THE USE OF VISUAL TEMPLATES FOR SHARING KNOWLEDGE IN TEAM MEETINGS AT WORK: A QUALITATIVE CASE STUDY

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SUPERVISED BY
Dr. Sue Williams
Professor Dr. Michael J. Fass

Valérie Michèle SAINTOT

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ABSTRACT

The present study explores the use of visual templates to facilitate knowledge sharing in real life team meetings. Ten real life teams belonging to ten different departments of the same organisation have been invited to take part in a case study replicating a team meeting. The purpose of the case study was to compare how and why meetings supported or not by visual templates lead to diverging meeting output, participants' behaviours, and perceptions. The visual template used in the case study is a matrix mapping interest and power of stakeholders.

The present qualitative research built on two disciplines, namely knowledge visualization in communication research and group interaction analysis in small group research. The phenomenon of knowledge sharing in meeting discussions was explored through a social constructionist lens with some embodied cognitivist elements borrowing from the 4E cognition framework. The verbal statements of the meeting participants were coded with the Act4Teams coding scheme. Participants' perceptions have been collected through an individual questionnaire and focus group discussions. Field notes, artefacts and photographs completed the data set.

The field research confirmed that also real team are helped by visual templates when it comes to delivering on their meeting objectives. A visual template can help make tacit knowledge tangible. It helps recall the knowledge visualized on the template. It nudges the discussions towards a concrete output. A visual template stimulates disagreement and avoid groupthink. It enables silence which in turn helps teams take distance to review critically the knowledge sharing process. It also helps the team organise the knowledge shared.

The research contributed to bringing together knowledge visualization and group interaction analysis. It allowed the Dunning-Kruger effect to be observed as the satisfaction affirmed by teams without tangible meeting output was comparable to those with a tangible output. It also contributed some insights on how making thinking visible can help researchers unveil patterns relating to the phenomenon studied using visual ethnography approaches.

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Student Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific references in the text. No part has been submitted as part of any other academic award. Any views expressed in this assessment are those of the author and in no way represent those of the University.

Signed:

Date: 23/09/2020

1 Introduction

This chapter gives some background and context about the research. It explains the problem that is being explored (1.2). The three research questions are then presented (1.3). This chapter is completed by some intermediary conclusions (1.4).

1.1 Problem which triggered the research

Meetings tend to be perceived as a waste of time by team members. A significant portion of the entries in the Harvard Business Review focus on how to fix non-productive meetings and elaborate on various practices to improve the preparation, running and follow up to meetings, to foster knowledge sharing.

The problem unveils three important dimensions that form the context of the present research. The first dimension relates to the use of teams to perform work. The second deals with the role given to meetings. The third dimension is concerned with the process of knowledge sharing.

About teamwork

No matter the type of activity, public-private, profit-non-profit, business-academia, being organised as a team and being expected to perform teamwork has become a common feature shaping the way people organise themselves at work. Team dynamics as a phenomenon has been studied for seven decades (Kozlowski, 2018, p. 5). The study of how team members interact has evolved from a socio-psychological approach of teamwork to looking at it from an organisational perspective focusing on structures and more recently from a management perspective exploring interpersonal dimensions. In this research, the focus has been on the way the exchange of knowledge between team members to solve the problem the teams have been entrusted with can be managed and organised. In the context of the field research undertaken, teamwork is often experienced and expressed through arranging meetings to bring people together within an existing team or across teams.

About meetings in general

A broad mix of business practitioners and academics have tackled the meeting question from multiple perspectives, producing an extensive collection of articles critiquing the suboptimal way meetings are run. Equally, management books endeavouring to make meetings more effective and efficient are regularly published. Three book titles arbitrarily selected describe well what could be called the 'meeting drama': i) Meetings Suck (Herold, 2016); ii) Bad Meetings Happen to Good People (Epsy, 2017); iii) First Aid for Meetings (Hawkins, 1997). Dilbert cartoons do not fall short of deploying their dose of irony about meetings dissatisfaction. In May 2020, a search on Dilbert.com revealed 209 Dilbert comic strips with the hashtag 'meetings' and dedicated to mocking meetings. Picture 1 below highlights the challenge of sharing knowledge if one or several meeting participants are using the meeting time to attend to their inner dialogue and not the discussion taking place around the table.

Picture 1 One of 209 Dilbert comics on meetings *(authorised reproduction)*

Three data points can be useful when reflecting on meeting practices and culture in organisations. The first data point to keep in mind is *how many* meetings take place every day. In the Harvard Business Review of June 2019, an acknowledged meeting expert, Rogelberg (2019), mentioned that in the United States alone, 55 million meetings are taking place every day quoting the findings of Keith (2015) who did a systematic review of meeting data available at the time. This data was generated by surveys issued by consulting firms and public authorities between 1974 and 2015. Even if imperfect, this data covers the most transparent and rigorous data set known to date.

The second data point to be considered is *how much* meetings cost. The financial weight of meetings is counted in billions and is often calculated by surveys conducted by consulting firms. Exact figures are not repeated here as the data behind the conclusions is not accessible. What can be said is that surveys both in the United States and in Europe have comparable patterns when it comes to the humongous cost of meetings per year and the lack of clarity about their proportionate return on both investment and time.

The third data point to have in mind is *how much time* a single person spends in meetings. Again, none of the statistics given are completely transparent about the parameters of their calculations, but what can be said is the studies agree in scale and evolution. It is commonly reported that every white-collar employee spends several hours a week in meetings. It seems it is even more time consuming for managers.

About knowledge sharing
Among the many aspects as to the reason organisations use teams as a way of organising themselves, one is consistently reported, namely the need to share knowledge to perform a given task. More precisely, in this research the way team members share knowledge face-to-face in a meeting context is explored. Individually, people have personal knowledge (Polanyi, 1958) that often remains tacit (Sternberg & Horvath, 2000). Knowledge sharing has various purposes and can help solve problems, help decision-making, generate new insights, or share know-how.

Through a process of sense making, a piece of knowledge which may have once been individual and tacitly kept in the mind of a team member is availed to the team after being shared in the

discussion process. As the meeting unfolds, more knowledge may be generated and further shared as meeting participants keep on adding pieces of knowledge.

Exploring knowledge sharing in meetings endeavours to better understand how a problem-solving task is executed from the perspective of the knowledge pooled and used during the meeting.

The aim of the research has been to use knowledge visualization to explore how and why the process of visualizing influences the transfer of knowledge in face-to-face meetings. It uses a visual template in the form of an empty stakeholder matrix. As explained in more details in sub-section 2.4.3, the use of the term visual template is the outcome of a thematic literature review. Several terms could have been chosen, visual template is retained for its literal description of the artefact used, namely a stakeholder matrix, which is 'visual' in that one sees what is written on it and is a template in that it is pre-designed with spaces marked with descriptive labels defining what type of knowledge could help fill theses spaces.

1.2 Research questions and objectives

The research questions and objectives cover three key perspectives. First, they deal with the way a problem-solving task leads, or not, to a tangible output at the end of a meeting. Second, the research questions and objectives are concerned with the behaviours displayed by the team members during the meeting. Third, the research also covers the perceptions expressed by the meeting participants who were asked to fill out an individual questionnaire about their perceptions, i.e. what they thought about the meeting, how they perceive the meeting process and result.

1.2.1 Research question 1 on meeting output

Why the output of a problem-solving meeting may (or not) differ when the discussions are supported by a visual template in comparison to when no visual template is used?

This first question aims at understanding the factors which influence the results delivered when using or not a visual template to solve a problem. In case differences would be observed between the five teams using a visual template and the five teams not using a visual template, this first research question was designed to help define some reasons for these differences. This question lends itself to a method based on case study (Yin, 2013) as explained in greater detail in chapter 4 on research methodology.

This first question encompassed a series of more detailed aspects that the case study was designed to help explore. The sub-aspects cover both tangible observations (Is there a tangible meeting output in the form of a collectively agreed document or not?) as well as more subjective analysis (Is the output of a meeting using a visual template possibly more concrete, detailed, and usable, or not?). This first question also provided an opportunity to explore the potential differences between group A (not offered use of visual template) and group B (offered to use

one). It sets out the intention to compare and contrast the meeting output of the ten teams participating in the case study.

1.2.2 Research question 2 relates to behaviours in meetings

How do meeting participants' behaviours vary when the meeting discussions are not supported by a visual template in comparison to when a visual template supports the discussions?

To continue exploring factors that can help grow an understanding of the impact (or the lack thereof) of visual templates on the way a meeting unfolds, the idea of borrowing from the field of meeting science was progressively developed (Allen et al., 2017). In conversations with the supervisors, the field of group interaction analysis appeared to be a useful approach when it came to the analysis of the way team members would interact during the meetings. It follows a so-called 'IPO' approach: input-process-output (IPO). Coding schemes based on the IPO approach can become complex. This was the case at the origin of the logging system used to analyse team interactions created by Bales (1950). The challenge was to retain the logic of such a valuable system while reducing its complexity to fit the purpose of the research question. The intention was to have a method which could inform a qualitative purpose while borrowing from a systematic method geared at analysing group interaction and participants' behaviours.

Following a literature review of coding schemes building on Bales' seminal contribution, recent research work has proposed approaches that make Bales' IPO approach more manageable (Brauner et al., 2018). A coding scheme called Act4Teams (Kauffeld et al., 2018) offered to categorise team members' meeting behaviours in four categories and forty-one indicators. The definitions of behavioural indicators of the coding scheme from Act4Teams were adjusted as explained in chapter 5.

In addition, recourse to an audio-coding software to apply the coding scheme was made to record, store, analyse and visualize the codes. As the software commonly used in conjunction with Act4Teams was financially unaffordable, open-source software was sought and identified. The software called BORIS - an acronym standing for 'Behavioural Observation Research Interactive Software' – and used by behavioural biologists to observe behaviours of animals (Friard & Gamba, 2016) was identified as a viable option. At this stage, the literature review did not show examples of other research projects using such event logging software for recording the behaviours of people in organisations. While originally designed to observe animals, the software could be used for the present research and could surely be used in the future for comparable studies. This open-source software provided the functionalities and data visualisation needed to help collect elements of answers, particularly for research question 2.

1.2.3 Research question 3 on team members' perceptions

How do participants perceive the process and output *of discussions not supported by a visual template and of discussions supported by a visual template?*

Meeting participants in organisations often complain about the number of meetings they need to attend. Over the years, meeting participants have in general been reporting a lack of effectiveness and a sense of participatory frustration (Keith, 2015). Exploring the perceptions of team members in greater detail was a central purpose of the case study for meetings conducted both with and without a visual template.

Various aspects of the way team members would report their apprehension of their immediate experience were brought together and formed the basis of the five questions asked to participants. A sub-concern of the third research question comes from the intention to explore the level of awareness of meeting participants about how the meeting process should unfold and whether the process they had just experienced matched their understanding. It questioned whether there was a gap between what the meeting participants perceived and what the researcher-observer noted about the meeting process and output.

1.3 Overview of the thesis chapters

The research motivators and objectives and the research questions have been presented. The knowledge coming from two fields of research, namely communication and group interaction analysis, is given as the basis for explaining the backbone of the literature review.

As a third step, the philosophical lenses through which the research has been conducted are explained. A social constructionist approach in the tradition of Gergen (2015) focusing on the relational dimension of social constructionism is developed (chapter 3).

The methodology having supported this research is then exposed (4). The methodology follows a case study approach in which the researcher holds an observer role. This supported the choice of a case study approach in the tradition of Stake (1995) rather than the one commonly associated with Yin (2013). It also contains a detailed description of the data collection process and collected data. The intention of the section is to ensure an accountable and transparent sharing of the qualitative approach employed in this research.

The section on findings and analysis (5) gives a detailed view of how the data was treated and how insights gained helped with finding elements of answers to the three research questions being pursued and provides a deeper look into one outlying team.

The discussion section (6) focuses on insights harvested across the ten teams part of the case study. It helps to gain insights about why and how visual templates influence the sharing of knowledge in face-to-face team meetings. It offers some insights into how visual templates can play a role in making team members share knowledge and solve the problem they were given as a reason to meet.

The final chapter (7) takes a step back to conclude on the findings, the possible confirmation of what we knew from the outset but also the contributions to knowledge and the opportunities for further research and practical applications.

2 Literature Review

2.1 Chapter overview

Following an overview of the chapter (2.1), the following section focuses on the approach followed to generate the thematic literature review (2.2). The theoretical about the framework of reference chosen are then exposed (2.3).

The domain of knowledge management is presented in the context of face-to-face knowledge sharing in meetings by using knowledge visualization (2.4). To frame the discussion, three important concepts are defined: knowledge, knowledge visualization and visual templates. The definition of 'knowledge' is taken from the past seminal work of Polanyi (1966). Among the various possible fields of study, the selected definition of 'knowledge visualization' stems from the field of management and organisational communication. Finally, the definition of 'visual template' has been placed in the context of a newly created overview of all relevant terms and an explanation for choosing a visual template has been provided.

Explanation about the field of small group research within which the field of group interaction analysis is located is further detailed (2.5). The key aspect of the literature about this theme is explained in greater detail. The purpose of bringing knowledge visualization and group interaction analysis together is explained (2.6). Some additional themes added to the initial literature review are further exposed (2.7). The knowledge gap is then identified (2.8) before some intermediary conclusions are finally offered (2.9).

2.2 A thematic literature review

This research is informed by a thematic literature review. It was built over time and to some extent dynamically. Four phases of this research project led to identifying and narrowing down the relevant literature to three key themes and to complementing the research philosophy chapter with an important aspect around 4E cognition. Phases one and two took place before the data collection while phase two and three unfolded during and after the data collection.

Phase one was early in the research process and revolved around the key concept of 'knowledge visualization'. An initial research showed this may not help answer the three research questions. Indeed, while the seminal work prevailing over the domain of knowledge visualization was clearly established, the next challenge was a semantic one. How to refer to the 'visual template' used, namely 'the stakeholder map'? Therefore, some more research on the actual semantics was conducted and helped realise there is no definitive and established definition. Rather, different authors define it using equivalent terms. For this research, the decision was made to use the term 'visual template' as further explained in Table 2 (p. 25).

Phase two came into being when it became clear that to answer why and how questions around the way the visual template may influence the behaviours and perceptions of meeting participants was not so well covered in the theoretical framework relating to knowledge

visualization. The latter is more concerned with experimenting which templates work best or has which knowledge sharing effect and less with how participants work together and relate to the visual templates. It became clear that another theoretical framework would be necessary to bring the inquiry into the why and how further. Following the advice of the first supervisor involved the research expanded towards the field of group interaction analysis. The reference given to investigate was the research of Bales (1950). After studying some of the work of Bales and with the help of a rather recent article tracing the evolution of group interaction analysis, the second important building block could be identified namely the academic references to literature presenting the coding scheme to explore the interactions within the meetings between the participants and the participants and the visual template.

Phase three was concerned with the need to understand the gap and at times the contradictions between the various data, the perceptions of the participants as well as the researcher's observations. Puzzled by the level of contradiction between meeting participants' high degree of satisfaction, some of the data, and the researcher's own observations and expertise, a conversation was sought with a key academic author from the Act4Teams coding scheme. The question asked to this researcher was whether, based on their extensive use of the coding scheme, they had ever observed that meeting participants would be very satisfied with the meeting output while other data points would indicate the meeting was not conclusive. Receiving confirmation that this phenomenon was commonly observed yet no concrete reference could be provided, a further literature search led to the concept of the Dunning-Kruger effect as the root cause of this blind spot. It also brought to the foreground that the visual template plays a nudging role to mitigate and even possibly help remedy the negative side of the Dunning-Kruger effect.

Phase four came into being when reading the field notes and exploring the visual artefacts gathered during the ten meetings. A key insight gained from the observations and the collected visual data was the role the body, the environment and the human senses appeared to play in the knowledge sharing process. Searching for some explanations in the literature around the role of the body, body language, cognition, cognition-perception, the theme of 4E cognition came to the foreground. It was a risk to expand the research and add this framework. There was also no ideal place to introduce and explain its basic tenets. A lot of reflection was invested in whether to add it in the literature review but in the end the decision was made to add it in the philosophy chapter. Referring to it here is solely for highlighting this dilemma and the choice made so when later reading about it, there is a reference to it. It was better placed in the research philosophy chapter focusing on the question of how one knows what one knows. It complements the social constructionist philosophy paradigm prevailing in this research.

To sum up, the above sub-section focused on knowledge visualization, group interaction analysis, Dunning-Kruger effect and nudging while 4E cognition appears in the following chapter 3 on the research philosophy.

2.3 Theoretical framework

Bryman and Bell (2015, p. 20) affirmed that 'understanding the link between theory and research is complex'. The present research spells out explicitly its challenge in claiming an unambiguous theory on which it would be based or a theory it would generate.

The present research refers to two domains of research: knowledge visualization and group interaction analysis.

The phenomenon explored could be usefully located in either domain unless the intention to contribute to knowledge is to bridge both parts. This is the case in the present research. The case study focused on how the use of a visual template to solve a task in meeting discussions could influence or not the sharing of knowledge in team meetings at work. A key part of the exploration focus was the team members' behaviours, perceptions, and observable actions in the meetings and how the behaviours, perceptions and actions may be different when using a visual template and when not.

