

TOWARDS UNDERSTANDING THE EFFECTS OF VISUAL ARTEFACTS IN PROBLEM STRUCTURING PROCESSES: A BOUNDARY GAMES APPROACH

Jorge Velez-Castiblanco

Diana Londono-Correa

Olandy Naranjo

Departamento de Organizacion y Gerencia

Universidad EAFIT

Medellín-Colombia

velez.castiblanco@gmail.com

ABSTRACT

The construction of agreements on the nature to the problem confronted by a group can be seen as the aim of problem structuring methods. Visualizing issues to facilitate the discussions play a protagonist role in the process. However, we lack methods to study this kind of interaction, and therefore, we know little about how these visual artefacts catalyse the structuration of the problem. This paper builds towards these two interrelated issues by analysing the interactions using Boundary Games, a theoretical synthesis based on philosophy, language pragmatics, and boundary critique. The Boundary Games framework shows how actors' communications affect the boundary of what is considered relevant to a situation. Boundary Games have been applied to study oral segments of interaction; in this case, its application is extended to visual supported interactions, specifically whiteboard supported facilitation. The preliminary analysis shows that visual artefacts allow people to keep track of distant and varied ideas and that the visual is helping to connect and reinforce those ideas. This work can be seen as a stepping stone for understanding models, a more complex visual artefact of common use in structuring problems.

Keyword: Boundary games, Behavioural OR, Problem construction methods, Visual artefacts.

INTRODUCTION

The literature talks about problem structuring methods as a way to intervene in situations in which the problem needs to be constructed. The problem requires to be constructed because its nature “might not even be agreed across the interested parties, never mind-any agreement existing on potential solutions” (Shaw, Edwards, & Collier, 2006: 940). The situations that require this kind of approaches are normally characterized by multiple actors, multiple perspectives, conflicting interests, intangibles and uncertainty (Mingers & Rosenhead, 2004:530). It is expected as one of their contributions “to help groups arrive at a shared problem definition” (Ackermann, 2012:657).

The work towards structuring the problem involves human interaction and consequently, constant negotiation (White, 2009). It is iterative work. From a systems thinking perspective, it is necessary to support the work considering ‘wider boundaries’

(Ackermann, 2012), then these boundaries are, in turn among other possibilities, developed, challenged, refined, combined or enhanced.

The “exploration and accommodation of different perceptions during what is essentially a conversational process [is] supported by group model building and facilitation.” It can be said that problem structuring methods, consist of the use of models by a group of people in a facilitated interaction.

At this point, we can argue that we can talk about something call problem structuring. Basically, it shares all the described characteristics with the big omission of models. They can use, for example, simple techniques such as brainstorming and rely much more in facilitation. However, techniques such as the one mentioned, share (although in a much simpler way) an element with modelling: the visual aspect, both can be drawn on a whiteboard, one with a list of words the other has the additional complexity of the relationships. We propose that it pays to study this kind of situation because they present a stepping stone to study more complex use of visual elements in facilitated modelling (Paroutis, Franco, & Papadopoulos, 2015).

The use of a whiteboard is known in several fields as a visual artefact (Ehn, 1988; Gray, Brown, & Macanuso, 2010; Hodder, 1998; Nielsen, 2012; Yanow & Schwarz-Shea, 2006). They consist of a material substrate in which symbols can be placed. The literature tends to focus on the material substrate, here although the substrate is important because it enables writing, erasing and the persistence of the symbols, we are more interested on the symbols bestow to the medium.

The focus on symbols enables us to treat them as just an additional element to a communicative process. We can talk about oral and visual elements during the process of constructing a problem. We can understand both in terms of the communicative effects on the problem construction process, through boundary games theory (henceforth BGT).

However, BGT has not been use in relation to visual artefacts. This paper then shows how to integrate the visual artefacts to the BGT analysis and shows some initial finding about the role of them in the communicative process of structuring a problem.

The paper starts by giving an overview of BGT and argued the case of why it can deal with visual artefacts. Then it presents the case of a value proposition construction in a group of consultants working in a university. Next, some of the interactions are analysed and discussed showing how the visual artefacts play a role. The paper ends with some conclusions.

