Findings

- **Context**
  - cultural diversity and previous experience all positive, group sizes too large
- **Purposes**
  - mostly OK
- **Method**
  - online not as 'effective', struggles with disentangling method from platform
- **Outcomes**
  - some issues about expectations/scope

Midgley, G., Cavana, R.Y., Brocklesby, J., Foote, J.L., Wood, D.R.R., & Ahuriri-Driscoll, A. (2013). Towards a new framework for evaluating systemic problem structuring methods. *European Journal of Operational Research*, 229(1), pp.143-154. doi: <https://doi.org/10.1016/j.ejor.2013.01.047>

Under context - the cultural diversity of the groups and breadth of experience of the participants was considered to be a strength. On the other hand, the group sizes were also considered to be too large. I believe this was a relative categorisation of group size compared to group work carried out in other modules on the programme, but also online. The groups were no larger than 7 members, which was set as the maximum size based on prior experience of "same time/same place" workshops held using this methodology. For purposes, the workshops had a single ostensible purpose and due to their manufactured nature there was no real diversity of worldview or representation of broad stakeholder concerns. Questions concerning method highlighted the biggest participant concerns. Students struggled to disentangle the method from the use of the platform in the sense of User Experience – which I cover outside the Midgley et al framework under technical considerations. There were also many expressions of concern that this way of working was just not as effective as working together in same time/same place groups – that is, business as usual. Whether this was no different from the broad criticism levelled at Universities by students for switching to online delivery rather than in-person teaching was difficult to judge from the data. The questionnaire was not designed to disentangle this effect. Perhaps, like everything else, a reflection of the speed with which we were working to make the transition to online. There were also some issues about scope and expectations – As mentioned already, there was no guidance offered about breadth or depth of modelling – only a limit on the amount of time available for the activity.

## Preliminary Findings

- **Technical**
  - zooming in/out, scrolling, anonymous contribution, 'limited functionality', connection issues
- **Social**
  - interruptions, scheduling and time zone

Outside the CMPO framework - questions about the technical environment surfaced difficulties with the strategyfinder zooming-in and zooming out functionality, and scrolling. This was probably due to the limitations in the training material which did not adequately cover dragging the model around the screen and the centering function. Some participants also mentioned connection issues due to poor broadband connectivity. Interestingly, anonymous participation, which is a feature of Group Explorer and strategyfinder was considered by some participants to be annoying. Finally social issues covered interruptions arising from working at home – from family members and neighbourhood, difficulties scheduling mutually convenient times, and dealing with remaining time zone issues

## Reflections

1. Teaching systems modelling that avoids ontological commitment is hard
2. Creativity trade-off between prescriptive and generative rules
3. Students demand IT that is easily accessible, delivers its functionality quickly, and conforms to idiom
4. Disconnect between training material and use of the platform

Yearworth, M., & White, L. (2014). The non-codified use of problem structuring methods and the need for a generic constitutive definition. *European Journal of Operational Research*, 237(3), pp.932-945. doi: <https://doi.org/10.1016/j.ejor.2014.02.015>

I offer these reflections by way of conclusions to the work. The first point I think reflects the problems that arise from any significant engagement with taking a soft systems stance and isn't specific to the use of a group support system. This is probably a discussion for another day. On the whole I think the students managed to build conceptual models that managed to avoid reification and I was pleased with what they achieved. The modelling I think did help their group decision making although this was not explicitly tested. The second point arises directly from the feedback obtained and relates to the next point about IT. A systems modelling approach has a rigorously defined set of rules that define it. These are different from the generative constitutive rules of the method that we have discussed elsewhere. However, it is this collision between generative rules that allow expressiveness in method and prescriptive rules that define a specific type of model that caused difficulty for some students. The third point is really about the nature of IT in a world that is already completely in the grip of a type of Group Support System – except that these are called social media platforms. Students that have grown up with these platforms, which have been highly optimised for user experience with vast development budgets, and they offer an IT experience that is easily accessible. That is users don't have to work too hard to obtain desired functionality. Use of strategies such as A/B testing on live platforms further optimises every aspect of the user experience. By idiom here, I mean that the user experience of these mass platforms has set the generally expected way that user-facing IT works. In the Business school I have colleagues that use Mural extensively and to certain extent that has defined a local idiom for group support systems against which strategyfinder is being compared. Our fourth observation concerns the fact that we have opted for a self-facilitation approach. Part of this was pragmatic for the reasons I explained earlier. However, our research has been exploring the question of self-scaffolding of method in a group support system. What we mean by this is the degree to which the method is built-in to the way in which the Group support system works. A highly self-scaffolded platform would require little by way of training, or explanation, or facilitator intervention. I have seen some excellent examples of self-scaffolding Mural applications that have been designed for student use. These lead the student through a process, as well as in effect implementing the process. We see this as a very positive way forward for group support systems. Finally, to conclude, In combination, the questions arising from these reflections define a profitable research agenda in this space. And of course, next term we will have to devise a way of constructing hybrid group work sessions that are a mixture of same place and different places at the same time as we deal with dynamic travel restrictions and increasingly student choice for their location of participation.