While only a few studies use a qualitative approach to study the impact of knowledge visualization, even fewer are conducted as fieldwork. In addition, the task defined to be performed during the meeting was such that it could have been a real task. Some teams even said that participating in the research would help them in the implementation of their work program. Participating in the case study meeting was of direct relevance to their work.

Against the above background, the case study presented in this research has been located at the intersection of knowledge visualization and group interaction analysis.

2.4 Key aspects of knowledge visualization

The scope of this research covers the study of how pieces of knowledge shared by participants during face-to-face meetings help solve the problem teams are given to solve in a meeting. It explores the role of knowledge visualization using visual templates. Knowledge visualization as referred to in this research is not to create a graph or picture. It is to gain new insights and through the act of visualizing to share relevant pieces of knowledge. In this context, knowledge visualization is meant to help meeting participants see what they know. Through the visualization process, the teams embark on a discovery process and enrich a visual artefact as they exchange pieces of knowledge that are designed to help perform the task that triggered the need to meet in the first place. Van Biljon and Renaud (2015a, p. 157) noted that 'Visualisations have a powerful capacity to improve interpersonal communication and interaction'.

Comparing data and information visualization with knowledge visualization, the quote below summarises the essence of the differentiation and states that 'Information visualization aims to explore large amounts of abstract (often numeric) data to derive new insights or simply make the stored data more accessible. Knowledge visualization, in contrast, facilitates the transfer and creation of knowledge among people by giving them richer means of expressing what they know' (Eppler & Burkhard, 2004, p. 4).

The definition created for this research affirms that visualization is the act of documenting with words or sketches, in a common space, pieces of knowledge shared. It makes invisible pieces of knowledge visible by turning them into artefacts. The artefacts created are kept visually accessible for the duration of the face-to-face meeting allowing meeting participants to interact with the pieces of knowledge visualized. Other definitions focus more on the intention or the typologies of knowledge visualization (Chen et al., 2014; Eppler, 2013). The insights gathered and presented in chapter 6 in hindsight of the learning from this research focus on the process of visualization.

2.4.1 Data, information, and knowledge

Research dealing with knowledge visualization proceeds with distinguishing - despite the absence of universally agreed definitions – between data, information, and knowledge. The intention behind dedicating some explanations to this distinction in the context of the current research is not to establish an undisputed framework of definitions. It is provided to make explicit the scope covered in this research. It is also designed to avoid as much as possible misconceptions about what is in focus.

Burkhard (2005a, p. 22) states that 'The definition of the concepts data, information and knowledge is important because in the literature there is no consensus yet. A common view is the so-called knowledge pyramid, which distinguishes between data, information, and knowledge'. In the same logic, van Biljon and Renaud (2015a, p. 158) consider it important 'When considering knowledge visualisation (...) to establish a shared understanding of the meaning of the terms data, information and knowledge.'. Renaud and van Biljon (2017, p. 1477) still note that 'Many different labels and conceptions exist in different domains to explain the integrative power of visuals for knowledge transfer. Therefore, it is necessary to revisit the basic terminology and clarify the intended meaning in the context of educational technology before proceeding to any discussion of how these can be represented. The fundamental constructs of data, information, knowledge, and visualisation are depicted below. This last contribution was a source of motivation to venture into contextualising the definitions used in the present research.

Among the attempts to define data, information and knowledge, the approach of Tergan and Keller (2005) is retained as they also focus on some visualization aspects of knowledge management in an organisational context which matches the research field of the present study. Data are symbols or non-interpreted facts. Information in turn is data which are interpreted in context. Finally, knowledge is information that is processed by the mind and so it is the result of cognitive processes. Table 1 below gives an overview of what each are and what the purpose of visualization for each category is.

	DATA	INFORMATION	KNOWLEDGE
BASELINE	Data is symbols or non-interpreted facts (Tergan & Keller, 2005)	Information is data in connection and in context (Tergan & Keller, 2005)	Knowledge is information that is processed by the mind and so it is the result of cognitive processes (Tergan & Keller, 2005)
CONTEXT	Large volume of raw data	Explicit and structured data made of words and/or numbers	Experiences, insights, assumptions, beliefs
PURPOSE	Visualization makes the output of data mining more apprehensible (Chen & Floridi, 2012)	Visualization helps identify information patterns for various purposes (Card et al., 1999)	Visualization contributes to augmenting knowledge transfer capacity (Eppler & Burkhard, 2007)

Table 1 Data, information, knowledge, and visualization purpose

Polanyi (1966, p. 4) recognised that knowledge can be tacit or explicit. He affirmed that 'we can know more than we can tell'. This illustrates the tacit dimension of knowledge. It refers to the part of what we know which is not shared. This is relevant when exploring knowledge sharing in organisations, as studied by Nonaka and Takeuchi (1995), who generated a knowledge model crossing the tacit and explicit dimensions of knowledge. In the present research, all four dimensions of the model (socialization, externalization, internalization, and combination) are of interest yet to different degrees. When exploring the way visual templates influence or not the sharing of knowledge, the focus is more on the space where knowledge shifts from tacit to explicit, as well as when made explicit how other pieces of knowledge held by the same participant or another individual can be complemented by making explicit another piece of knowledge adding to the piece which has just been externalised. Whether successful or not, one intended goal of using visual templates is to help make tacit knowledge explicit.

2.4.2 Key aspects of knowledge visualization

Knowledge visualization for organisational and management purposes dates to the first half of the 2000s and was tackled in a series of individual and collective publications. Early on, Burkhard (2004, p. 1) observed that 'The last twenty years various information visualization methods were invented. However, it has been neglected to link these methods to the background of managers and to the knowledge management life cycle. (...) What is missing, is a mediating framework for the use of visualization methods for different tasks that concern managers; starting from information exploration and ending with the transfer of knowledge'. Eppler and Burkhard (2004, p. 3) saw in knowledge visualization an opportunity to use 'visual representations to improve the creation and transfer of knowledge between at least two people'.

Knowledge visualization covers a broad array of application areas: information visualization, cognitive art, knowledge management, communication science, information architecture, learning psychology, cognitive psychology (Burkhard, 2004). Other knowledge visualization research teams have focused on other fields of application like communication, learning sciences or design and architecture (Marchese & Banissi, 2013).

Visualization can be defined as a process used to give knowledge a transferable format. Eppler and Burkhard (2004, p. 3) state that 'the field of knowledge visualization examines the use of visual representations to improve the creation and transfer of knowledge between at least two people'.

Knowledge visualization is not yet a unified framework. A team of researchers coined the expression 'St Gallen School' in relation to a group of academic researchers contributing to shaping and expanding the field of knowledge visualization (Gavrilova et al., 2017). The St. Gallen School is also the origin of the most used definition of knowledge visualization. Much of the work of the so-called St Gallen School served as the frame of reference for the present research while contributions from other teams have been integrated when the specific aspect studied justified it.

The choice to refer to the St. Gallen School of knowledge visualization was mainly influenced by the focus of the St. Gallen School on the domain of application, namely management and organizational development. This is also the context and focus of the present research. Naturally, the St. Gallen School became a reference as it informed the origin and further developments of this research. Gavrilova et al. (2017, pp. 7, 8) remark that 'The number of works devoted to the theme of visualization is growing every year. There are numerous studies on the visualization of networks and relationships, and visualization of communication with a consumer. Fewer articles have been devoted to the visualization of knowledge in the implementation of business practices. At the same time, researchers are often examining one specific area of application of visualization and only a few contribute to the theory of the subject and study it in a versatile manner. The latter include the works of researchers from the University of St. Gallen (Switzerland), which we call in this article the St. Gallen School.

Eppler and Burkhard (2004, p. 3) have defined knowledge visualization as 'all graphic means that can be used to construct and convey complex insights'. An important aspect of this definition was that it did not reduce visualization to computer generated visuals but that it included handwritten or drawn notes, graphs, posters, or templates filled with visual signs, etc.

The output generated when visualizing knowledge can be analogue or digital artefacts produced as the team members share knowledge. For the sake of this research, the focus has been placed on face-to-face sharing of knowledge as opposed to remote sharing. It also focuses on face-to-face knowledge sharing in contrast to the sharing of knowledge which may happen sequentially. It uses analogue means (pen, paper, poster) rather than digitally ones to fill the visual template on a computer screen.

Another important aspect of the above definition of knowledge visualization is that it distinguishes knowledge visualization from information visualization. The exchanges revolved around pieces of knowledge that meeting participants shared because of their own cognition. It did not build on the sharing of pre-existing data at the start of the discussion. The case study targeted knowledge from the perspective of insights, attitudes, values, and other less tangible information.

Knowledge visualization possesses characteristics that justify it as a standalone discipline alongside information visualization. Knowledge visualization covers comparable yet different aspects than information visualization does. Four key differences give knowledge visualization space to develop in dialogue yet separately from information visualization. It was pointed out (Burkhard, 2005b, p. 230) that 'First, non-computer based visualizations disappeared from the research field information visualization. Second, knowledge types (e.g., insights, experiences, tacit knowledge) that cannot be put into a digital carrier (i.e., a database) were ignored. Third, the role of the recipient was not studied enough. Fourth, applying the new methods to knowledge and business processes, and real problems, was not investigated systematically.'

Several researchers from the St Gallen School have continued to build a theoretical framework by bringing together eight scholars to give short definitions of what they understand by knowledge visualization (Bertschi et al., 2013). Eppler & Burkhard (2004, p. 22) use the acronym CARMEN to give an overview of the key functions knowledge visualization can fulfil. They affirm that 'In terms of advantages, knowledge visualizations offer cognitive, social, and emotional benefits'. They synthesize these strengths in the CARMEN acronym and explain that the acronym stands for:

> **'C**oordination: They help to coordinate the communication of knowledge workers. (Social benefit).
> **A**ttention: They raise awareness and provide focus for knowledge creation and transfer. (Cognitive benefit)
> **R**ecall: They improve memorability and thus foster the application of new knowledge. (Cognitive benefit).
> **M**otivation: They energize viewers to engage in interpretation and explore the graphic. (Emotional benefit).
> **E**laboration: The process of visualizing knowledge leads to further understanding and appreciation of concepts and ideas as one interacts with them. (Cognitive benefit).
> **N**ew insights: Knowledge visualizations can reveal previously hidden connections and lead to sudden insights, a-ha experiences. (Cognitive Benefit).'

In this already very comprehensive overview of the potential benefits of knowledge visualization captured in the CARMEN acronym, the 'R' linked to the recall effect of knowledge visualization will be further explored in this research. Equally important for the present research is the 'M' which stands for the motivation effect. Indeed, in this case study, it was observed that the visual template can become an incentive for meeting participants to fill

in the visual template as it hangs in the meeting room empty, giving a framework on which to think and discuss.

2.4.3   Visual templates for the present case study

Among the various forms that knowledge visualization can take, the focus has been placed on what is referred to as a 'visual template'. Before explaining why visual templates were selected as the visualization format, it is helpful to consider the reason for the absence of a well-established definition recognised across the various fields using knowledge visualization.

Table 2 below presents the summary of the findings of the terms held relevant in the context of the present research. These terms were encountered in multiple articles. Despite their being presented in a table, the set of definitions below compiled when performing the overall thematic literature review remains thematic. The use of a table was to support the visualization at a glance for the purpose of increasing understanding and recall effects.

CONCEPTS	AUTHORS	CHARACTERISTICS
BOUNDARY OBJECT	Ewenstein and Whyte (2009)	Can be a thing but also a drawing. It helps the community using it to generate understanding and share knowledge.
KNOWLEDGE SCAFFOLDING	Orlikowski (2006)	Scaffolding denotes a broad class of physical, cognitive, and social augmentations. (…) Scaffolding structures human activity by supporting and guiding it, while at the same time configuring and disciplining it.
VISUAL ARTEFACTS	Eppler (2007)	The rich and close descriptions of the use and appropriation of visual artefacts reveal that images help groups to focus attention, to surface areas of agreement and disagreement, to make implicit knowledge and past experiences explicit, to discover new perspectives, and to document or revise decisions.
	Comi and Whyte (2017)	Visual artefacts are 'lines, materials and shapes which bring an imagined future into the present'.
VISUAL REPRESENT-ATION	Lohse et al. (1994)	Visual representations offer a structure to harvest data to express knowledge. It supports cognitive processes and can be categorised into graphs, tables, maps, diagrams, networks, and icons.
KNOWLEDGE VISUALIZATION TEMPLATE	Alexander et al. (2013)	Knowledge visualization templates 'allow people working together in teams to contemplate their common object of knowledge creation from various perspectives'.
BUSINESS CANVAS	Osterwalder et al. (2010)	Business canvases are visual charts which help document existing ideas or generate new ones for business purposes.

| VISUAL TEMPLATE | Perez and Bresciani (2015) | Visual object which combines cognitive, social and emotional benefits. (…) Templates provide representational guidance (…) keep participants focused and shape their thinking process toward a focused and efficient discussion. |
| | Bresciani and Comi (2017) | Visual templates (e.g. BCG matrix, SWOT diagram, Porter's five forces diagram) provide a graphic structure onto which knowledge, in the form of text and images, can be meaningfully mapped. |

Table 2 Overview of related concepts around 'visual template'

Retaining the term 'visual template' for this research is the result of different considerations. First, the body of research using this term is directly relevant to the present case study as it applies to knowledge sharing in organisations. Second, juxtaposing both terms make it explicit: 'visual' stands for something being seen or visualized; and 'template' stands for something being pre-defined and to be filled. It literally describes the object of the study and helps convey the main idea. Finally, it nudges towards progressing the discussion to have at least what is pointed out at with explicit topics written down to be covered and filled during the discussions.

Bresciani and Comi (2017) define visual template as 'a graphic structure onto which knowledge, in the form of text and images, can be meaningfully mapped'. Perez and Bresciani (2015) postulate that 'visual templates provide useful support for teams, which lead to higher quality of idea generation and sharing, compared to unstructured meetings'. Combining mixed methods research and using both a case study and a lab experiment, the same authors underpinned the conclusion that visual templates help unstructured meetings to be more effective (more ideas, faster produced and of a better quality).

Perez and Bresciani (2015, p. 344) concluded that 'people don't realize the value of visual representations, and this might be the reason why they are not more satisfied when meetings are facilitated with templates, and why visual templates are not often adopted in organizational meetings'. These authors explained the need to investigate the how and why of these findings. While the present research does not close this gap, the present case study integrates several perspectives, including the perceptions of the meeting participants, which possibly will help understand some elements that explain this gap. This could help shape practical intervention using visual templates to influence the unfolding and output of a given meeting.

2.5 Group interaction analysis

The second body of knowledge from which this research has benefited relates to group interaction analysis. The research questions endeavour to shed some understanding on the way team members interact on different levels. The studied interactions focused on the relations between the team members; between the team members and the process of performing a knowledge sharing task; and between the team members and the output of the meetings. After establishing what is meant by team, by meeting task, by meeting output, some insights are presented on what is meant by team effectiveness.

2.5.1 Concept of teams

The definition of team selected for the type of team involved in this case study was derived from the work of Kozlowski & Ilgen (2006). The literature on team interaction analysis as reviewed in an article presenting the history of this field of study (Kauffeld & Meinecke, 2018) refers to the definition of Kozlowski and Ilgen. Their definition reads 'A team can be defined as (a) two or more individuals who (b) socially interact (face-to-face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and output; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment' (S. Kozlowski & D. Ilgen, 2006, p. 79).

The characteristics of the ten teams engaged in this case study fit the six elements of the definition cited above. *First*, the number of members is constitutive of a team which is made up of at least two persons. *Second*, the meetings can take place face-to-face or remotely. *Third*, the notion of common goal is at the centre. The members of the group need to have a goal in common, at least one, but of course, it can be more. *Fourth*, the team members are brought together to perform according to the expectations of the organisation to which they belong. The *fifth* characteristic deals with the concept of interdependencies understood as being part of a larger context with workflows, goals and output pre-defined and a given framework within which a team is expected to deliver. *Finally*, the above is part of the ecosystem of the organisation within which it operates, and its boundaries are given by the context.

Table 3 below presents how the six constitutive elements of the selected definition of a team also defined the ten teams engaged in this case study.

#	Characteristics	Overview	Applied to our case study	Given
1	Number of members	2 or more	The ten teams in the case study consisted of between 4 and 7 members	Yes
2	Location of meeting	Face-to-face or remote	The ten teams work daily onsite and agreed to face-to-face meetings as part of the case study	Yes
3	Purpose	One or more common goal	The common goal of the teams is a successful implementation of their respective annual work programme	Yes
4	External expectations	External expectations	Team members are expected to perform	Yes
5	Identity	Different roles and responsibilities	In each meeting, roles were taken by team members, e.g. discussion leader, note taker and timekeeper. They may or may not match roles held in day-to-day work.	Yes
6	Contextual boundaries	Being part of the organisation ecosystem	The ten teams of the case study belong to a department in one single organisation.	Yes

Table 3 Team characteristics (Kozlowski & Ilgen, 2006) adapted (Saintot)

The ten teams involved with the case study were teams pre-existing the case study and remaining as teams after their participation in the case study. This led to calling these teams 'real' teams in contrast to teams formed for the sole purpose of the case study.

2.5.2   Some elements to understand meeting effectiveness

Respecting the spirit of this qualitative research, the research questions were not designed to lead to quantitative answers. The focus was not on 'how much' the visual templates were instrumental in mapping the stakeholders relevant to the implementation of the work program of the ten. Equally, the research was not about the appropriateness of the visual template selected. It was also not about whether a team would get a maximum number of relevant stakeholder names with or without using a visual template. The research was designed as an exploration of why and how visual templates may or may not have an influence on knowledge sharing in face-to-face real team meetings at work.