BOUNDARY GAMES THEORY

BGT explains intervention as a process driven by communications. The communications in turn affect the boundaries of what is seen relevant to produce change. What dominates the dynamics from this perspective is not the logic of the situation, or individuals’ methodological pre-dispositions nor another logic, but that instead all those logics become subordinated to the needs of a communicative process. The underpinning assumption is that all the interaction can be understood as a language game, they can be understood as

language and actions intertwined and those in turn are tools that let us do things accordingly to Wittgenstein philosophy.

The advantage of this underpinning philosophy is that in an intervention process we can have into account not only methods and methodologies from different paradigms, but we can treat as tools dissimilar games such as gestures, anecdotes or drawing. Boundary game theory proposes then that we can understand what all these tools are doing through the way in which they are affecting the boundary of what is considered relevant. Following relevance theory (Sperber & Wilson, 1995) it can be conceptualized that what lies inside of the boundary consist of ideas, assumptions and the rules used by actors to produce inferences about the communications. Those assumptions are affected with every new move in the language game and consequently, in a figurative way the boundary “containing” those assumptions. BGT (Velez-Castiblanco, Brocklesby, & Midgley, 2016) shows six ways in which language games change the boundary:



Setting: It “draws” a new boundary placing new assumptions and rules for the conversation. It can be understood as a change in the topic (sometimes subtle), that creates a space where certain answers fit the rules, assumptions stated. It assumes that the new boundary brings ideas from past boundaries, hence the illustration shows thin circles representing the previous boundaries that are joined within the bold circle.



Following: It applies the rules and assumptions in place. It can refer to something that has not been expressed but in any case, it is something that is possible to infer from the stated rules and assumptions. The boundary gets stronger because it becomes easier to understand its implications. The bold line inside the circle represents an operation using the rules and assumptions inside the boundary to obtain something that also lies inside the boundary.



Enhancing: It introduces a new assumption or rule to the conversation. With this new rule is possible to obtain previously unobtainable inferences. However, it does not change the focus of the conversation neither the kind of answers that fit the boundary in place. The representation shows how the boundary grows due to the new rules and assumptions and the new possibilities for inferences.



Wandering outside: It shows something that it is not inside of the boundary, but in the process by contrast makes the boundary clearer reinforcing the ideas inside.



Probing: Due that, ideas are abstract sometimes visualizing if something is inside or not of the rules and assumptions of the conversation is tricky. This game aims to help

clarify the boundary. In a way it produces as an answer a clarification of the issue, but if the actual issue belongs inside or outside of the boundary cannot be predicted.



Challenging: It weakens the boundary making the rules and assumptions less pertinent for the problem at hand. There are two ways to do this. One is by pointing out contradictions between elements that are contained within the boundary. The other is show that in the light of a different boundary, the ideas of the boundary in focus are no so appropriate. The representation shows a movement that crosses the boundary and weakens the boundary.

The aforementioned operations can be used to codify the communicative acts of the actors in an interaction. It is important to have in mind two things: one is that a communicative act can have multiple effects so multiple games can be labelled on it. The second is that there can be many boundaries in play. It is important then in the codification not only to identify the game in particular, but crucially how it connects with a thread of games. It is necessary to show the links and how the operations affect the different boundaries. The process is an interpretive one, in which we look for the more plausible explanation of a series of communicative actions.

This codification has been applied already to verbal communication (Velez-Castiblanco et al., 2016). What has not been shown, and that is important for the purposes of this paper is the way to take visual artefacts into account.

From the theory, there are two arguments that suggest that BGT can be applied to the use of visual elements. First using Wittgenstein philosophy, it can be argued that drawing, pointing at, are just language games involving language and actions as any verbal counterpart. From the point of view of relevance theory, communication is a process in which the sender of a message modifies the physical environment, and the receptor makes inferences. In the oral case of communication, the modifications to the environment are the sound waves. In the visual case drawing, writing or pointing at something is changing the configuration of the space or the physical items themselves, e.g. writing in a whiteboard.

What is important here for the arguments is that in the philosophical (language games) and in the theoretical (relevance theory) underpinnings of BGT, there is conceptual space for talking about visual artefacts. Let us see now the case used as empirical support for the arguments of this paper.