# Any Questions?

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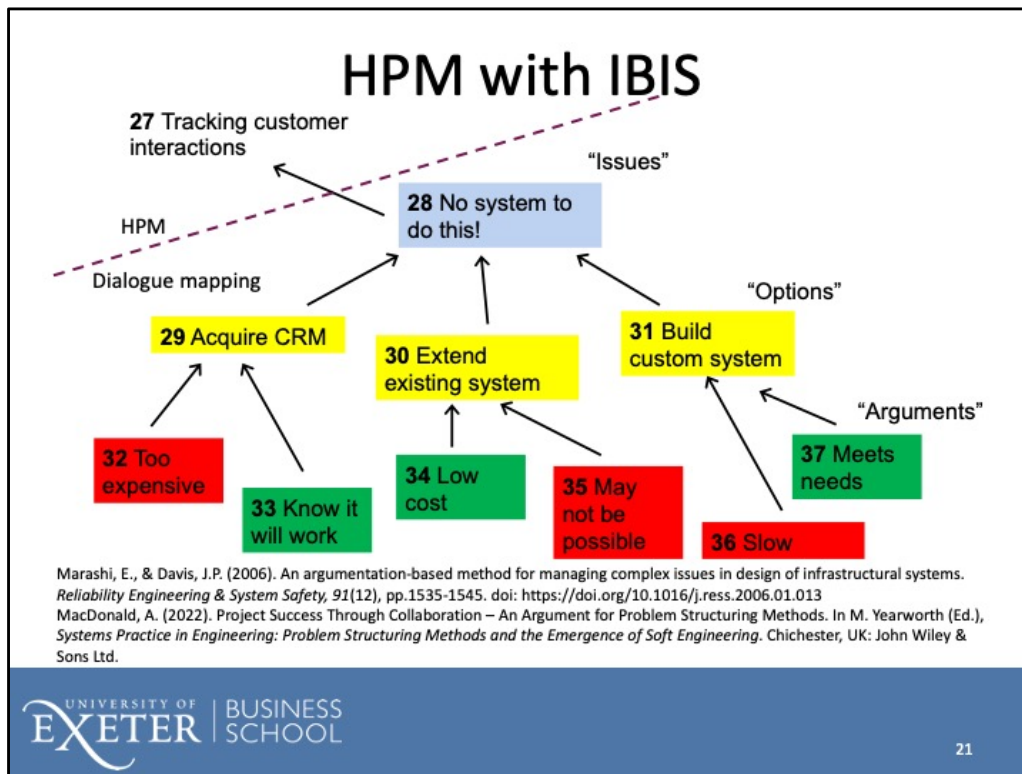
[https://business-school.exeter.ac.uk/about/people/profile/index.php?web\\_id=Mike\\_Yearworth](https://business-school.exeter.ac.uk/about/people/profile/index.php?web_id=Mike_Yearworth)