While being qualitative, to find a way to come to some element of an answer it became necessary to find a way to ground the research questions in tangible aspects. When researching about the question from the perspective of meeting effectiveness, additional exploration led to borrowing from small group research. It brought to the foreground the so-called input-process-output (IPO) model to observe various aspects of the team in its workings in meetings. This approach to explore small group interaction dates back to one of the key thinkers of small group interaction analysis, namely McGrath (1964, 1991).

To explore what is going on during the meeting interactions, the behaviours of the meeting participants were coded (for details, see sub-section 5.3, p. 87). The meeting discussions were not influenced by the researcher who took the position of observer. Meeting behaviours that occur to a great extent without being influenced by the researcher have the potential of informing the research with more natural insights into group interaction. Coding the meeting discussions allowed the researcher to combine and compare several layers of interactions over time in a meeting and across teams. It would have been very challenging to compare what was said in contrast to how people behave in terms of meeting interactions as the teams were unrelated and worked on very different subjects and had different focus. By coding the group interaction, a space to compare behaviour became open to observation and analysis independent from the actual pieces of knowledge exchanged.

Recently, S. W. J. Kozlowski and D. R. Ilgen (2006) and Kozlowski (2018) have reviewed several decades of team effectiveness research and again deconstructed the three dimensions of the IPO model that was adapted to fit this research.

The above figure served as the meta-level to describe the findings detailed and explained in chapter 5. At this juncture, what should be retained is that visualizing what is being discussed during the meeting allows for iteration and fine tuning. Input can be given at different points of the timeline. This input can be processed iteratively. The output can evolve during the meeting interactions. In that sense, the input-process-output sequence is not linear. Meeting duration

allowing, a strong iterative character of the knowledge sharing process can unfold. It often allows team members to elaborate on the knowledge shared by each of them. This evolutive process leads to a more complete output. Output meant for this case study what the ten teams could consider a result of the meeting discussions. It allows for a certain degree of quality control. Such quality control may not be present in the same way when no visual templates are used (Alexander et al., 2016).

An alternative approach could have been to omit the coding and avoid the complexity of the IPO approach by using surveys and possibly individual interviews to obtain the participants' own assessments of their group interactions. This would have certainly had the advantage of being less effort intensive and more narrative based. Yet it would have missed the depth that the approach selected could offer. In retrospect, it was a valid choice, and it can be affirmed that no survey or interview would have unveiled the meta level the coding enabled by this approach.

The input-process-output model has been the dominant framework, significantly influencing the inquiries into how teams work. The insights that IPO provided were key to understanding meeting interaction and of great relevance for this research as various sections below show. It also harmonised well with a social constructionist philosophy and the view of the mind which takes into account different factors like influencing meeting participants through 'interactions with the environment, their task, and each other over time' (Kozlowski, 2018, p. 206).

2.5.3 Act4Teams coding scheme and BORIS software

Once the IPO approach was clarified, the key issue was to develop some tools to detect possible patterns helpful for producing parts of the answers to the research questions.

Some history will be presented to inform the thinking process that was followed and to explain the choices made. Researchers with focus on small groups have tried to develop over time extensive quantitative frameworks (Brauner et al., 2018). It appears there is no foundational date marking the start of the work on small group research (Kauffeld & Meinecke, 2018). When searching with keywords like 'group interaction', 'social interaction', 'group interaction observation', 'small group effectiveness', 'meeting effectiveness', 'meeting behaviours', the name Bales came up from various perspectives. His work was of relevance as he focused on problem-solving tasks that groups were entrusted with. The task of the present case study is a problem-solving task.

Bales started long ago (1950) before he could present his complex analytical and coding scheme laid out in his two books 'SYMLOG' (1979) and 'Social interaction systems' (1999). His system was rather overwhelming upon first read. Bales was preoccupied with correlating tasks and behaviour. He developed the so-called interaction-process-analysis (IPA) framework. He created categories of behaviour and sub-behaviour described as events to codify the thoughts expressed and exchanged in group interactions. Every unit shared in a group discussion was supposed to fit one of the twelve categories of behaviour he had defined.

While it was attempted to apply Bales' approach in this research, it was not suitable to transpose. It would have required a disproportionate amount of work and it would not have fitted the qualitative, social constructionist approach which informed this research.

Yet, the idea of detecting behavioural patterns using a coding scheme was not discarded. Additional research identified an alternative coding scheme which was in the direct lineage of Bales' work. It was important to mention Bales' legacy as a significant amount of work was originally invested to understand it and finally disregard it while acknowledging its parenting influence on the scheme used subsequently, namely the Act4Teams coding scheme (Kauffeld et al., 2018). Over the decades, significant evolution (Mathieu et al., 2018) and newer frameworks like Act4Teams have made coding of meeting interactions possible and more accessible. These are discussed further in chapter 4 on methodology (p. 51).

Finally, the software used to apply the Act4Teams coding scheme should be mentioned. It is called Behavioural Observation Research Interactive Software (BORIS). Without BORIS, the vision of coding what meeting participants said as a proxy for analysing their meeting behaviour would not have been possible. This helped gather insights or lack thereof to pursue the why and how questions of the case study, exploring how visual templates may or may not change the process, perceptions, and output of the ten meetings. Detailed understanding of BORIS and its implications for the present research are further expanded in section 5.3.5 (p. 95).

2.6   Knowledge visualization and group interaction analysis

The phenomenon at the heart of the study deals with the challenge teams are facing when they meet to share knowledge for the purpose of solving a problem or at least for making progress towards solving it.

Traditionally, small group research has had a long lineage originating in the work of Bales (1950) with different branches that have developed over time. When looking at answering the research questions forming the case study of the present research project, a search for analytical frameworks which could help understand better the phenomenon at stake was identified in the tradition of analysing the input-process-output of meetings as detailed in section 1 above. Figure 9 below sketches the bringing together of the knowledge borrowed from the group interactions analysis body of knowledge and the use of visual template as understood in the body of knowledge formed by the domain of knowledge visualization.

On reflection, there are essentially three situations that can be faced by team members. The first situation relates to the case where a team member does not have a piece of knowledge and depends on the other team members to acquire a relevant piece of knowledge. The second situation is that a team member possesses a piece of knowledge that others also know about, yet it needs to be shared to understand concretely who knows and who does not know about it. Third, an individual has a unique piece of knowledge that only she or he possesses among the team members in the team they belong to. Most of the time, meeting participants are not only

unaware of these three categories, even more, they do not know to which category the other participants belong.

In all three cases (missing knowledge, shared knowledge, and unique knowledge), it is a challenge for a team member to correctly identify which situation they are in. First, the piece of knowledge needs to be shared and travel from the mind of a team member to the mind of the other meeting participants. Second, imparting knowledge does not mean that it will retain the attention of the other meeting participants. Even if the piece of knowledge shared is acknowledged by the other meeting participants as it is being shared, a third hurdle still exists which is to make use of the piece of knowledge shared.

Using knowledge visualization interventions as a meeting participant, as a meeting host or as an active observer of the organisational life, can lead to fundamental differences on the meeting output depending on how the meeting process is run. Depending on whether the meeting was supported or not by handwritten or digital knowledge visualization techniques, the output of the knowledge exchange in the meeting could lead to very differentiated output. Depending on the way a meeting is led, the output can vary immensely by the end of the meeting. This field experience gave the spark to take a more evidence-based management approach. Evidence-based management has been defined as being 'about making decisions through the conscientious, explicit, and judicious use of four sources of information: practitioner expertise and judgment, evidence from the local context, a critical evaluation of the best available research evidence, and the perspectives of those people who might be affected by the decision' (Briner et al., 2009, p. 19).

It was of the essence to not only cultivate the belief that the use of knowledge visualization worked because I could personally see merit in it. It mattered to place this sentiment in the larger picture and also see what others may have said and discovered. The need to have the use of a visual template researched and evidenced for whether knowledge visualization works or not was important enough for a research project to be undertaken.

The overarching research aim was to make an informed decision on whether to invest efforts to promote more systematically the use of knowledge visualization to foster knowledge sharing in field meetings. In the literature, evidence-based management is often performed by practitioners targeting critical knowledge that they research to inform their practice. A key element in this approach was the use of a systematic literature review to cover a possible area of relevance (Briner & Walshe, 2014).

The growing body of literature in the field of knowledge visualization has been focusing its efforts on delineating the benefits, risks, and opportunities of knowledge visualization in business. It has mainly used quantitative approaches to evaluate the impact of given visual interventions on the output of knowledge sharing and knowledge communication endeavours in the field of knowledge visualization (van Biljon & Renaud, 2015a). It seems that the body of knowledge informing this research has less emphasis to date on how visual interventions in meetings affect participants' behaviours in meetings. When wanting to shift from a quantitative

view of the impact of knowledge visualization interventions to a more qualitative exploration, the issue was to find a body of knowledge which could help with this exploration as presented in Figure 1 below.
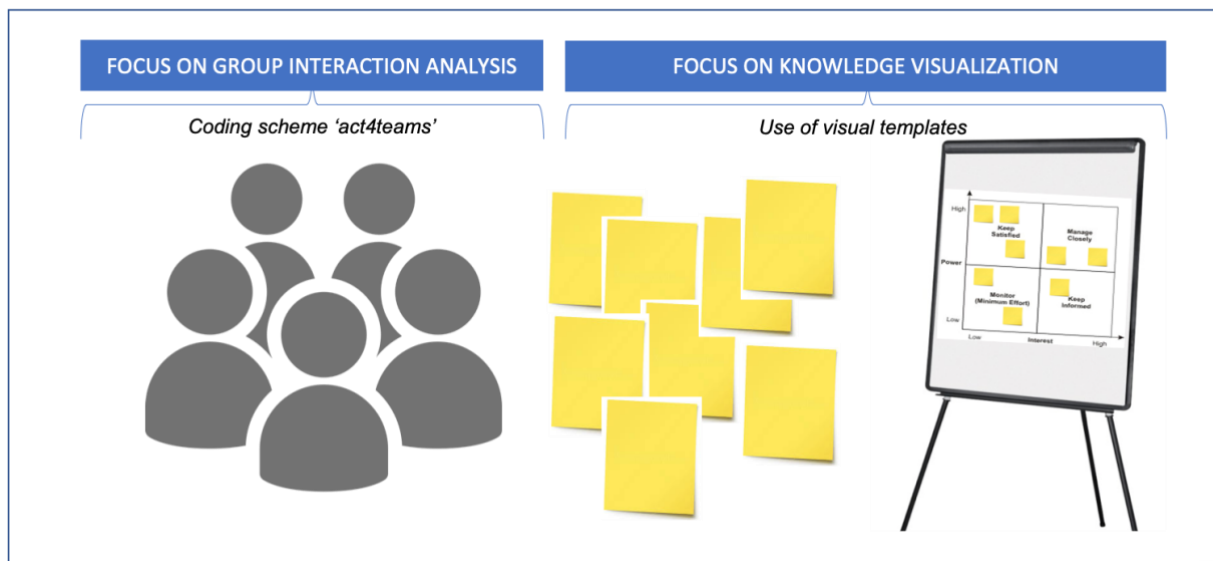
Figure 1 Combining Act4Teams and knowledge visualization

Interestingly, bringing these two domains together gave enough basis to design the research project. The remaining part of this chapter explains how bringing these two bodies of knowledge together helped answer the research questions.

2.7 Expanded literature review

To explore and explain the findings that followed the pursuit of the three research questions, an iterative approach materialised regarding the literature review. An iterative process including the findings and the relevant literature became necessary as the body of knowledge which informed the research project at its inception needed to be expanded. This iterative-inductive dynamic (Orton, 1997) helped to structure and focus the findings presented in chapter 5 (p. 79).

Three additional concepts present at the periphery of some of the seminal articles needed to be added and made more central to help interpret the findings. The present research does not claim to represent an in-depth mastery of each of these additional perspectives as they span several disciplines, yet equally, it would have had the potential of being a misleading piece of research to leave them out. The choice made is to borrow the insights from the authors quoted in the field of social constructionism, knowledge visualization and small group interaction where this piece of research is most proximate to and familiar with.

Two additional concepts revolving around the theme of the Dunning-Kruger effect (2.7.1) and the topic of 'nudging' behaviours have been supplemented (2.7.2). They were present in the literature reviewed but did not occupy at first a central role until reaching the phase of data analysis. It became clear they also needed to not only be included but also to become the starting points of future research to deepen the phenomenon this research has been trying to understand.

While these additional concepts belong to extensive theoretical frameworks, they will only be drawn upon insofar as they help understand some specific aspects which came out from the data analysis. The unattributed saying goes that 'good research poses more questions than it solves'. This research has raised many questions as the work progressed, more than could be imagined at the start of the project and surely more than what could be integrated in the write up. The need to expand the literature review in the directions below is an expression of this phenomenon.

2.7.1 The Dunning Kruger effect on meeting know-how

One question has been a trigger for the pursuit of this research. Namely, how come - with all that is known about what makes a good meeting - the overall sentiment of meeting processes and output remains negative as described in chapter 1 (p. 10)?

When looking at the fifty-seven responses given to the individual questionnaires harvested in the context of the present case study, it became clear that some additional literature would be necessary to understand a paradox. As it appeared, meeting participants expressed a comparably high level of satisfaction with the meeting output whether they used a visual template or not. This was judged on whether a team had a document of their discussion or not at the end of the 30-minute meeting. This came as a striking aspect of the findings and additional efforts were invested to understand why this occurred.

This additional research brought into the foreground the concept of the Dunning-Kruger effect (Kruger & Dunning, 1999). The Dunning-Kruger effect is a cognitive bias which leads to allocating a value to a phenomenon that departs from what could be observed by third parties. It appears that people are not naturally equipped with the ability to appreciate their blind spots. An overconfidence in one's own ability leads to a lack of awareness of the limits of one's own capabilities. It is particularly the case for lower performers among whom the phenomenon seems even more present. Dunning and Kruger expressed it as being under a double curse. The first curse is the one of not knowing. The second curse is the one of not being aware of one's own ignorance. Ehrlinger, et al. observed that , first, their lack of skill, by definition, makes it difficult to produce correct responses and, thus, they make many mistakes. Second, this very same lack of skill also deprives them of success at the metacognitive task of recognizing when a particular decision is a correct or an incorrect one (Ehrlinger et al., 2008, p. 99).

When a skill is not present, it appears that it is very difficult to realise that the skill is lacking and the actual scale of the impact of the missing skill. This leads to poor meta-cognition and low accuracy in self-assessment skills (Dunning, 2011).

A contextual and more detailed understanding of how some individual questionnaire results are linked with the Dunning-Kruger effect will be given in the concluding chapter.

2.7.2   About nudging in relation to knowledge sharing

The case study was conducted in an organisation where the biggest professional community is comprised of economists. In 2017, when Thaler won the Nobel Prize in Economic Sciences, attention was given to behavioural economics. At that time, the research process was at its inception. Discussions were conducted when preparing the research proposal with people in the organisation. When explaining to people about the case study planned and that it would revolve around exploring the use of visual templates to foster knowledge sharing in face-to-face team meetings, several voices expressed a direct connection to behavioural economics and the work of Thaler and Sunstein (2009). They describe nudges as details 'focusing the attention of users in a particular direction' (Thaler & Sunstein, 2009, p. 4).

On his own, Sunstein, a legal scholar, also reflected on whether using nudges would be ethical (2014a). He teamed up later with Hastie, a scholar in psychology, to explore groupthink and how nudges could mitigate this potentially negative bias (2015). All three perspectives came together: decision-making and group behaviours, group behaviours and groupthink and the ethical dimension of nudging. The three aspects were of direct relevance and helpful to interpret and reflect about the data and the subsequent findings. It remains to date a source of surprise that so few meeting scholars or knowledge visualization scholars have not brought these together more explicitly. It seems that only two key authors in the field of knowledge visualization have done so (Eppler & Kernbach, 2018).

Introducing nudging in the literature review was one of those decisions that became irresistible in context. The feedback received when working on the research project in the organisation was so compelling that in the name of a social constructionist approach, the suggestion to integrate nudging was followed. Fully aware of the risk and of being superficial versus the good idea to build the bridge to a valid and helpful theory for the future, the balance was tipped towards including nudging in the literature review.

Nudging comes from the field of behavioural economics. Behavioural economics challenges the worldview classical economics holds about people being all equal at everything. Behavioural economics presupposes that people are not rational in their decisions but are optimising their decisions to their benefit and prefer to indulge in pleasure than in reason. To influence the way people make decisions, behavioural economics strives to organise alternative choices to the default choice people may make if not presented with an alternative (Thaler & Sunstein, 2009). It uses a so-called 'architectural choice' which offers an alternative way to the habitual one way of doing things. A famous example is the placing of a picture of a fly in the bottom of the urinal in the gentlemen's rest room at Schiphol airport in Amsterdam in the Netherlands, leading to a dramatic improvement in the hygiene of that corner and an 8% cost saving in cleaning as visitors aimed at the fly. This has inspired several governments to build nudge units to help shape public policies and offer alternatives to habits considered less useful (Murray, 2017).