THE EMPIRICAL CASE

The participants of this study are strategy experts. They have different careers in industry and academy leading to a variety of backgrounds. They all have offered strategy courses for a number of years at a Colombian University. They knew each other as members of a group that have met once a month for several years. The purpose of these meetings was to study strategy and keep a common language for teaching courses on the subject.

However, the purpose of the meetings was changed due to the pressure by the university to offer consultancy services in strategy. Consequently, nine short workshops (two-hour each) spread across a year, were carried out with the purpose of developing a value proposition as a consulting group. Additionally, the work was an opportunity to allow the participants to take turns in facilitating the workshops and improve their skills for leading them. The works on the workshops finally lead to a conceptual model, similar to the ones produced in Soft Systems Methodology. The work was carried out in the spirit of an action research project. The first and second author of this paper participated in the workshops and facilitated some. They also played a leading role in most of workshops' planning processes.

This paper focuses on the third workshop of the series. So let us mention the first and the second workshops as part of the context and as contrast elements, as it is shown in section 4.3. In the first workshop, a broad map of issues was developed. The topics of legitimacy, reporting, fields of expertise and coherence and responsibility were identified as important for the kind of consultancy that the group wanted to perform and pertinent for future sessions. The second workshop was an activity thought to improve the way in which we formulate and manage questions in facilitation. The group felt that the workshop was a detour, and the participants lost track for the purpose of the proposed series of workshops.

The third was a way to return along the path decided on the first workshop. It was heavily discussed and planned beforehand. This session also developed ideas on the notions of responsible and coherent consultancy. However, our analysis focus on the part mentioned about recovering the track of the first session.

The sessions were conducted in a room with square form, with a screen and a whiteboard on the front. The dotation consisted of movable tables and chairs, placed in a U shaped form. A video beam and a computer were available.

The data was collected in the way of audio recordings and for the second with adding the video component. All participants were informed of the recording. Conversations were transcribed in plain language (Spanish) following some conventions that we developed in order to include the interaction with the whiteboard, operations such as writing, deleting, and saying while writing (see Table 1). Then the conversation was coded using boundary games. Then we developed a technique to transform the codification in a graph showing the structure of the workshop. This is shown in section 4.2.

ANALYSIS OF THE INTERACTION – DISCUSSION

In the above section the philosophical and theoretical we put forward the hypotheses that the visual communicates things and affects the interaction. Now this section shows evidence that the visual aids have communicative effects. Two themes emerged in our analysis. The first is that visual aids help to correct possible mistakes and reinforce the meaning of the ideas shared. The second is that what is written, remain visible, easy to track down and available to the participants, enabling connections between non adjacent, far apart mentioned ideas during the session. These are developed in what follows with an

intermediate section developing methodological approaches needed to support the second theme.

Correcting and reinforcing

In the first part of the third workshop the facilitator, manage participants' turn taking, looking for the expectative of the group in relation to the topic of the workshop and the overall series of workshops. While the facilitator was listening to participant's opinions, she writes the synthesis of those on the whiteboard.

Convention	Description
[text]	The person writes on the whiteboard the "text"
[text]	The person erases the "text"
Speech <u>text</u> speech	The text is both part of the speech and is written down while is mentioned.

Table 1. Some conventions used in the transcriptions.

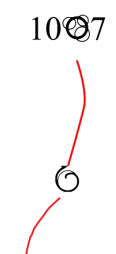
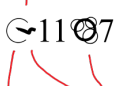



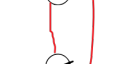

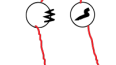
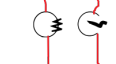