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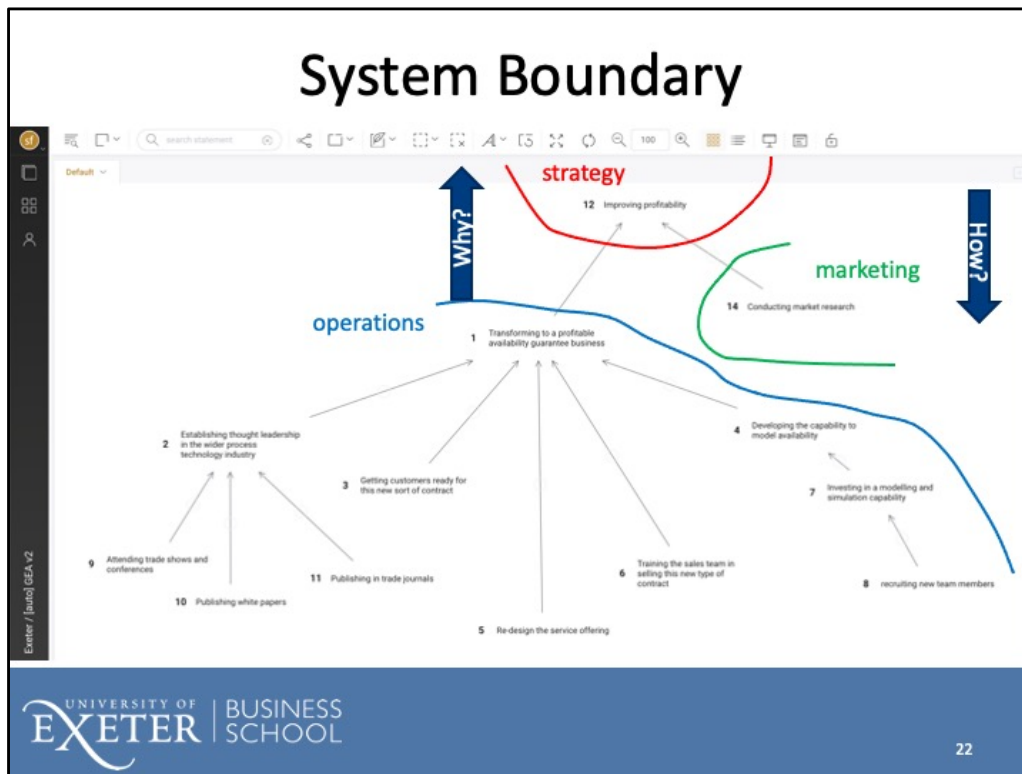
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# Spare Slides



The HPM modelling approach was extended in its evolution to becoming useful for problem structuring by the addition of issue based information systems capabilities by adding decoration to identify Issues, options and arguments. The essence of the dialogue mapping or argumentation approach is to recognise the Process to Issue boundary, in effect the edge of the Hierarchical Process model, and then shift thinking to mapping Issues to Options and Arguments. This is a trivial illustration from the training material given to the students but there have been examples published and a good case study from the rail industry is under development for the book I'm Editing that should appear next year.



The training material also provided some gentle introduction to critiquing the boundary of the system – so asking the question why are we transforming to a availability guarantee business leads to a higher level process within the business which is simply stated as improving profitability and other ways of answer the why question lead to non –operational focussed processes e.g. here in marketing

## Stimulation of creativity in enactment

- Even physical entities can be considered as processes i.e. “The bus is a process”
- The bus is enacting the process <transporting passengers>
- Avoids over specification when modelling
  - Perhaps we don’t need a bus, but we do need something for transporting passengers
- Enables the simultaneous exploration of why and how
  - Q: Why the bus? A: <Transporting passengers>
  - Q: How do I achieve <transporting passengers>? A: A bus, or...
- This is an important language game when constructing system models using this approach
- When modelling this way, stick to processes

Even physical entities can be considered as processes  
 For example we could say that the “The bus is a process”  
 Because a bus is enacting the process <transporting passengers>  
 Although this is merely a linguistic trick we have found in many  
 years of practice that using this strong process ontology avoids over  
 specification when modelling

Perhaps we don’t need a bus, but we do need something for  
 transporting passengers

Therefore, this so-called delayed reification of processes (i.e. turning  
 into things) Enables the simultaneous exploration of why and how

So the Question: Why the bus? Is Answered: for <Transporting  
 passengers>

And the Question : How do I achieve <transporting passengers>? One  
 possible answer is A bus

This is an important language game when constructing system  
 models using this approach

When using this problem structuring approach which is based on  
 hierarchical process models of purposeful systems, stick to  
 processes