A nudge does not impose an alternative, so the proponents of behavioural economics see it as compliant with a liberal and democratic worldview. Applied to this research, a visual template could be an alternative architectural choice to support the sharing of knowledge in meetings. Meeting participants may decide or not to use a template available in the room to document their discussions and agreement about the problem-solving task they are jointly working on.

2.8   Knowledge gap identified

This research relates to two fields of research, namely communication and small group research. Both fields of research are connected to a variety of domains of application. The two domains of application that are the closest to the context of the case study are knowledge management in organisations and communication in team meetings at work. The identified gap in knowledge is made of several elements related to different aspects of the two fields and two key domains of application as presented in Figure 2 below.
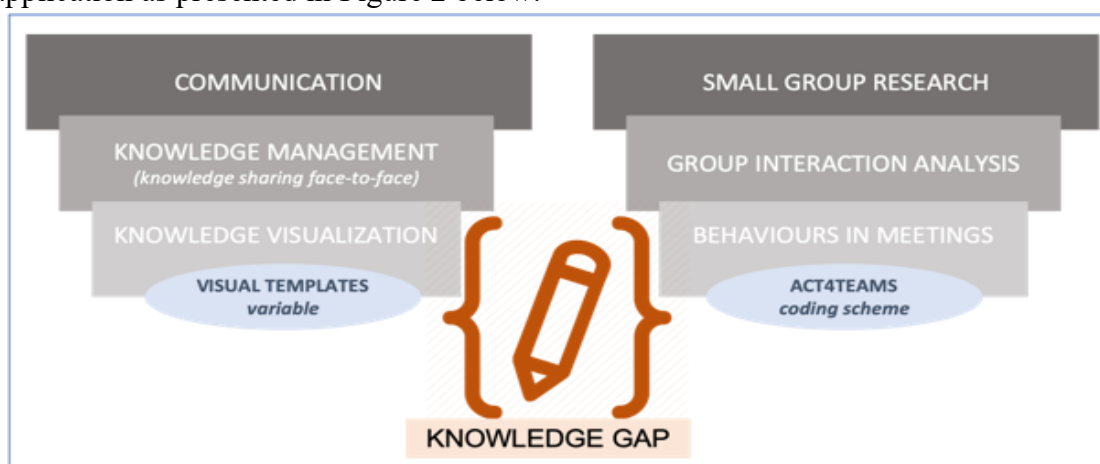
Figure 2 Knowledge gap identified

First, the research took place in an organisation with people used to working in teams outside the case study, called 'real team' in this research as opposed to a team formed in a lab for the purpose of an experiment.

Research in both knowledge visualization and meeting behaviours is essentially quantitative, using experiment or quasi-experiment methodologies as shown in the meta-analysis of Mesmer-Magnus and DeChurch (2009) or by the overview presented by Gavrilova et al. (2017, p. 11) while this case study is following a qualitative approach.

The literature indicated that evidence of the influence of collaborative knowledge sharing visual practices is scarce. Bresciani and Eppler (2009, p. 3), referring to boundary objects which is a synonym of visual templates, stated that 'few, mainly qualitative (and highly cited), studies have examined the effect of boundary objects'.

Second, to the best available knowledge at the time of writing, there was no research using the group interaction analysis called Act4Teams applied to the use of visual templates in face-to-face meetings at work. This was discussed in the context of the present research with a regular

co-author (Meinecke) of the originator of the Act4Teams coding scheme (Kauffeld) and with the lead researcher for knowledge visualization (Eppler).

Third, the research focused on making explicit why and how visual templates may or not influence knowledge sharing in meetings. By exploring through the lens of 4E cognition how meeting participants interacted among themselves, within the room and with the visual template when available, several deeper elements of understanding were made explicit.

Fourth, the use of open-source software called 'Behaviour Observation Research Interactive Software' (BORIS) for the purpose of observing team meetings was also a novel application. BORIS is used by natural scientists to observe animals. The functionalities are comparable to those offered by software developed for studying human behaviours. The significant difference is that BORIS is free and open source, kept up to date and improved by an active team of researchers of the University of Turin in Italy.

Dedicated software to observe human behaviours is often very expensive and does not seem to offer fundamentally more meaningful functions. It is likely that the expensive licence fees of coding software have had an impact on using coding to explore behaviours of meeting participants. This free of charge software opportunity may create new possibilities both for academic research and for practitioners in organisations.

The space for contributing to knowledge can be found at the crossroads of bringing knowledge visualization and the Act4Teams coding scheme together in a field study as summarised in Figure 3 below.
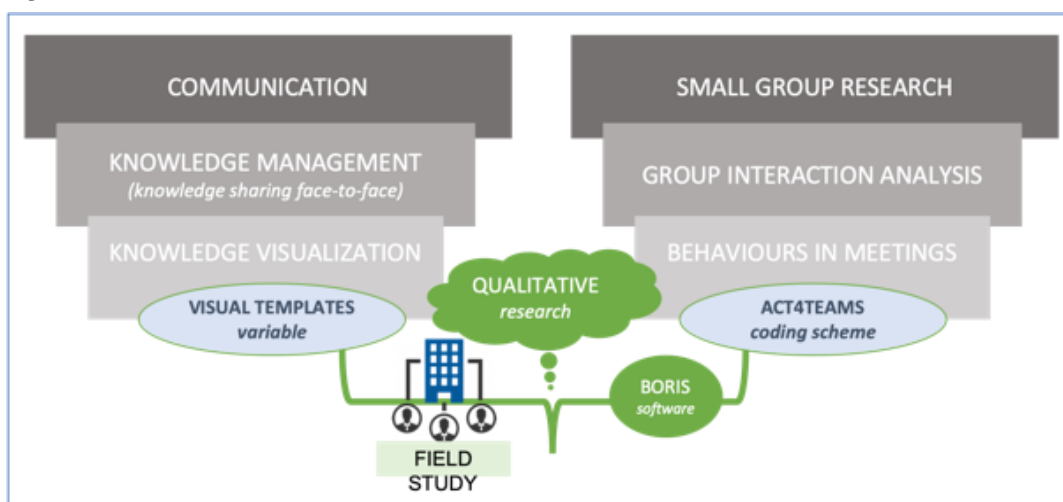
Figure 3 Expected contribution to knowledge

An additional contribution to knowledge relates to the actual use of visual artefacts as an integral part of the observation, data analysis and findings. The body language of team members working with the visual templates as documented by the photographs taken during the meetings was of particular importance for understanding why and how visual templates can influence the output of meetings in the context where the study took place. Some methodological insights have been drawn from sensory and visual ethnographic work (Pink, 2013a, 2015).

Some additional confirmation of the importance of visualization for knowledge transfer and in particular for learning purposes has been drawn from the work of Ursyn, who considers visualization 'in the context of knowledge management as a stimulus to its understanding' (2015, p. 391). In turn, van Biljon and Renaud have researched the importance of the use of knowledge visualization in academic research and observed that 'in education, the essence of the educational assessment process requires knowledge to be communicated (transferred) by means of academic writing. This, then, is where knowledge visualisation might well play a mitigating role' (2015b, p. 27) and help transfer knowledge between author and reader. Wang and Jacobson affirmed that 'knowledge visualization has the potential to facilitate the construction of understandings at a deeper level as well as with multiple perspectives such as interpretation and abstraction' (2011, p. 1). The authors added that 'Knowledge visualization, viewed broadly to include both information and social visualization, has potential advantages for encouraging deeper understanding, hypothesis building, reasoning, and problem solving, and these advantages have been well recognized in learning and knowledge management research and practice' (Wang & Jacobson, 2011, p. 2).

The need to expand the methodological tools originally anticipated was unveiled after the data collected were physically visualized on the wall (Picture 2). When searching for patterns to analyse the data and draw some insights, the approach used proved important and led to some additional research to give it a framework and relate it to other academic work having employed comparable approaches.

2.9   Chapter conclusion

In this chapter, four key perspectives have been presented.

First, knowledge visualization was distinguished from data and information visualization. It was also explained how studying meeting interactions by coding what people say could help explore how behaviours compare and contrast between meeting supported by knowledge visualization and when not.

Second, several defining terms were spelled out to ensure clarity about the concepts in the scope of the case study. These definitions covered the most helpful concepts and ranged from defining teams, problem-solving tasks, stakeholder mapping, meeting effectiveness, to the Act4Teams coding scheme.

Third, some essential insights were also added regarding 'extended cognition' bridging the field of study of philosophy, psychology, and neuroscience with the use of visual templates. It also covered the so-called Dunning-Kruger effect which relates to the fact that teams have blind spots and tend to overestimate their capabilities, explaining why meetings do not really evolve despite the obvious and widely shared dissatisfaction.

Fourth, visual templates were put into the context of the broader field of behavioural economics and were equated with an architectural choice meant to help teams address shortcomings of their meeting processes and output. To conclude, visual templates are meeting nudges.

3 Research philosophy

3.1 Chapter overview

Chapter 3 is concerned with the research philosophy and presents the ontological beliefs of what constitutes reality in the logic of this research. It also refers to the ways of knowing.

Articulating answers to questions about what ontology and epistemology are and about how I know what I know and where my knowledge comes from – helps with creating a framework to build assumptions and be explicit about these assumptions, which helps inn turn among other things with avoiding biases. As Robson (2011, p. 171) states, 'issues of bias are present in all research involving people (…) in particular when there is a close relation between the researcher and the setting'. Bryman and Bell (2015, p. 178) reported that 'the possibility of lack of objectivity and of the intrusion of the researcher's values would appear to be much greater when examining the social world than when the natural scientist investigates the natural order'. A certain degree of coherence in the interpretation of the phenomenon studied is more likely to be achieved by being able to explain one's own responses to these questions.

After giving an overview of the content of the chapter (3.1), the more specific 'school' of social constructionism hosting this research is presented (3.2). Social constructionism is often explained as conceiving reality to be made of the meaning and mind-based representations given to the words exchanged within social interactions (Galbin, 2014). While no school of thought has the ultimate definition of what social construction of reality is, the present research borrows from social constructionism in the tradition of K. Gergen (2015) where the emphasis is placed on the relational dimension of social construction to other people and their environment.

Another dimension of the philosophical underpinning of this research resides in bringing forth the role of the body, the senses and the unity of body-mind-environment (Holstein & Gubrium, 2008). This is captured under the heading 'knowing beyond the mind' (3.3). The chapter is concluded by appreciating the synergy between the social constructionist impulses and the embodied process of knowing. Some authors have expressed criticism for the limited attention given to the senses at the origin of social constructionism. 'Reference to the senses are only brief' (Asia, 2016, p. 80). Uniting these different dimensions helps interpret the data collected and the findings in their original context (3.4).

3.2 Knowledge as social construct

Several dimensions contribute to the construction of reality. Exploring how visual templates influence the sharing of knowledge in face-to-face meetings at work brings several of these dimensions to the foreground. Meetings are places for relating to other members of the team. The act and process of meeting and discussing are ways of relating between participants with the intention to perform the task entrusted to the team.

Social constructionism is a philosophical approach which focuses on understanding and addressing social change in society and in organizations. The term 'social constructionism' was coined towards the end of the sixties (Berger et al., 1967).

Social constructionism does not deny there is an objective reality. It is interested in the way people interact and generate meaning as they interact among themselves and their environment. It presupposes that through their interactions, people construct the reality they relate to.

There are several positions in social constructionism, each laying emphasis on a different aspect of the philosophy, in particular in terms of domains of reference: feminism, ethnography, psychology, etc. (Burr, 2015). The present research refers mostly to the work of K. Gergen (2015) and of Camargo-Borges and Rasera (2013).

The work of K.J Gergen is particularly relevant as it explores the social construction of reality with a particular interest in dialogue, co-action, and relationships. It gives particular importance to the question of what happens when we relate to each other (K. J. Gergen, 2015). It is also preoccupied by the questions around what happens in organisations and how collective intelligence can be activated for decision-making or knowledge sharing (K. Gergen, 2015).

Camargo-Borges and Rasera have less extensive work to offer yet a very stimulating take on social constructionism in organisations. Their work focuses on the transformation of organisations and how social constructionist views can help with this purpose in mind. It has a strong dimension on knowledge production in organisations and how knowledge production may take other shapes and forms than words and encompass visuals and artefacts. For these authors, social constructionism is a 'way of thinking and doing that moves away from expertise-based, rational, hierarchical, and result-focused models going toward more participatory, co-creative, and process-centred ones' (Camargo-Borges & Rasera, 2013, p. 3).

This is against the background of the research fitting well in these two streams. The concepts of relations and artefacts are central to the work of Gergen and of Camargo-Broges and Rasera. In addition, for the latter team of authors, dialogue and artefacts creation are researched in the context of organisational development. It also echoes the reference to social constructionism in previous research in the field of knowledge visualization ((Burkhard, 2005a); (Comi & Eppler, 2011).

Both realists and constructionists recognize the need to map and detect patterns in the world (Moses & Knutsen, 2019). They affirm that 'for the constructivist, truth lies in the eyes of the observer' (Moses & Knutsen, 2019, p. 10). As this research has focused on knowledge visualization, using this reference is in many respects meaningful. The eyes of the meeting participants have played a key role. How they shared and related to what they saw and made others see was key to this research. In addition, past research in related fields has often been quantitative and therefore cultivating the intention of proving the single truth held in using knowledge visualization for knowledge sharing purposes in meetings.

In the present research, the intention is less to prove the impact of knowledge visualization on the output of team meetings, and more to understand how and why it might have an influence. This implies the need to explore the relations between the participants, between the participants and the visual template and how they make sense or not of their perceptions and exchanges.

This research is about how teams and team members perceive the world and their relations to their tasks and interactions. It is less about arriving at assertions on how the world is. This makes social constructionism a particularly suitable paradigm to account for the beliefs, presuppositions, social influences, and values that prevail over this research.

Two dimensions of the research are brought to the forefront in this section of the chapter on philosophy. First, how social constructionism focuses on relations (3.2.1) and second, how social constructionism sees words, numbers and visuals contributing to the representation of knowledge (3.2.2.).

3.2.1   Relating

Two aspects of social constructionism deserve to be in focus. They have been retained for their direct relevance for the discussions in chapter 5 on data analysis and findings . These aspects are presented in succession. The first aspect relates to the idea that the construction of knowledge would be the result of social interactions leading to co-creation. The second aspect relates to the fact that knowledge would essentially be situated in the context where it is generated and shared, so it would have contextual value and relevance.

*First, that the construction of knowledge is the result of social interacti*ons leading to a co-creation process. Parallel to the logic of the input-process-output ('IPO') presented in chapter 2 to describe what happens in meetings, a comparable three-step approach can be found in the way knowledge is constructed according to the social constructionist paradigm. Three phases are involved in creating knowledge out of human inter-relations: '

Externalization can be equated with the process where people exchange their impressions and experiences of the world. Objectification can be defined as making the social relations tangible, by making these relations an object thanks to the discourse used to embody in words or another medium the description of people's impressions and experiences.

The internalization is the reflection about the meaning generated by having experienced externalization and objectification. Internalization contains an important aspect of self-reflective practice with a space to critically review what is being exchanged. During this process, meaning is viewed as reflexive and where wanted meaning can be influenced before being internalized again.

Borges and Rasera (2013, p.3) explain that 'the production of knowledge in a constructionist perspective is characterized by processes of deconstruction, reconstruction, and especially democratization.' Through this process, participants can generate new ways of understanding a given topic and influence the way it is understood and filled with meaning. This is how participants may have a transformative role on the reality they relate to and exchange. Meaning generation becomes more democratic as participants can influence the deconstruction and reconstruction of what is shared. It is more participatory (Galbin, 2014).

The transformative and participatory dimensions underlined above were of relevance when exploring how and why the use of a visual template may have an impact on the output of meetings. The generative opportunity that visual templates offered to participants to alter or shape meaning will be further deepened when describing the findings. Knowledge visualization and visual templates appeared to foster a relationship-based construction beyond the individual understanding of the world (chapter 6 below). Knowledge is not exclusively contained in the heads of the individuals.

As one visualizes the knowledge, one creates meaning with the viewers who visualize the knowledge. It contributes to sense making which 'involves the ongoing retrospective development of plausible images that rationalizes what people are doing' (Weick et al., 2005, p. 409). Knowledge visualization fosters a relationship-based construction of the world beyond the individualist one. It helps the group make sense together through the relations and interactions the visual template stimulates among them and with the pieces of knowledge materialised on the visual template.

To conclude, from the relational social constructionist perspective, the individual is not the source of the knowledge but actually it is the relation between the individuals which helps generate knowledge (Gergen & Gergen, 2016). Andrews (2012, p. 42) says 'that the world can only be known in relation to people's experience of it and not independently of that experience'. In the process of externalizing and objectifying, there is a shift from the individual viewpoint and the internal realm to the collective viewpoint and to a space in between the individuals. These individuals are called, in the context of the present research, participants or team members. The notion of 'team member' refers to a static status of organisational belonging, describing the link between a person and a particular unit forming a team. The concept of 'meeting participant' brings forth, in addition, that team members can also be participants when they join a meeting which underlines that the sense of participation and co-creation are at the heart of this research. The co-creation is both epistemological, the fact we are in relation we co-create, and a practice. From the way the process of relating to each other is engineered, the relation becomes the basis for co-creation.

It is interesting to reflect on the risk that 'social constructionism blurs the division between intervention and inquiry, inviting the professional to become an integral practitioner-researcher' (Camargo-Borges & Rasera, 2013, p. 6). The result is the creation of new knowledge and insights as to how a given part of the organisation works. Dialogue and co-

creation are the whole mark of this type of philosophical orientation and are seen as practical tools which evolve as people relate and interact.