6:58		GG	Y la otra es como dado que este grupo se define cómo para definir la estrategia; aunque no seamos un grupo formal para dar esas consultorías, si quisiera como poder llegar a definir nuestro objetivo, nuestros recursos,	And the other is like as this group defines itself as a group to define strategy, although we are not a formal group to provide these consulting, I really want to come up with our objective, our resources
7:15		EK	en qué podemos participar, cómo definir esa estrategia y entenderla, para ver como juego yo en eso. <u>[definir roles]</u>	In what kind of activities can we participate, how to define and understand strategy to see how can I play in that <u>[define roles]</u>
7:23		EK	Pero no te entiendo, tú esperarías definir qué?	But I do not understand, what do you expect to define?
7:25		GG	Seguir en la definición de cómo es el grupo consultor de estrategia en el CICE.	To continue in the definition of what is the consultancy group in strategy
7:34		EK	Cuando dices eso	When you said that..
7:36		GG	Si...	Yes...
7:37		EK	Tu llegaste ya hasta definir roles, ¿no es cierto? Pues hasta inclusive definir roles, quien hace que,	Did you reach to the point of defining roles, isn't it? so up to defining roles, who does what,
7:44		GG	o no, me lo inventé No	Or not, I made it up No
7:45		EK	Me lo inventé <u>[definir roles]</u> .	I made it up <u>[define roles]</u>
7:46		GG	Si	Yes
7:47		EK	Entonces <u>definir cómo es el grupo consultor</u>	So <u>to define what is the consulting group</u>

Table 2. Interaction excerpt from the third workshop. (original Spanish, English translation).

The segment on table 2, shows GG Setting an idea (6:58) then EK misinterprets and register something different on the whiteboard (7:15). The effect is that a new competing boundary, weakening GG's idea. Next, EK realizes that she is not sure about capturing the idea in the right way, Probes (7:23) the Setting (7:15), and it concludes at 7:45 that the words needed to be erased and replaced by new ones.

EK writes to reinforce idea, creates a different thread, it comes the correction. It helps to build up.

See how basically she ensures the correct interpretation of the idea. Additionally, the information is there on the whiteboard for participants to come back and keep the ideas available and fresh.

The foundation gets better and more certain about what people are thinking.

Enhancing the methodological toolbox

Last segment of interaction is a very short one, and it is not good for showing the claim that visual aids are helping to connect very distant ideas. A problem to argue this kind of cases is the limited space in papers (Midgley, 2002). Here the claim demands to show far between linkages between parts of the session. Building this argument requires additional treatment of the data. The basics of the additional treatment rely in recognizing that there are different kinds of Settings. These are recognised by the way that they are linked to previous operations (Figure 1).

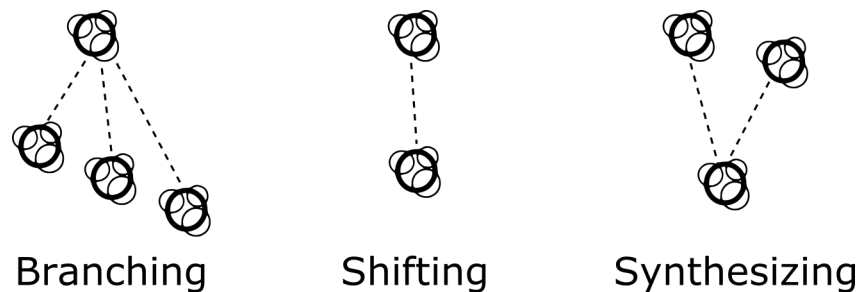


Figure 1. Types of Setting

Branching, refers to a rule placed upon the interaction that asks for different contributions about a topic. The rules at the top acts as a Setting defining what kind of contributions are expected. The Settings connected below represent possible alternatives to what has been asked for.

Shifting, basically change the focus of the topic. Sometimes the topic is related to one before, but it is more precise and has different implications. Sometimes is a complete change of what is before but in any case, it is connected to a previous operation that allows the space for the contribution.

Synthesizing, refers to previous Settings that are combined to form an idea containing aspects of the previous ones. It is not necessary to blend all the contents of the previous boundaries in the new one.

The dotted lines in Figure 1, symbolize that there can be an undetermined number of operations between the Settings shown.

Now when we connect all the Settings of the interaction in focus, we obtain a graph with all the boundaries playing a role during the discussion. Additionally, we obtain all the paths followed in the conversation. This shows an overall structure of the meeting where now it is possible to see how the different ideas connect (Figures 2 and 3).

Tracking ideas and build up

It is interesting to compare the segments belonging to workshops 2 and 3 depicted in figures 2 and 3. Both refer to the first part of the respective workshops. The facilitator was different in each case and there was a huge difference in the amount of effort devoted to planning and organizing them.