Second, knowledge is situated. Social constructionism is not about the existence of a prevailing truth but about the social construction of meaning. The knowledge created through the social relations and interactions will be situated and make sense in that particular context. The same participants in a different context may generate different knowledge and meaning while relating to a similar, or even identical topic of discussion.

Burr (2015) brings some additional insights when it comes to observing that some relational dynamics among participants may be influenced by other factors than the participants' personalities. While personality traits are commonly perceived as stable, visited through social constructionist lenses a different worldview becomes possible.

Each of the ten teams has its own stakeholder paradigm. The goal of evaluating the output was not to appreciate whether the teams would have named an exhaustive and correct list of stakeholders. The goal of the exploration was to explore the situational effect of using or not a visual template and how this helped the meeting participants in co-creating a common understanding of who their stakeholders were. Only the participants in the co-creation of the stakeholder map can appreciate the value of the maps. Therefore, in the next chapters, no appreciation of the correctness or completeness of the stakeholder maps is provided. What will be focused on is the process of knowing how to reach an output or not and how the process to do so is perceived by the participants. It will also have to do with whether observable patterns of behaviours can be detected and reported as linked or not to the use of visual templates.

3.2.2   Speaking

Several ways of expressing knowledge cohabit in both the social constructionist paradigm and in the present research. These different ways of expressing knowledge are made of systems of signs to represent and support the communication of a view of reality. Three forms of signs deserve more attention for the role they played in this research: words, numbers, and visuals. All three systems of signs and representations were relevant all along the research project.

Each of these three representational forms in the chapter on philosophy helped to root the conversation in a deeper understanding of how knowledge and meaning can be generated. A more open understanding of language is used to interpret the data and articulate the findings of the present research and not a narrow understanding of language limited to words. It mattered to shed new light on how numbers in a qualitative research project were no different to words as symbols used to communicate certain experience or insight.

As far as words are concerned, they do not only represent reality but are generating reality as they are being exchanged with others (Andrews, 2012). According to Andrews 'it is language that makes thoughts and concepts possible and not the other way around. Language predates concepts and provides a means of structuring the way the world is experienced' (2012, p. 41).

In a social constructionist paradigm, words become a medium to do things with other people. They can play many roles. They help represent the world. Words help give form to the knowledge either held originally in the mind or to knowledge created as people interact with each other. These words form the language used in a particular context which in turn contribute to generate meaning. Burr (2015, p. 60) considers that 'the meaning of a sign resides not intrinsically in that sign itself, but in its relationship to other signs'.

It is less the descriptive character of words that interests social constructionists in the lineage of Gergen and Gergen (2016). What is of interest are more the actions that are the result of a dialogue, through saying words and relating to them. This relates to the dimension where in a relational social constructionist paradigm, actions follow the relations that people are experiencing. The same people while using the same words in a different context may well mean different things and build different worlds.

In this research, the ten teams had several stakeholders in common but the relation that each team has to them is unique. Words provide their users a way of giving contextual meaning to their experiences. The relations established in the meetings are products of the language participants used to produce knowledge to solve the problem they were tasked with. Words are vectors of social construction, meaning that 'social reality is constructed in communicative interactions' (Luckmann, 2013, p. 45).

When it comes to numbers, there is a common impression to consider that they describe 'the truth' by the seemingly quantitative nature of their expression. In this research, numbers have been used not with the intention to describe 'the truth' but with the intention to detect patterns which may not reveal themselves with words. Gergen affirms that numbers 'are no more an adequate 'picture of the world' than words, music or painting' (2015, p. 65). Numbers have been used and displayed to help grasp patterns and describe a level of interaction which cannot be analysed or seen unless it is coded and translated into numbers.

To express it simply, the fact that this research has been proceeding from a social constructionist view of the world and yet uses numbers and statistics has not been a source of disruption or contradiction. Social constructionism does not reject as such the use of numbers or statistics.

Numbers and statistics can be analysed as establishing a relational dimension among multiple actors. Equally, the important social constructionist concept of co-creation can be activated with numbers. These numbers built together with the findings, the researcher, and the literature a network of actors. Numbers or statistics can become actors in the dialogue between the researcher, the phenomenon explored, the data collected and the self-reflection leading to the findings. Such a network has a generative power equivalent to more traditional components of social constructionism (K. Gergen, 2015).

As far as visuals are concerned and viewed from the social constructionist paradigm, not only is the construction of the world an act of speaking and writing words or turning patterns into numbers but it can also, among other things, be an act of availing visually what one wants to

share and let others give feedback and agree or disagree with the contributions. From this standpoint, knowledge visualization can be described as a dialogue facilitator which not only harvests what individual participants may think but also can become an active crucible prompting the collection of meaning. It can help generate and co-construct sense. Knowledge visualization can form a new representation of the world that did not exist in the respective individual minds before being materialised and availed to the group (Comi & Eppler, 2011).

The visuals co-created among the participants present were contextual, situated and they materialised the output of the relations between the participants. Iteration after iteration, the relations and the sharing often led to evolving the visuals co-created, adding, altering, dropping, redirecting the visual elements. These visuals differed depending on the meeting time available, how much the participants felt connected or concerned by the problem they were supposed to solve. Participants may have come to the meeting with one representation of reality and left with one or more different ones. This is the performative nature of the social constructionist conversations (Gergen & Gergen, 2016). It means the output of the act of relating leads to performing one or several new acts. Knowledge visualization becomes a means to collectively make sense through sequencing the sharing and the negotiation of new meaning and consensus. It stimulates a relationship-based construction of the world beyond the individualist one.

3.3 Knowing beyond the mind

This second part of the philosophy chapter adds to the usual questions covered by philosophical discourse - *'what is the world made of'* and *'what is knowledge in this context'* - another important question *'where do I know what I know'* and even *'where do WE know what WE know'* (Moses & Knutsen, 2019).

From this perspective the act of knowing becomes an activity versus a fixed and determinate way of defining knowledge. It invites moving beyond knowing in the mind for oneself to knowing beyond the boundaries of individual minds and expanding possibly to bodily experiences, like the sensory system or body movements. This philosophical approach borrows from philosophers like Rowlands (2010) in the field of the extended mind and embodied phenomenology.

From the various senses, the seeing function is central in the present study, both among the meeting participants as well as for the observer-researcher. Seeing is superficially explored from the perspective of visual thinking (3.3.1) while some insights are shared around embodiment from a sensory ethnographic angle (3.3.2).

3.3.1 Seeing

The seminal work of Arnheim (1969) on visual thinking has great relevance in today's society intensely based on multi-media with significant emphasis on seeing, viewing, and visualizing. Arnheim brings together two dimensions commonly kept apart the field of cognition and what happens in the mind, and the field of perception and what happens more through the senses in

the body. He has explored how visual perception is a cognitive activity in the sense that it is a form of reasoning and thinking. It is generally considered that seeing belongs to the realm of perception while thinking belongs to the realm of cognition. As a psychologist of art, Arnheim stands for uniting cognition and perception. He considered that 'perception is disdained because it is not assumed to involve thought' (Arnheim, 2015, p. 3). Arnheim considered that words are a referential medium and require an experience to be useful. The work of Arnheim has essentially expanded the field of teaching art. Yet he is mentioned as a seminal reference when it comes to highlighting the interaction between visualization and learning or visualization and knowledge creation and sharing (Bertagni & Salvetti, 2015). In her work, Ursyn (2014, p. 159) summarises Arnheim's thinking by affirming that 'perceiving and thinking being indivisibly intertwined(…) word and picture cannot be split into parts that have any meaning separately'. This is of essence when it comes to gathering elements to understand how supporting a knowledge sharing meeting conversation with a visual template can make a fundamental difference in terms of output.

Visual representations exist, and are particularly helpful in different fields such as learning, architecture, design, marketing, law, medical research, etc. The communication of one's own thinking, even without visuals, implies a recourse to conscious and often unconscious mental representations and models of different levels of abstraction. Over time, the use of external visual representations has grown significantly.

Human beings have a uniquely developed use of their senses (and of their ability to see) to produce meaning. This explains the common adage that 'a picture is worth a thousand words' (Lurie & Mason, 2007, p. 160). When visualising the tenets of a discussion or decision, the processing of information takes a new course. It appears therefore warranted to explore whether the statement that 'you can lead a group to information but you can't make it think' (Dennis, 1996, p. 433) holds true in the context of visualization of information and knowledge. The field of visual cognition is becoming accessible to the layperson due to the growing number of toolboxes and management books published.

Schneiderman wrote in the foreword to a book on information visualization that "the essence of information visualization is more ambitious and more compelling; it is to accelerate human thinking with tools that amplify human intelligence.' (Chen, 2004, pp. vii-ix). The plea made by Ursyn (2014) in this respect is significant as it also promotes the practical use that should result from a deep grasp of visual and sensory thinking in connection with knowledge to help create, think, innovate in organisations and in the society at large.

Going further, recent studies have explored and shown that emotions that can be released when visualising management information, appear to increase the impact of the information on the viewer's cognitive response (Bresciani et al., 2011). This had a bearing on the analysing aspect linked to discussion intensity and group member motivation supported by knowledge visualization techniques as shown in what meeting participants showed and perceived.

Visualizing as a process is more important than the actual visual output: it is not the knowledge visualised that matters but the visual knowing. Knowledge visualized is an output. Visual knowing is the experience of the whole input-process-output. By adding the bodily dimension, knowledge visualization permits moving beyond 'language games' (Wittgenstein, 1958, p. 17). Knowing is not bound any more to what is established ahead of the knowledge sharing process; knowing can take place as meeting participants relate to each other, the problem and the environment.

3.3.2   Embodying

To define and locate extended cognition in the broader context on how knowledge is generated, this research proposes to refer to 4E cognition. Carney (2020, p. 77) affirmed that 'Though very much in vogue, 4E cognition has received relatively few critical evaluations'. This being acknowledged, it remains that the perspectives offered by this framework were of great value to compile answers to the research questions pursued in this project.

4E cognition refers to *extended* cognition, *enactive* cognition, *embodied* cognition and *embedded* cognition. Inspired by the historical elements accounted for in Newen et al. (2018), Figure 4 visualizes a portion of knowledge retrieved on reading their handbook exploring the evolution of the role of the body in philosophy, cognitive sciences and psychology. The goal is not about mastering what each of the thinkers explained. The intention behind sketching the names of the authors and their key proposition is to observe how evolutive the concept of cognition has been in philosophy, cognitive sciences, and psychology over time. On the downside, there is a certain superficiality as it is very difficult to master each aspect and it is easy to spread thin. On the positive side, it avoids entrenching oneself in well-established and 'safe' beliefs that meet academic canons. The choice in this research has been to take risks to explore as a learner. It was when using the filter of 4E cognition that dots got connected and several 'aha' moments were experienced. While it would take more time to become fully articulate, 4E cognition has offered the understanding that all previous readings often left incomplete. Figure 4 below shows a visual overview of the evolution of the way cognition has been understood over time and across disciplines and created on the occasion of reading Newen et al. (2018).

PHILOSOPHY			NEW BRANCH OF COGNITIVE SCIENCES	PSYCHOLOGY
GREEK φ	MIDDLE AGE	20th CENTURY	1990s onwards	
PLATO'S DIALOGUE *The Phaedo* Already debates the role of the body in cognition	**NEOPLATONISTS** Struggle with the same questions Spinoza La Mettrie Condillac	**PRAGMATISTS PHENOMENOLOGISTS PHILOSOPHERS** Wrestle with the same questions	**FLOR, HUTCHINS** 1991 Distributed Cognition	**GIBSON** End 90s Ecological approach to psychology. Cognition does not only happen in the brain.
ANAXAGORAS Decisions can be explained by physical mechanisms		**COGNITIVISTS vs BEHAVIORISTS** The role of the body in cognition remains controversial	**HUTCHINS** 1995 Cognition in the Wild	
SOCRATES There is more to reason than bodily processes		**VARELA, THOMPSON, ROSCH** 1991 The Embodied Mind	**CLARK, CHALMERS** 1998 The Extended Mind	
ARISTOTLE Hands may play a role				

4E COGNITION brings the different perspectives together.
It opposes an internalist, brain-centred worldview.
It holds that cognition brings brain-body-environment to work together.
This is a provisional understanding as many questions are still debated.

Figure 4 Evolution of body, mind and environment in cognition (Saintot)

There is a bias towards accessing and generating knowledge from within the mind using words. There is some natural acceptance with including seeing as a source of knowledge. One can observe a tendency to or even deny other forms of knowing, namely through bodily experience and through relating to the environment.

While the body as a source of knowledge was not present to start with, it became unavoidable to include some philosophical reference to knowing through the body in the light of the observations and pictures collected during the data collection phase.

It would be a fallacy to pretend to be able to give a fully-fledged account of what cognition is. Yet, while a systematic and encompassing account would require cross-disciplinary knowledge

spreading at least across philosophy, neurosciences and psychology, some elements taken from the field of cognition are important to make the present case study subjectively complete within the boundaries of this research project.

The idea to explore and add this body of knowledge germinated in the light of the data collected and findings made. The keyword which originally triggered some more exploration is 'augmented cognition' and stems from an article about the use of knowledge visualization (Bresciani & Eppler, 2010, p. 359) where the authors distinguished between two different sorts of cognition at the individual and collective level: 'generative cognition' to create and share knowledge; and 'evaluative cognition' to assess and plan tasks.

From augmented cognition the next exploration led to the concept of extended mind (Clark & Chalmers, 2016) and the discovery of the handbook on 4E cognition (Newen et al., 2018). Figure 5 below proposes the various 'Es' of cognition. In this 4E cognition paradigm, the mind is not equal to the brain. Cognition exists beyond the brain, in the body and in relation to the environment, including in relation to other persons. From this broad angle, 4E cognition intertwines well with social constructionism as a philosophical stance. It complements in particular the work of Gergen and Gergen (2016) which emphasises the relational and performative character of the social construction of the world we live in and how it influences the way people think in return.
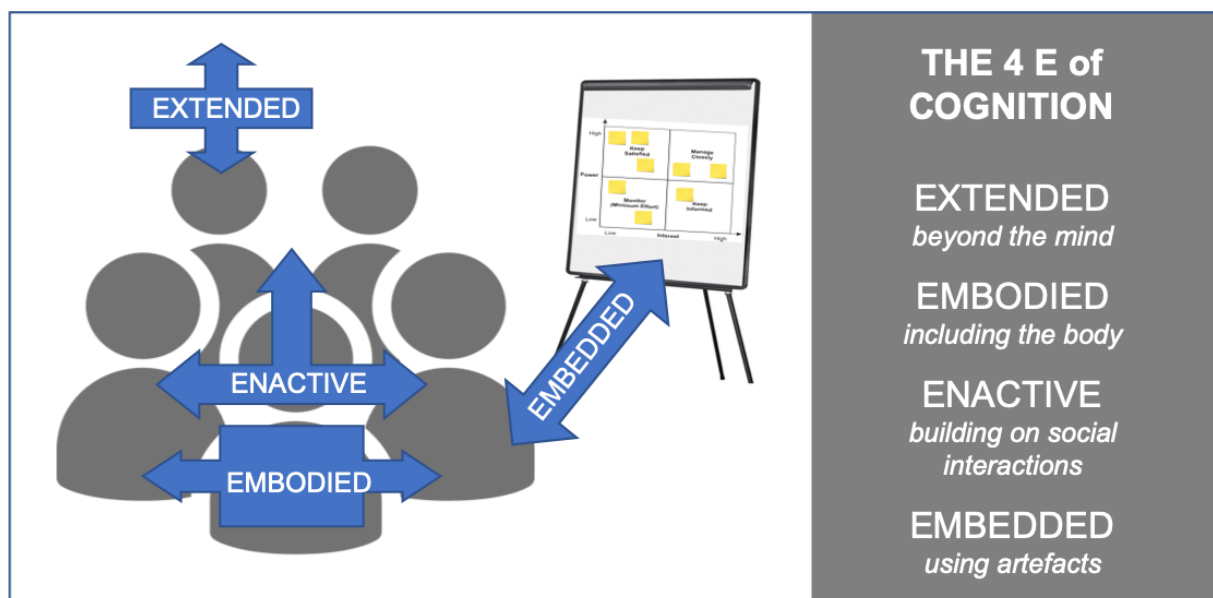
Figure 5 The 4E cognition model applied to this research (Saintot)

About extended cognition

A common belief is that meaning is generated through the representations made in the brain of words. Extended cognition happens when people also generate meaning outside of what happens in their brains. Extended cognition moves beyond the common understanding that meaning is exclusively internal (Vygotsky & Cole, 1978). In their seminal work, Clark and Chalmers (1998) proposed a new approach to how the mind, the body and the world interact and affirm that cognition extends beyond the boundaries of the brain. More recently, a renewal

in the interest in the theory of the extended mind has been seen (Theiner, 2011) supported by the expanding interest in neurosciences.

A useful account of the evolution of the theoretical underpinning of the extended mind has been proposed by Menary (2010). It shows the various streams, trends, agreements, and divergences of a nascent framework around extended cognition. While it would go beyond the scope of the present research, it is important to keep in mind the level of controversies around extended cognition to retain the necessary awareness that it will take time to have some alignment - if ever - across the disciplines contributing and benefiting from the ideas extended cognition offers.

In the context of the present research, it was observed that the cognition in the mind of the meeting participants was extended with what was available in the meeting room for them to perform the problem-solving task they were entrusted with. In particular, the presence or the absence of a visual template as external prolongation of their mind for cognitive purposes has been explored and more generally the use of pen and paper. The findings of the insights generated through understanding the phenomenon of knowledge sharing through the lenses of extended cognition are presented in chapter 6 on findings.

About embodied cognition
In a nutshell, embodied cognition proposes that meaning is not only originally generated by representations in the brain but can also stem from the bodily experience of people. The body is not only at the periphery of the brain executing mechanical orders from the brain. The body becomes a source of meaning generation (Shapiro, 2019).

In the context of the present research, caring for furthering a better understanding of how meaning among meeting participants is generated is helpful. It enables gathering elements of answers to the how and why questions being pursued. Building on both field notes and pictures taken during the meetings, the role of the body as an autonomous source to generate meaning in the meeting environment can be appreciated. A section has been dedicated to an outlying team which was highly exemplative of the theory of 4E cognition, namely section 5.5 below.

About enacted cognition
Enacted cognition encompasses the relations between the brain, the body, and the environment. It is the relational dimension of the extended cognition. It happens in relation with the other people and the environment hosting the relations (Rowlands, 2010). Accordingly, making sense of the world comes from being active in the world. It helps to make sense of the experience through the interaction between the brain, the body and the world (Overmann, 2017). Enaction points to a highly reflexive process. Internal representations are externalised, and external expressions are again brought back within. It flows between what one person has as internal representation and how it is affected after experiencing it externalised and in relation with the other participants.

This double loop, from inside to outside back to inside again and from individual to collective to individual, is of high relevance in the way knowledge is generated when using or not a visual template to facilitate knowledge sharing in meetings.

About embedded cognition

Embedded refers to the fact that internal cognition at times uses external scaffolding to unfold and support internal cognition. It brings together the brain, the body and the environment in action and interaction. The internal brain-based cognition is prolonged and aided by the environment and artefacts outside the brain (Rowlands, 2010).

Another important aspect of embedded cognition to generate knowledge and make sense is that it allows for a shift from the individual perspective to the collective level. It allows one's internal cognition to be shared with others and embedded in the environment allowing a collective process of knowledge generation to build on an external artefact such as a visual template. Embedded cognition presupposes action and interplay between internal cognition and external objects, scaffoldings, or artefacts. This brings the key aspects of the present research to the centre of the conversation as the visual templates or the written traces participants produce qualify as external scaffolds (Kirsh, 2009).

The reference to scaffoldings or artefacts, combining them with the idea that these external representations allow for a co-creative and cognitive space where participants can relate, could explain some findings from the data in the later chapters of this research.

3.4   Chapter conclusion

In this chapter, the philosophical underpinning of the research framework has been detailed. First, social constructionism was established as a philosophical framework with a focus on the relational dimension and verbal dimensions of knowledge production and sense-making where numbers and visuals also have a place. Second, the role of the body in the process of knowing was introduced to complement the epistemological paradigm used in this research. Knowledge is not only static and pre-existent; it can also be generated as people relate to each other and to the environment. Knowing does not only happen in the mind but also beyond the mind. Knowing is more than an individual internal process; it can also be external and collective. The present research follows a social constructionist and embodied cognitivist way of viewing the world. The remaining chapters will directly and indirectly be developing and embedding this philosophy in their reflections.

4   Research methodology

Chapter 4 hosts an account of the description of the procedure followed to design the research. Some readers may consider it too detailed. Other readers may appreciate that such a detailed account avails an opportunity to gain insights into the rigour invested before, during and after planning and collecting the data in the context of qualitative research.

It is a conscious choice to go for the detailed account as part of it explains the discoveries made in the process. As Hancock and Algozzine (2017, p. 24) observed, a case study is more 'exploratory' and less 'confirmatory' in nature. The exploratory character of the present case study is one factor motivating the detailed reporting. Additional reasons for the path selected are explained below.

First, after reading about several perspectives on qualitative research (Creswell, 1994; Holliday, 2016), it became clear that there is space for a qualitative researcher to choose what makes sense in a given context. Yet, with this extensive freedom of choice and design comes a responsibility to be transparent about the less visible parts of the project which had an influence on the output and findings.

Second, as a qualitative researcher, there are several temptations and opportunities to deviate from the plan, based on one's intuition or in the face of the challenges met. Having a plan to follow and to account for requires staying close to it. It allows as well for possible deviations. This was perceived to be a sound practice of self-accountability, which might be even more important than accounting for those interested in the research.

Finally, academics promoting rigour in qualitative research consider that qualitative researchers may at times give too few details about their work (Holliday, 2016). Details help in understanding the thinking path, activating the critical reflection when starting future research and allowing others to repeat a certain course of action or, conversely, decide against doing so.

4.1   Chapter overview

Following a presentation of the overall content of chapter 4 (4.1), the essential features of the case study are introduced. This section explains that the approach followed was in the tradition of the case study as promoted by Stake (1995, 2005). In this approach to case study, the researcher is to some extent involved in the case. This contrasts with a commonly used approach to case study, namely the approach developed by Yin (2013). In Yin's approach, the researcher would be more distant to what is happening with and around the phenomenon studied (4.2).

As the next step, the research strategy and the data collected are staged in detail. The research questions have been paired with their objectives and the data collected, with insights into how the data would be used to progress towards finding answers to the research questions (4.3).

While designing the research methodology, it became advisable to conduct a pilot to check the practicability of the data collection process and check the relevance of the data to be collected (4.4). The next section exposes multiple parameters, which happen to resonate with some of the features of extended cognition mentioned in chapter 3 above. It describes the meeting room which formed the environment in which the meetings took place and the identities of the people who participated in the case study (4.5).

Standard and less standard ethical considerations are then described, including the use of photography showing meeting participants (4.6). Insights into the research ethics follows (4.7). Finally, some intermediary conclusions regarding the research strategy were compiled to complete this chapter (4.8).

4.2 A case study approach

To study the phenomenon, a case study has been designed to encompass ten real-life team meetings. These meetings were followed by a sequence where meeting participants answered an individual questionnaire. Finally, each of the ten teams was invited to discuss its experience in a focus group.

A contemporary phenomenon in a given organisation
The present research took place in one organisation and within its ecosystem. It was designed to bring new insights from the perspectives of team members in their normal work setting when using or not a visual template to support the sharing of their knowledge. In the same way, the case study included not only participants from the organisation where the study took place but also drew on real teams that existed prior to the research and that continued to work together after.

The data collection took place in a knowledge-based organization with real-life teams. The meetings were a part of their normal schedule and took place in their habitual context. The meetings were designed to create the conditions to study more closely a contemporary phenomenon, namely the way knowledge was or was not shared in real team meetings.

The case brought together multiple sources of information:
- audio recordings of the meeting discussions;
- researcher's observations in the form of field notes during the meetings and journaling notes during the research process;
- team members' answers to an individual questionnaire;
- information gathered in focus group meetings;
- actual artefacts produced during the team meetings; and
- photographs taken by the researcher, etc.

The data collected aimed at answering the why and how questions. All these elements would fit adequately in what would generally be used to characterise a case study, in particular by the logic of Yin (2013). Yet, it is more the spirit of the case study as presented in the work of Stake

(1995) which prevails in this research. Yin's approach would focus strongly on the possible generalisation of the conclusions drawn, imposing a strict study cycle. Stake would place greater emphasis on the possibility to interpret the findings. The latter fits better with the way the present research has been conceived. The focus was placed on understanding a contemporary phenomenon in its context rather than affirming that the findings can be generalised beyond the context of the study (Dasgupta, 2015).

While Stake (1995) saw the practice of case study as an art, he nevertheless promoted the logic of planning the case study thoroughly. Creswell (2015) underlined significant pitfalls in a research process following the case study method, in particular the bias in the choice of the case and the non-replicability of the cases. These limits are accepted constraints which will be to some extent tempered by giving a detailed account of the methods, data collection and coding procedures followed.

As this research proceeds from a social constructionist paradigm with extended cognitivist elements, the sense of co-created reality and biases is inherent to the research approach. The risks highlighted above are therefore inherent to the philosophical orientation informing this research and as such were accepted. It was also coherent with this philosophical view that generalization would not be the goal as reality is co-constructed among those taking part in the dialogue and that findings would be more indicative than definitive.

As the present researcher was interested in generating some understanding of interpersonal processes at play and in the relations to the environment of the meetings, a method following a case study approach was considered to be a legitimate choice to explore the research questions forming the scope of the current project (Baxter & Jack, 2008; Hancock & Algozzine, 2017).

The observer-researcher-practitioner perspectives
Three perspectives were combined and had an influence on the research process. The 'observer-researcher' role in comparison with the practitioner role was meant to be the focal role. Indeed, the goal of the research was to learn and practice academic research and not to model and promote known management heuristics from the practitioner perspective.

To proceed with the above-described case study features, the researcher needed to hone specific skills that transpired in the reporting of the case. The art of asking questions combined with being a good listener helped elicit and interpret what was said and heard (Gerring, 2004, 2007). Having both a theoretical and practical understanding of the phenomenon was relevant to place it in context. The overarching goal was to be able to report on a rich dialogue among participants which generated some elements of the answers to the three research questions pursued. In line with what Yin (2013) reported, this approach underpinned the research conclusions made as a result of the case study.

4.3 Research strategy and data collected

This section is composed of five sub-sections and gives an overview of the data collection strategy (4.3.1) and accounts for its unfolding (4.3.2). The research strategy is further detailed from the perspective of the collections of individual perceptions and the design of a tailor-made questionnaire (4.3.3). The next building block of the data collection, the focus group, is also described and its components and process are explained (4.3.4). The final sub-section reflects the thought process around the exploration of the interactions and experiences in the teams (4.3.5).

4.3.1 The data collection strategy

The meetings to collect data had three parts and generated different data. No part of the meeting was meant to provide answers to a single research question alone. Elements of answers were meant to be emerging and combined from various data sources, perspectives and triangulations analysed against the backdrop of the literature review and relevant theories. Figure 6 gives an overview of the various data collected in the different parts of the meeting and an idea of how they have been analysed.
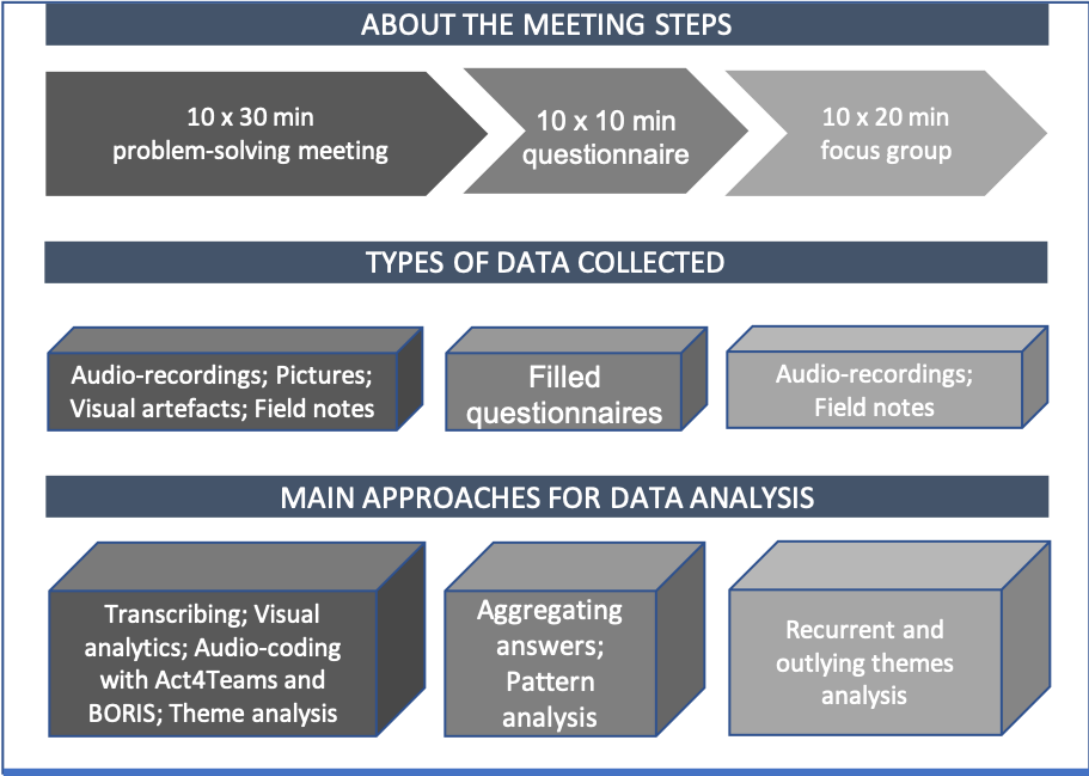
Figure 6 Basic overview of data sources and analytical approaches

The case study was conceived to explore a problem-solving task to be given to ten teams. The goal was to create the conditions to observe how real-life teams arrange the sharing of knowledge when they are tasked to solve a problem. Five teams would form group A and would not be offered to use a visual template during their meetings. Five teams would form group B and would be offered a visual template on a pin board available in the meeting room.

Following a short welcome by the researcher at the start of the meeting, team members were asked to fill in the declaration of consent confirming their voluntary participation (see Annex

1). Team members were informed on the way the data collected would be kept confidential and disposed. In the meeting invitation, team members received a brief description of the unfolding of the meeting composed of three distinct parts.

The first part was planned to last thirty minutes and was dedicated to having the teams discuss the task they received. The data collected in this part were the audio-recordings, which were later transcribed to take a written form; photographs taken at the start, in the middle and towards the end of the meeting; and some field notes taken at various points of the meeting. Any artefacts produced by the teams individually or collectively were also collected. For teams in group B, the visual template they filled in was also gathered as well as any individual notes.

The second part of each meeting was planned to last ten minutes and was dedicated to having each meeting participant complete in silence a six-question sheet. Each question offered respondents to select from five different affirmations and asked participants to reflect on their perception of the experience they had just gone through. This part was not audio recorded.

The third and last part of each meeting was planned to last twenty minutes and was dedicated to running a focus group. This part was audio-recorded and was later transcribed. Field notes capturing the observer-researcher observations and impressions were also taken.

To cater both for testing the concept and the procedure of the research design and considering the compact meeting duration of 60 minutes, a pilot meeting was organised with selected participants to confirm or adjust the data collection plan as needed and as detailed in section 4.5 below.

4.3.2 Replicating a team meeting

To explore the way knowledge is shared among meeting participants in the workplace with real teams, the choice was made to organise meetings with existing teams of the organisation where the case study was conducted. Participants in each team were working together on an on-going basis prior to being invited to take part in the case study. They continued to do so after. Therefore, they were referred to as real-life teams.

The purpose of the study was not to assess how well teams exchange knowledge in relative terms to each other. The purpose was to contrast and compare qualitatively the role a visual template can play to facilitate the pooling and use of pieces of knowledge within a team to solve a task compared to having no visual template. This meant that it was necessary to create some points of comparison and limit the number of variables that could bring unnecessary sources of divergence. The selected design was arranged to follow two goals. First, it was necessary to select a task contextually relevant for the organisation and the teams. Second, the unfolding of the whole session would need to be mirroring a usual meeting of the participating teams.

To achieve the above goals, two team meeting scenarios were developed. Five teams would perform the meeting task without being invited to visualize the knowledge they exchange, yet

also not prohibited to. They would form what was called group A. The other five teams would be offered a visual template to document their knowledge exchanges, yet not forced to. They would form what was called group B. The meeting process was meant to be identical in all ten meetings. By creating an environment with limited variables that influence the unfolding of the meeting, the intention was to increase the attention given to exploring the influence of knowledge visualization in these two groups.

4.3.3 The task given in the case study

To define the meeting task required first to define the type of meeting in focus. Among the various typologies found, the typology selected comes from the work of Allen et al. (2014). The reason for drawing from their work was manifold. First, it was linked to the fact these authors have meetings and group work as the main object of research. Second, their publications were cited by other authors. Third, the article in reference contained a literature review of how other authors defined meetings from the perspective of the purposes that meetings may have. Allen et al. (2014, p. 799) suggest that meetings can be used for updating teams, sharing information, making decisions, solving problems, generating ideas or building teams and any combination thereof.

The meeting type in the case study was a problem-solving meeting. The task given to the ten teams was formulated in a way that the teams would have to exchange knowledge they held individually but also construct together new knowledge to progress with solving the problem.

The choice of the task type was conditioned by various parameters. The task needed to enable the gathering of elements of answers in relation to the three research questions respectively dealing with the meeting output, the participants' behaviour and their perception of the meeting process and output. The task needed to be sufficiently motivating and contextually relevant to generate the sense among the participants that it was a standard meeting for their team and a useful discussion for their work so they would engage in problem solving.

Another important characteristic of the task selected was that it could be tackled within the time frame and lead to tangible results that the teams as well as an external observer could understand. It was also helpful that the exchanges could be visualized if a team chose to do so to harvest what was said and agreed during the meeting (Hollingshead & Poole, 2012).

A problem-solving task confronted the teams to find a way to depart from the problem and reach a goal. Several cognitive processes are at play to solve a problem (Mayer & Wittrock, 2012, p. 289). These processes encompass activities such as planning the process to exchanging knowledge to solve the task. It also includes the implementation of the plan and the monitoring of the progress. All these aspects of the problem-solving process can be found in each of the audio-recordings which documented the conversations in the meetings.