Workshop 2, was felt for the participants as a detour from workshop 1, and people did not see the point of the activity. In fact, during the activity, there were a lot of questionings about the rules proposed by the facilitator. The facilitation did not make use of visual artifacts (whiteboard, power point, post it, etc.).

Workshop 3, was designed to recover the interest of the people in the process. There was very active participation and there was a lot of use of the whiteboard and power point in the part of the interaction illustrated in figure 3. The segment portrait involves the gathering of opinions of the participants, and the way that those opinions were connected to the purpose of the session and the overall idea behind the series of workshops.

When we compare the graphs, some interesting patterns appear. For instance, in Figure 2, the settings of synthesis basically occur with ideas that are very close spaced in time. Look, for example, the settings from 20 up to 24. The syntheses in this fragment are accomplished by the same person talking about an anecdote.

In contrast in Figure 3, we can see how frequent are syntheses taking ideas separated by big segments of time. From the perspective of relevance theory, one of the supports for BGT, ideas mentioned far behind will lose relevance because they will be difficult to access the memory (in the case in which they are really in the memory!!). However, having the information visually present all the time makes possible to have those elements fresh and ready available elements to construct new ideas.

This visual support made easier for the examination and comparison of the ideas (Streck, 1996) not only for the individuals but for the group. The list of ideas supported the group process in developing the topic of the meeting (Nielsen, 2012).