When deepening the understanding of what solving a problem takes in terms of knowledge transfer efforts, Mayer and Wittrock (2012) give insights that also warrant the use of such a

task to explore the impact of visual templates. Indeed, they speak of six methods that can be usefully supported by knowledge visualization as described below.

First, it helps to reduce the load of information. Second, it requires following a structured approach. Third, it helps to frontload some information ahead of the meeting. Fourth, a key dimension is so called 'generative methods' which deals with note taking. Fifth, some guided discovery ensures that building blocks help solve the problem in scope. Finally, it is also helpful to have some persons as role models to follow, to learn from each other as some team members might be advanced and each deserves to be heard.

Reflecting thoroughly about the choice of the task mattered for ensuring that it was fit for the purpose of this case study; that it was meaningful to explore the use of visual templates to tackle the task; and that the task and the problem-solving process would also fit the social constructionist paradigm within which the present research proceeded.

4.3.4   Stakeholder mapping

When searching for a task to give to the ten teams, it was also necessary to find a managerial or organisational topic of interest to the teams in the organisation where the case study would be conducted. Reflecting on the time of the year when the ten meetings would take place and the organisational actuality of the meeting participants, a primary and secondary topic emerged. The primary topic was having the team working on the annual work program as it was the season of the year when work programs are high on the organisational agenda. The secondary topic was to think about which stakeholder(s) had an interest and power over the work program of a particular team. Each team was invited to reflect on their case and explore their work items having in mind who could influence their work when implementing their plans.

Building on this situated reasoning, some more thinking was given to whether it would be possible to support the performance of this task with a visual template. This answer was positive. When searching among the various existing visual templates, it was clear that a minimum of understanding of the theory behind stakeholder management was necessary to choose the visual template which would lead to helping the team tap into their tacit knowledge and generate meaning through their meeting discussions.

Starting from a literature review from 2010 (Parmar et al.), it appeared that the work of Freeman (1983) and his subsequent research (Freeman, 1999; Parmar et al., 2010; Strand & Freeman, 2015) were meaningful references for this research. The use of visualization in business in the '80s was not yet as common as in the third decade of the 21st century but these researchers had already begun promoting the use of their stakeholder management model through a visual heuristic. Even though promoting a visual approach to the topic of stakeholder management was not their focus, they saw the merit in a visual support to analyse stakeholders.

For this research, the intention was to select a topic for the meeting discussions which would be concrete enough to be able to solve the problem or part of it within the imposed meeting

duration. The literature provided no guide on which topical task to select. Drawing from the author's practice in the field, it was known that the topic of stakeholder management was a topic of relevance in the light of some ongoing organisational conversations. It was also year-end when the data were collected and a time to plan for the year ahead and how to take care of the stakeholder in the new year. The topic would also not lead to sharing straightforward data or information already existing in an available repository. The goal was to find a topic which would by nature invite participants to share tacit knowledge and would lead to some discussions. Defining the stakeholders in relation to the work programs of the involved teams met these characteristics. The relations a team has with multiple stakeholders are not written in an organisational chart and are not predefined knowledge. It is also often evolving during a given organisational cycle, project or dossier. New team members may have different ideas on who the stakeholders were in comparison to long standing team members.

The question was about the choice of the type of stakeholder model to use for their discussions. Five teams would read the dimensions of the model in the instruction of the problem-solving task while the other five teams would be given a printed visual template with the model of stakeholder map they could choose to use during their discussions.

A key criterion to select the stakeholder map to be used was that it is self-explanatory and that it can be integrated into the text describing the task given to the ten teams, no matter whether a visual template would be offered or not in the room. This was of great importance to avoid an obvious favouring of the five teams offered use of the visual template versus the other five teams left to organise the solving of the task themselves.

The grid of Eden and Ackermann (1998) correlates the power and interest of the stakeholders. The topic of stakeholder management was selected because it best met the needs and context described above. As such, the themes of power and interest had no direct connection to knowledge visualization. They were a mere pretext to create a meaningful space to have a conversation adding value for the participating teams.

It remains important that Eden and Ackerman were also preoccupied by knowledge visualization naming it 'visible thinking' and co-authored two management books in the field. Their use of a stakeholder map to facilitate meaningful conversations cultivated the same intention as the one underpinning this research. They promoted the use of visualization for the purpose of organisational, management and strategy development to help teams offer conversations on these otherwise relatively intangible leadership themes (Bryson et al., 2004; Bryson et al., 2014). They affirmed that mapping stakeholders and 'depicting these interactions (visually) can surface the formal and informal relationships (underlying) social networks' (Bryson et al., 2014, p. 186).

As shown in Figure 7 below, the power/interest grid is made of four quadrants.
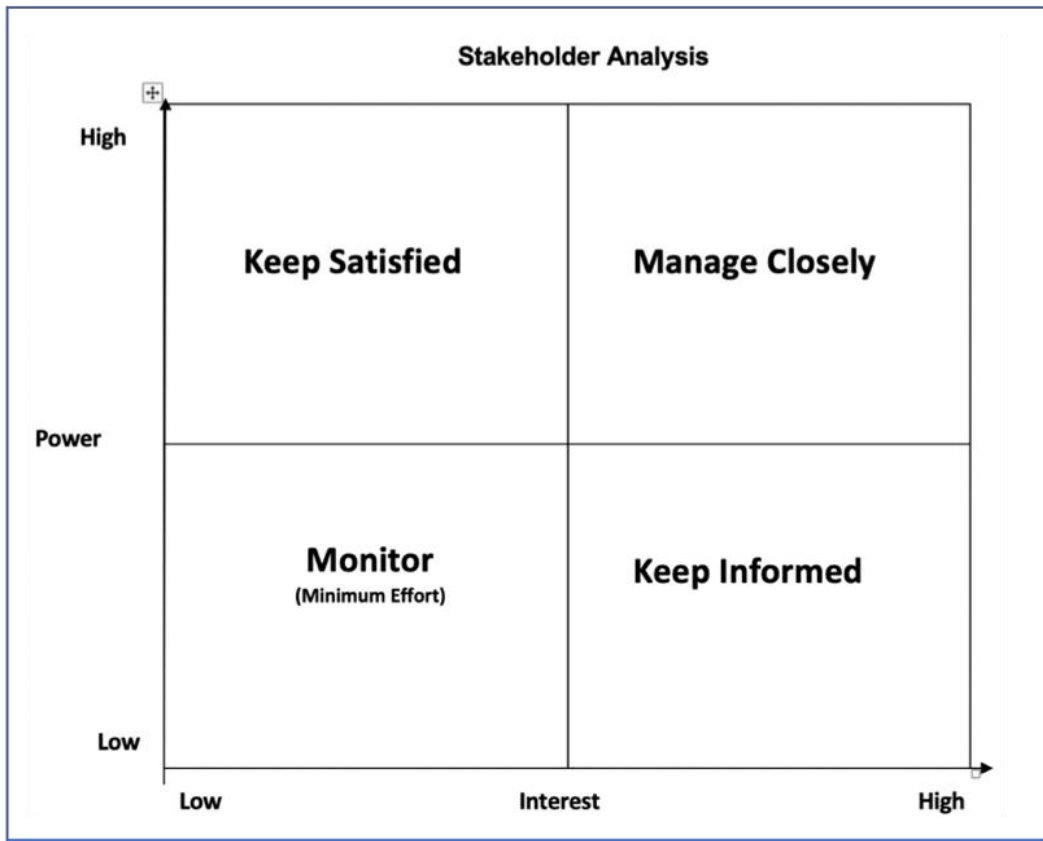
Figure 7 Stakeholder grid (Eden & Ackerman, 1998)

The stakeholder grid offers to those using it four quadrants to map - or visualize as defined in the context of this research - the stakeholders of relevance for the topic being dealt with.

The upper left quadrant is dedicated to mapping stakeholders with high power and low interest. It concerns people who need to be engaged in view of their power and will require some effort because of their low interest. This quadrant is about keeping the stakeholders satisfied.

The lower left quadrant is dedicated to mapping stakeholders with low power and low interest. It concerns people who need to be on the radar of attention but require limited communication and minimum efforts. They can be monitored with minimum effort.

The upper right quadrant is dedicated to mapping stakeholders with high power and high interest. A close, regular, specific management needs to be put in place and regularly adapted as the context evolves.

The lower right quadrant is dedicated to mapping stakeholders with low power and high interest. It concerns people who need to be informed of the progress, bottlenecks, achievements.

4.3.5   Individual perceptions

To answer the why and how questions, from a social constructionist standpoint, it is important to find ways to understand the meaning given by participants to their experiences and

reflections. Several sorts of data sources were accessible, the answers to the individual questionnaires and the discussions among the participants in the focus groups.

The individual questionnaire was meant to allow participants to reflect and express their perceptions in more depth. Meeting participants were asked to complete the questionnaire immediately after the thirty-minute meeting replica. A slot of ten minutes was dedicated for participants to reflect on their evaluation of the meeting individually. The participants were explicitly asked not to exchange their views among themselves, but to first fill in the questionnaire by choosing one of five affirmative statements prepared for each of the six themes covered (Annex 3). The themes were revolving around a comparable thematic to the focus group questions and the observation grid and fully relating to the topic at the heart of the matter about knowledge sharing in team meetings.

Designing a multiple-choice questionnaire
The goal of the individual questionnaire was to ask each participant to reflect on the meeting they had just experienced. The filling of the individual questionnaire took place immediately after the meeting replica and without an opportunity for the participants to exchange views among themselves before filling in the questionnaire.

The six themes explored in the individual questionnaire aimed at covering the various dimensions of the case study, namely: knowledge sharing process, levels of discussion engagement, respect of individual opinions, use of knowledge shared, satisfaction with discussion process and satisfaction with output.

The individual questionnaire was purposefully constructed in a way that requires the respondents to reflect on their experience (Nielsen et al., 2014). The affirmations were not complicated but elaborated enough to stimulate the respondent's reflection. The multiple-choice responses required weighing among the various options, possibly reflecting their experience, and crafted specifically for each of the six themes. Each theme offered five affirmations as responses. Respondents were expected to choose one and one only out of the five options.

Taking the fourth theme listed in the individual questionnaire titled *'Use of knowledge shared'*, the five affirmations below exemplified the way affirmations were constructed:
   a) I have the impression that most of the pieces of knowledge spoken were not picked up and not used by the group.
   b) I have the impression that some of the pieces of knowledge spoken were picked up but not really used by the group.
   c) I have the impression that a fair amount of the pieces of knowledge spoken were picked up and used by the group.
   d) I have the impression that all the pieces of knowledge spoken were picked up and used by the group.
   e) I have the impression that the pieces of knowledge spoken helped generate new knowledge individual group members did not have before.

Each affirmation had two aspects as summarised in figure 16 below for one of the six questions, namely the question on the use of the knowledge shared.

The individual questionnaire was also tested during the pilot meeting. The pilot informants reported that they considered the individual questionnaire to be understandable. They also confirmed that the way the individual questionnaire was conceived implied for them to think thoroughly before choosing an answer. They said they are used to Likert scale types of survey where choosing the answer is usually rather spontaneous and not thoroughly thought through.

The selected approach of proposing elaborate affirmations containing nuances and variations, while built in a systematic way, required the respondents to be in touch more deeply with their experiences before selecting an answer. The pilot informants reported that this approach was more challenging than what they are used to and made them reflect more about what they really wanted to answer. At that point in time, it was concluded that there was no need to adjust the multiple-choice affirmations and that the questionnaire was fit for purpose in that context.

4.3.6   Focus groups

The focus group method corresponds to a form of group interview. The goal of using focus groups is to explore the way team members interact and construct meaning about their experience around a specific theme or experience and help understand 'why they feel the way they do' (Bryman & Bell, 2015, p. 369). This was the goal as well in this research. The participants in the meeting replica were invited to exchange views about the experience they had gone through a moment ago.

Generally, and also specifically in this research, the interest in using a focus group is to observe and understand how meeting participants respond to each other's point of view and possibly build a new point of view on defined topics contained in the guiding questions (Krueger & Casey, 2015).

Six steps guided by six questions shaped the 20 minutes dedicated to the focus group. Some efforts were invested when designing the questions to find the right balance between a directive approach in the way to formulate the questions asked and a more open approach which would leave space for participants to share their views freely. The themes for the questions were defined to possibly harvest elements of answers to the research questions from the point of view of what the meeting participants and the teams perceived of their individual and collective experience during the meeting replica. The themes were also echoing the individual questionnaire and topics on the radar of the observer-researcher. The idea was to add a collective voice to the individual questionnaire performed in silence just before the focus groups took place. These connecting perspectives proved extremely insightful as some dissonances appear when analysing the data.

In this sequence, the researcher was also the focus group moderator. Some authors consider it essential to have a different moderator than the researcher to lead the focus groups (Barbour & Morgan, 2017). In the context of the present research, it would have been a loss of effectiveness and efficiency. The scale of the case study was manageable for the researcher and also involving others would have required a different agreement with the organisation. Having the researcher as moderator helped also ensure consistency across the groups by someone also sensitised to biases and having an interest in striving for comparability of the data collection process. Having a written script helped to replicate in a very comparable way the process in each of the focus groups. It also helped to give the same six prompts to launch the conversations. The variations observed among the focus groups discussions came from deciding, as the conversations were ongoing, where to possibly drill or prompt the groups to specify, go deeper or redirect if the moderator perceived that the discussion was possibly going beyond its scope (King et al., 2019).

Emphasis was laid on explaining to the teams that as moderator, no opinion would be offered or that this was not a space to engage in giving feedback as to how the group did in the meeting replica part of the gathering. This required discipline to be clear, simple, and understood without neither antagonising the meeting participants nor defocusing from the purpose of the focus group discussion. Rehearsing this approach in the pilot case study provided a very useful learning opportunity, as pilot informants (section 4.5, p. 67) tried to engage the moderator and take the discussion out of its intended scope. That experience made it much easier to bring attention back to the purpose of the focus group, in cases when they were going beyond the scope.

4.3.7 Group experience

The data collected throughout the ten meetings can be categorised into four types covering the audio-recordings, the individual notes, the output each team delivered, and the pictures taken as displayed in figure 8 below. The pictures are not readable. They are only reproduced to display the look and feel of the artefacts collected. What is written on them is not of direct importance.

Figure 8 Examples of data collected from the teams

Audio-recordings

All meetings were conducted in English as the working language of the organisation. Audio-recordings and transcripts were therefore in the same language and no translation and possible change of meaning could really take place at this level. Across the ten groups, the audio recordings show an average duration very close to thirty minutes. In addition, the focus groups were also audio-recorded. The recordings covered the actual periods of the meetings. The transcripts were sent to an external agency. The transcripts were verbatim transcripts with indication of speakers. The transcripts were read upon reception from the agency. As there was no intention to do a keyword analysis of the transcripts with a software, they were left unchanged, also sentences labelled inaudible.

The transcripts were used for two purposes. First, during the coding of the audio recordings, they were checked from time to time to get some written help in choosing a behavioural code. Second, the transcripts were also used when participants had been commenting on the use of the visual template reproducing the stakeholder map and offered to the five teams in group B. Some of the quotes could be used for the interpretation part of the research.

A general remark is that without the audio-recordings it would not have been possible to get very far. The recordings were essential. There is only so much even a very attentive and focused observer can be aware of and even less one can hear, memorize, and activate later. Another deep realisation is that seconds are long units of time. When replaying the audio-recordings, it was clear that a lot happens, and a lot is said in really a few seconds. This is one of the biggest insights and it matters as often meetings are set for (too) long duration. This can be questioned and deserves further exploration in the direction of the materiality of time and how to make meeting users appreciate and relate to time differently and therefore use it differently.

Finally, the recordings made it possible to have a dedicated code ('blank') for the periods when team members do not speak. In section 5.3 (p. 87), more will be made of the fact that silence is an integral part of the meeting dynamic and the relation between the use of visual templates and prevalence of silence in meetings.

Participants' notes

Two situations co-existed across the ten teams. Some participants brought with them a pen and paper while the others did not bring anything. There were pens, paper, and stickers (post-its) in the room readily available for participants to use if they wanted. In addition, the meeting task was written on a sheet of paper that each participant received. It ended up being used by several participants to jot down their thoughts. At the first meeting, all papers were collected to avoid participants sharing and exchanging their experience with other participants in later meetings. Later, after checking the papers collected, it became clear that these artefacts could also be pieces of the data puzzle. After the remaining meetings, all the distributed papers and all the papers otherwise used were systematically collected. As the meetings took place on a first available first booked basis, the first five meetings were dedicated to group A and the next five

meetings were dedicated to group B. This prevented information exchange which did not seem to happen as no team mentioned knowing anything about other participating teams.

One idea was to check whether all stakeholders appearing on an individual piece of paper would be shared or not with the team. As chapter 5 illustrates, this proved to be a useful set of information when comparing what happens at an individual level and what happens at team level, when it comes to pooling and processing knowledge.

Team artefacts

Team artefacts can be defined as documents created by the teams on their own initiative to harvest their discussions and also include the visual templates that the teams have filled in either by writing on them directly (one team) or by sticking 'post-it' notes on them (four teams).