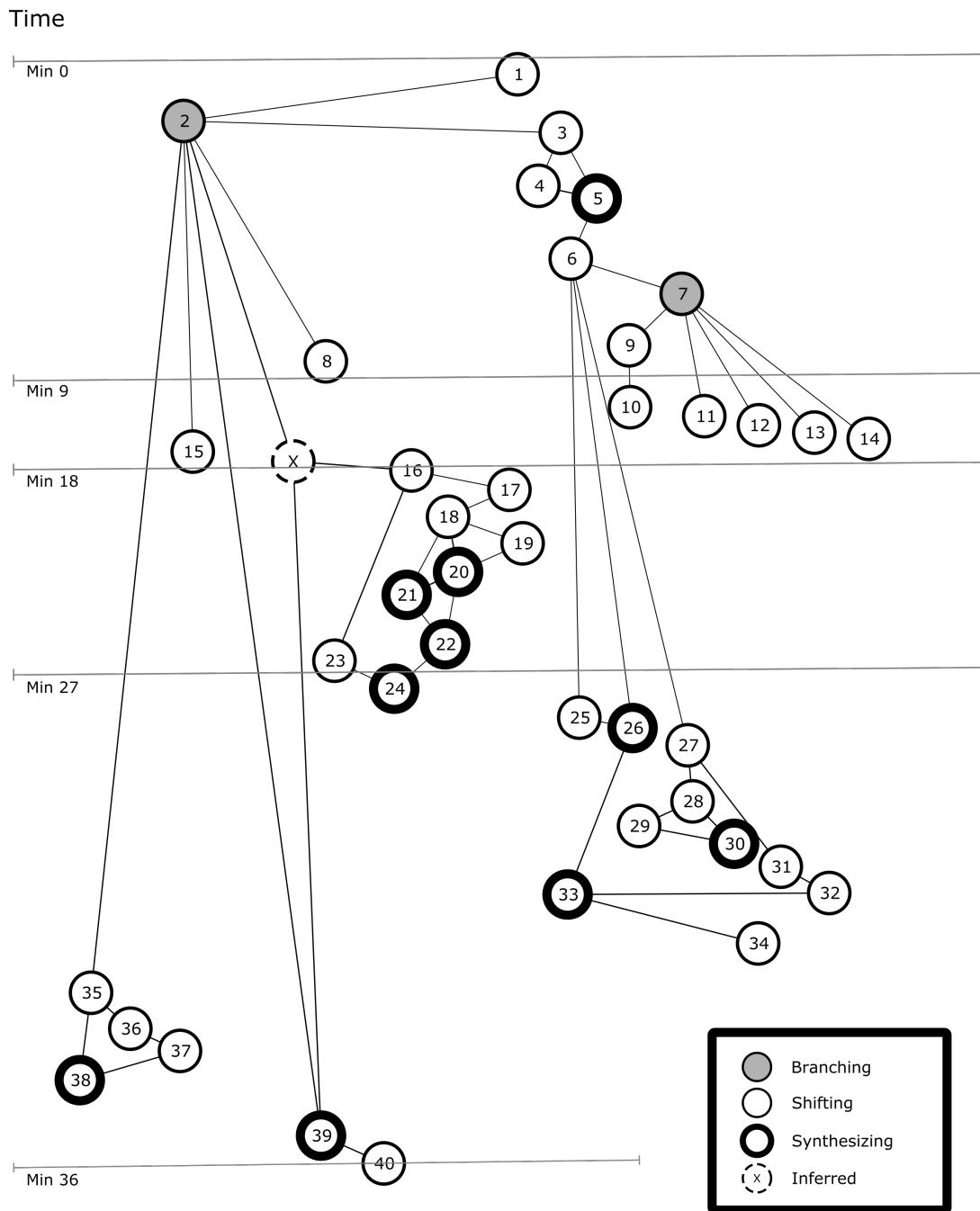


Figure 2. Structure of workshop 2.

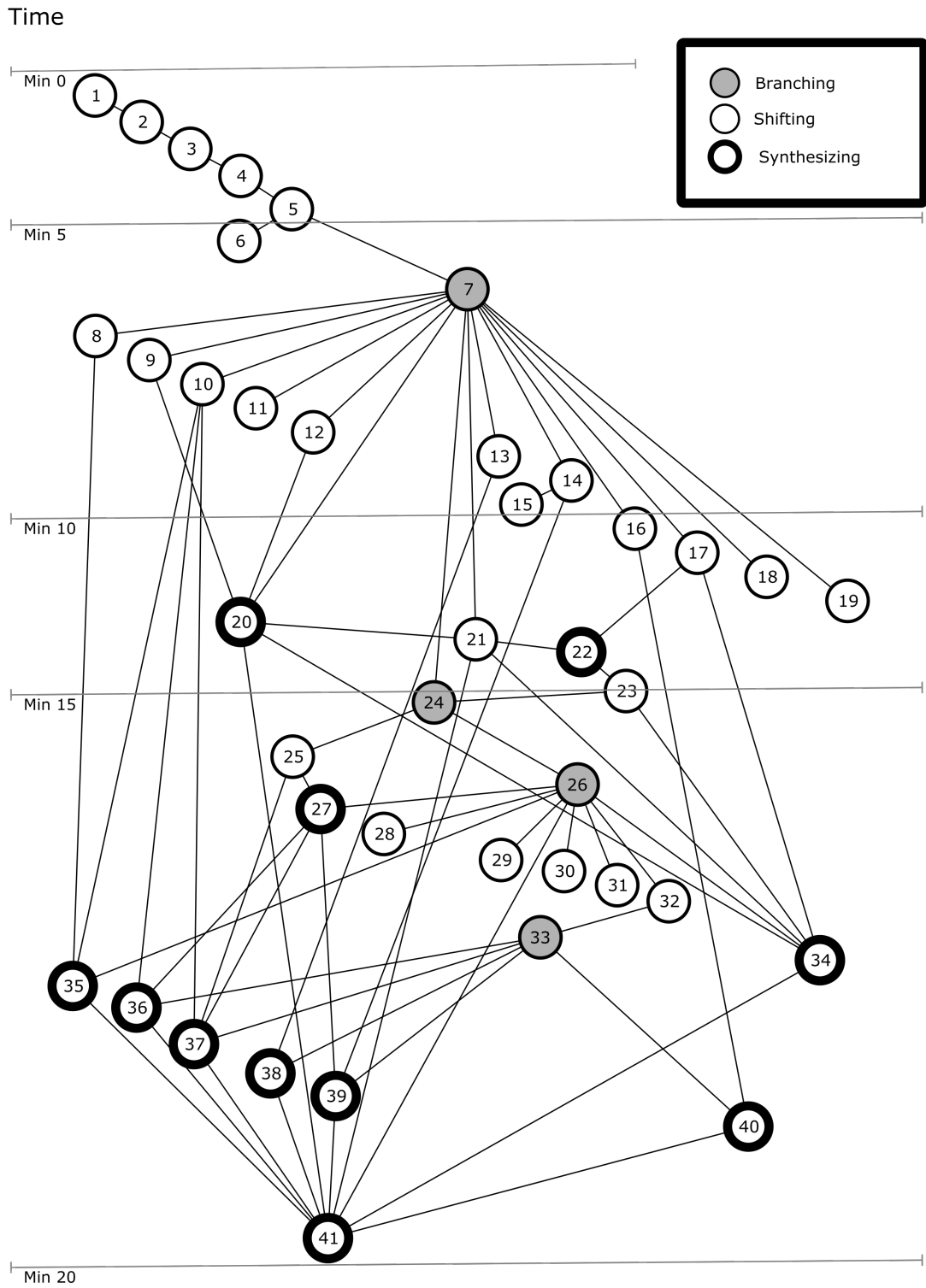


Figure 3. Structure of meeting 3.

CONCLUSIONS – LESSONS

The paper show how to use BGT to approach the problem of how people integrate visual and verbal communicative elements in a problem construction scenery. Some concepts arise as important such as the difference between the structure and the content of the meeting and the different kinds of setting namely, branching, shifting and synthesizing. Based of this is possible to construct a graph showing the structure of meeting.

From the BGT analysis, including the structure of the meeting, it can be shown that the visual artefacts are serving a communicative role that in most of the cases help to reinforce and keep track of different ideas presented and give the opportunity to check and verify those ideas.

On these foundations, the work of a facilitator of guiding, connecting the different ideas, and keeping ideas fresh on the mind of the participants in order to construct the problem and building up progress get eased.

REFERENCES

- Ackermann, F. (2012). Problem structuring methods ‘in the Dock’: Arguing the case for Soft OR. *European Journal of Operational Research*, 219(3), 652-658.
- Ehn, P. (1988). Playing the Language Games of Design and Use: On Skill and Participation. *ACM*, 142–157.
- Gray, D., Brown, S., & Macanuso, J. (2010). *Game Storming: A playbook for innovators, rulebreakers, and changemakers*. Beijing: O'Reilly.
- Hodder, I. (1998). The Interpretation of Documents and Material Culture. In N. K. Denzin & Y. S. Lincoln (Eds.), *Collecting and Interpreting Qualitative Materials* (pp. 110–129). Thousand Oaks: SAGE.
- Midgley, G. (2002). Final reply to Reynolds - Towards an enhanced OR for environmental management. *The Journal of the Operational Research Society*, 53(10), 1171.
- Mingers, J., & Rosenhead, J. (2004). Problem structuring methods in action. *European Journal of Operational Research*, 152(3), 530.
- Nielsen, M. F. (2012). Using artifacts in brainstorming sessions to secure participation and decouple sequentiality. *Discourse Studies*, 14(1), 87-109. doi: 10.1177/1461445611427211
- Paroutis, S., Franco, L. A., & Papadopoulos, T. (2015). Visual Interactions with Strategy Tools: Producing Strategic Knowledge in Workshops. *British Journal of Management*, 26, S48-S66. doi: 10.1111/1467-8551.12081
- Shaw, D., Edwards, J. S., & Collier, P. M. (2006). Quid pro quo: Reflections on the value of problem structuring group workshops. *The Journal of the Operational Research Society*, 57(8), 939.
- Sperber, D., & Wilson, D. (1995). *Relevance: Communication and Cognition* (2nd ed.). Oxford: Blackwell Publishing.
- Velez-Castiblanco, J., Brocklesby, J., & Midgley, G. (2016). Boundary games: How teams of OR practitioners explore the boundaries of intervention. *European Journal of Operational Research*, 249, 968–982.

- White, L. (2009). Understanding problem structuring methods interventions. *European Journal of Operational Research*, 199(3), 823-833. doi: <http://dx.doi.org/10.1016/j.ejor.2009.01.066>
- Yanow, D., & Schwarz-Shea, P. (2006). *Interpretation And Method: Empirical Research Methods And the Interpretive Turn*. London: M.E Sharpe.