Out of the ten teams, seven teams had a tangible team output in the form of a paper-based document. Three teams from group A (those not being provided up front with a visual template) did not have a documented output after thirty minutes. The other two teams from group A came up respectively with a drawing mimicking the actual visual template and a table to document the stakeholders and their characteristics.

The team output has been particularly useful when discussing and comparing whether the team meeting led or not to a tangible output in relation to the problem-solving task assigned to the ten teams. The visual comparison alone of these ten meeting output gives great insights into the role of the visual template (or its absence) on the sharing and usage of knowledge in team meetings in the workplace as presented in section 5.2 (p. 79).

Instructions for group A and B were identical except for the last sentence which read *'You may use the visual template on the pin board'* as shown in yellow highlight in Table 4 below.

Group A No visual template provided	Group B Visual template (stakeholder map) provided
Imagine you need to prepare the annual work programme for your team. The task of this meeting is to discuss among yourself who has a stake on the planning of your work to support its successful delivery. You have up to 30 min to identify the stakeholders of relevance, the level of their interest and influence and whether you need to closely manage them, keep them satisfied, keep them informed or only monitor them.	Imagine you need to prepare the annual work programme for your team. The task of this meeting is to discuss among yourself who has a stake on the planning of your work to support its successful delivery. You have up to 30 min to identify the stakeholders of relevance, the level of their interest and influence and whether you need to closely manage them, keep them satisfied, keep them informed or only monitor them. You may use the visual template on the pin board.

Table 4 Two types of instructions given for the problem-solving task

Paragraph 2 of the instruction reproduced in Table 4 above was crucial. It placed both groups of five teams, without and with a visual template, on equal footing when it came to describe what was expected as output. It made the four quadrants created by the crossing of the interest and power axis explicit: keep them satisfied (upper left), manage closely (upper right), keep them informed (lower right), monitor them (lower left). It mattered a lot that both groups would be empowered to build their respective discussions on the same understanding. Indeed, if this had not been the case, it could have been validly argued that five teams with a visual template were given such an undue advantage that from the outset the case study is skewed.

The first team which took part in the first team meeting and was not offered a visual template drew exactly the stakeholder map offered to the five teams in Group B. That team created for guiding its knowledge sharing and harvesting the piece of knowledge shared a visual template comparable to the one distributed as a visual template as shown in picture 2 below. The meeting participant who took the lead said she saw the grid as she read the instruction. There was no indication the person had done this before. It appeared that the instructions were formulated in a way allowing for the stakeholder matrix to be 'seen' for an attentive reader. Another team also 'saw' the different dimensions present in the instruction but used a table and not a matrix.

(…)
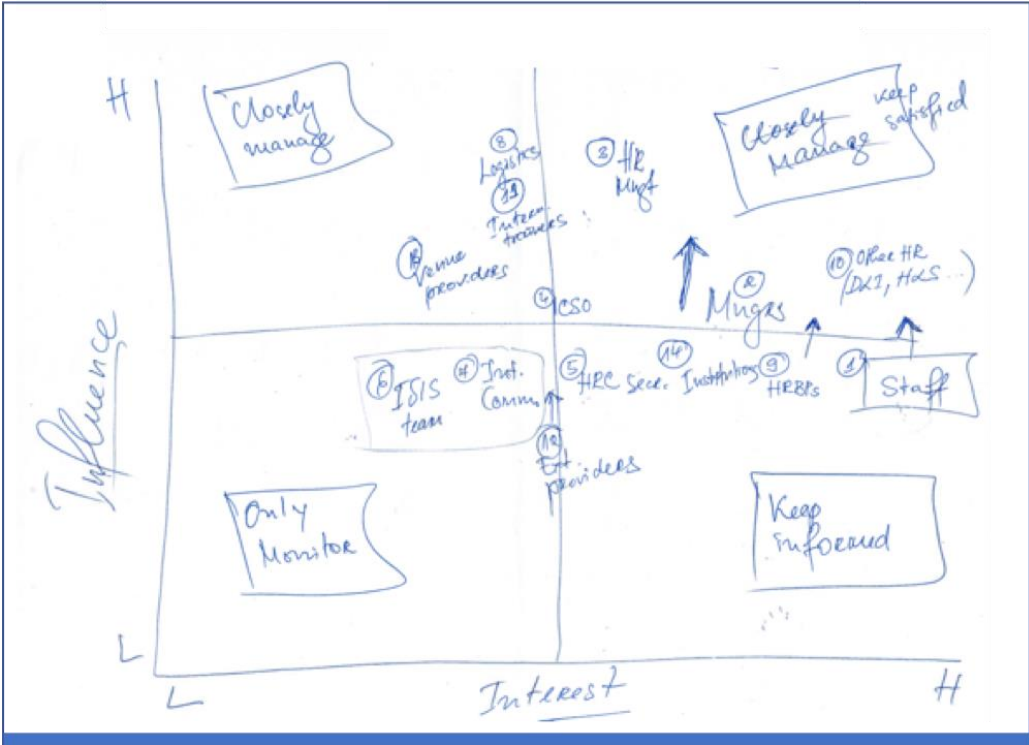
Picture 2 One team in Group A - Example of a team artefact

For the sake of completeness, the word 'power' on the visual template was substituted with the term 'influence' in the instructions, see Picture 3 below. There was no conceptual consideration behind this discrepancy. It was an oversight without substantive consequences.
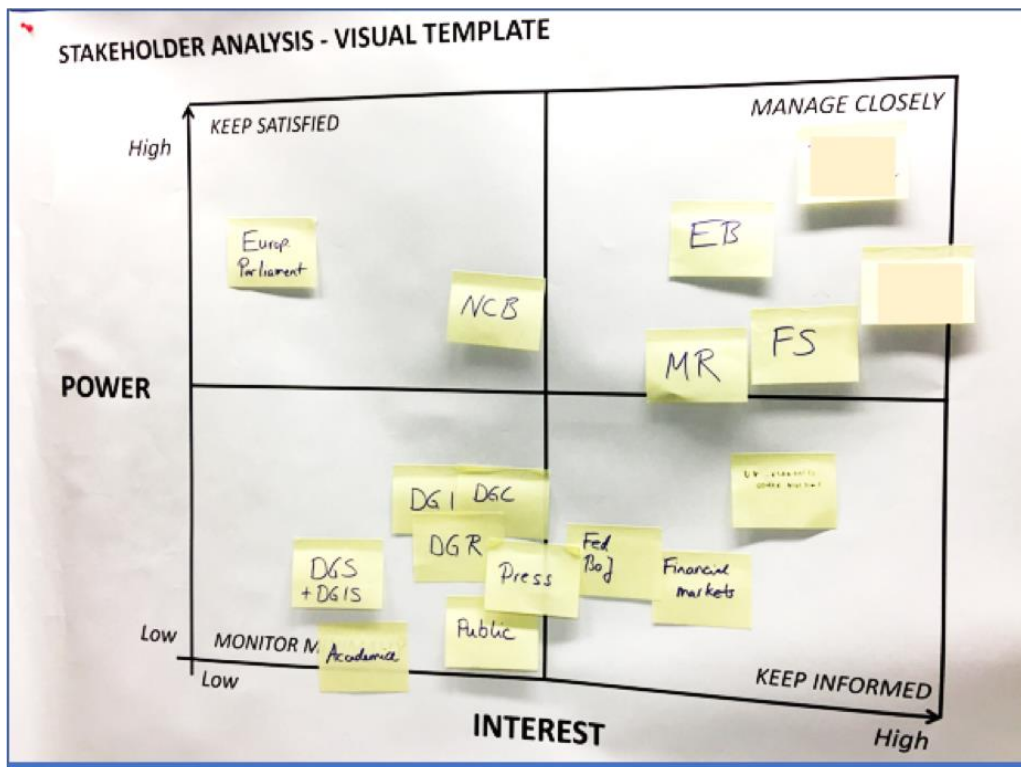
Picture 3 One team in Group B - Example of the visual template filled

Photographs

During the meetings, pictures were taken at regular intervals. Pictures were taken after five minutes, fifteen minutes and five minutes before the end and some more in between where a scene appeared worthy of being captured visually. The goal was to have, in addition to what was being said and what was being captured in the field notes, also some insights into the group dynamics, the body language, the way the participants interacted and how they looked or not at each other. The challenge of using photographs in research is further explained in sub-section 4.6.

For the teams using a visual template, the way they related to each other and to the template on the pin board appeared to be informative in the light of the research questions. This proved to be of immense value for comparing and contrasting how teams in both group A and group B behaved.

This is one of the crucial data sets in the whole research project. It would be highly advisable to consider picture taking as an integral part of comparable research providing ethics and data protection rules allow.

On a side note, videotaping the meetings would certainly also be a rich source of data. Yet this is a much more delicate question for field research. First, the relevance of such material would not have been of prime value for answering the research questions. Second, videotaping would have raised unnecessary issues in terms of compliance with data protection rules prevailing in the organization where the data would have been collected. And last, it would have been more

difficult to recruit teams for the research, as they may have been reticent to discuss their real business issues in front of the camera.

4.4   The pilot study

To help make the case study process as transparent as possible, a detailed account of the process followed has been documented during the planning, unfolding and after completion of the case study as various authors recommend such as Yin (2013) and Baškarada (2014).

4.4.1   Key features of the pilot

Scope and goals

The scope of the pilot covered several dimensions of the meeting. It encompassed logistical aspects; oral and written communication aspects with the managers of the team members; and the team members' invitations. The pilot enabled a detailed review of all the documentation and instructions to be used during the data collection meetings. Technical aspects were also probed, including the audio-recording devices, and recording routines.

The goal of having a pilot was twofold. First, it helped grow trust in the research protocol. Second, it fostered confidence in the fact that the data collected had the potential to bring answers to the research questions.

Selection of pilot 'informants'

The pilot participants were selected differently than the ten teams which took part in the ten data collection meetings. The pilot participants were called 'informants' on purpose to differentiate them from the team members of the data collection meetings referred to as 'meeting participants'. The pilot informants did not belong to the same team on a day-to-day basis. They were experienced meeting facilitators. The informants were interested in the research project and were invited to give qualified feedback on whichever aspect they thought useful to comment on.

The term informant has been borrowed from Stake (1995) who called 'informants' the participants in a pilot. Being an informant refers to the fact that these participants inform the research and the researcher through the lenses they represent. In the present research, they represent the lenses of knowledgeable meeting facilitators and insiders to the organisational context and actualities.

The informants also helped with creating the conditions to construct a clearer understanding of the environment and possible constraints. The pilot participants were not involved in the design of the methodology. Their feedback did not change the design, yet the feedback influenced the running of the meetings to help make the sequences run smoothly. It also helped with ensuring that the instruction and introductory words would be understandable. It also helped with ensuring a good rhythm and timing.

Targeted feedback during the pilot meeting
Feedback was sought from the pilot informants in an open dialogue. First, some focus was laid on appreciating the ease of handling the various documents. Second, some attention was given to the handling of the relations with the participants during the data collection. It was important to avoid out of scope conversations proposed by meeting participants which could derail the sequence and timing of the team meetings. With the real teams, several participants confirmed that the running of the meeting was smooth. Thanks to the insights gained and practice during the pilot project, the questions out of scope were usefully parked so the meeting could unfold according to plan and timing.

Insights for future comparable research
Looking back, the pilot was important. It showed that having pilot participants able to critically review their experience helped the smooth running of the ten team meetings. The ability of pilot participants to constructively report on their experience through the meaning of 'informants' defined by Stake (1995) helped grow confidence in the data collection arrangements.

4.4.2 Evaluation of different aspects

Evaluating the instructions spoken by the researcher
The understanding of the instructions by the meeting participants was a key concern to avoid divergences across groups. It was explored in the pilot meeting how easy it would be for the pilot informants to understand the instructions given for the different tasks to be performed by the participants.

Parts of the instructions were given orally, and parts were written on paper. The pilot confirmed that the instructions, both oral and written, were clear and while raising some questions among the informants, the instructions did not really lead to blockages or impossibilities to deliver. The instructions provoked conversations leading pilot informants to discuss and agree on the process and the meeting discussions which is only normal when people come together to solve a problem.

Testing the relevance of the task selected
The data collection took place with ten real teams at work. The task selected cumulated several characteristics. It was *a problem-solving task*. As the meeting was meant to be a 30-minute meeting, the task selected to explore how knowledge would be pooled and used in a meeting was a solving task.

The task was *identical for all teams*. The aim was to reduce the number of factors which could blur the interpretation or make it so complex that findings would become highly speculative. The intention was to increase the focus on the matter of interest, namely the way a visual template influences the process and the knowledge shared between team members in face-to-face meetings.

The task was *relevant for the team*s *beyond the research project*. It was meaningful to select a topic generating a natural interest in view of its relevance for day-to-day work. The task was *contextually meaningful for the organization*. It was a task revolving around annual work programmes and stakeholder management. Both topics were high on the organisational agenda and in relation to another contextually key topic, namely collaboration and breaking silos between departments.

During the pilot project, the task revealed itself as relevant and helpful. The informants gave the feedback that the timing in the fourth quarter of the year when the ten meetings took place was meaningful for thinking about work programmes. Equally, it was confirmed that thinking about the stakeholders that have an impact on the successful implementation of the work programmes was useful.

The feedback from the pilot informants was supportive. Later, various real teams in the focus groups also expressed that they gained a lot out of the meetings for their own work and considered they advanced their real work by participating in this research which they would not have done otherwise. Both the pilot and research meeting participants said they do not really take time to stop and think of their stakeholders, and that having done so they would think of this topic more systematically in the future.

The pilot proved to be a quality check point. The insights gained and adjustment made were validated later. Indeed, the tasks, the topic, and the timing fitted well with the participants and the organisation. The level of engagement and motivation displayed by the informants in the pilot gave confidence to proceed with the actual main data collection process and was mirrored by the equivalent reactions by the meeting participants. This step was not a delay. In hindsight, the benefits yielded warrant recommending running a pilot in the context of a comparable research design in the future.

4.4.3   Additional learning

An aspect which became clearer when running the pilot was the realisation that taking photographs would help to better report on the influence of the visual template on knowledge sharing. This was bringing some data protection and ethical concerns. An extra sentence seeking team members' consent was added to the individual declaration already planned to be requested from the participants. It covered the fact that photographs may be taken and used for the purpose of the research. One person out of the fifty-seven participants did not agree to having pictures taken. This refusal was obviously duly respected.

During the pilot, it became clear that being an observer-researcher would be a demanding role. Observing, taking notes, making sure the meeting unfolds adequately and taking care of the meeting progress was a challenging task. This led to reflecting on having a semi-structured approach to observing.

Concretely, an observation sheet was prepared for each team, with some pre-fixed aspects and an open and unstructured part. With the research questions and objectives as a starting point, three main clusters of indicators were defined: i) body language, ii) meeting documentation, iii) atmosphere. Seventeen indicators populated these three clusters.

The seventeen indicators were created for this research and selected with the expectation that they would help complement the findings made from the other data sources as displayed in table 5.

BODY LANGUAGE	MEETING DOCUMENTATION	ATMOSPHERE
1) Leaning backward	5) Brought pens	13) Relaxed
2) Leaning forward	6) Brought paper	14) Tensed
3) Looking at others	7) No use of pen	15) Lively
4) Looking away	8) No notes	16) Focused
	9) Notes shown to others	17) Balanced
	10) Common visual based made of an individual one	participation
	11) Common visual from scratch	
	12) Improve/customize visual prototype	

Table 5 Meeting observation indicators

As the meetings were not videotaped but only audio-recorded and observed, the idea was to attempt to capture with a certain degree of planning some similar data across the group to help later with the detection of possible trends or patterns. No literature could be found to apply to the context of this research. Three experienced researchers contacted could not really give concrete advice. For future reference, and in hindsight of the learning of this research, the definition of the indicators deserves to be the object of some inquiry before being integrated into the research methodology. This weakness did not have a consequence, just a double realisation that there is merit in planning these aspects and second that this needs much more deeper literature analysis and further design efforts. It represented a lot of work but little return on time invested because of the too disparate and volatile character of the dimensions observed.

4.5   Environment, process, people

Against the background of the 4E cognition framework presented in chapter 3 (p. 38) on philosophy, and also in the spirit of sharing a detailed account of the qualitative research journey, this section brings forth four themes relating to the physical environment of the meetings, which relates more to the embedded dimension of 4E cognition (4.6.1), the unfolding of the meetings, which relates more directly to the embodied dimension of 4E cognition (4.6.2); the teams' characteristics (4.6.3) together with the profile of the team members (4.6.4), which both could be influencing the extended dimension of 4E cognition.

4.5.1 Meeting rooms

The collection of data took place in three different meeting rooms in three different buildings. The basic existing meeting room arrangements were comparable. It was ensured that the seats for the participants, the stacks of white paper, the available pens, and the space for the audio-recorder on the meeting table would be very comparable. The rooms were arranged thirty minutes before the start of every meeting. Photographs of each meeting room were taken before the arrival of the participants. Other items such as pin board, video screens or refreshments were left in the room and placed on the outskirts of the room.

Building on the insights from the pilot meeting, a place for the researcher-observer was marked with a chair and a table at the back of the room. This signalled clearly that the researcher was not part of the meeting discussions. In two rooms, it was possible to sit at a small table away from the meeting table. In one meeting room it was necessary for the observer-researcher to sit at the meeting table, so that was arranged in a way that allowed for as much distance as possible to again underline the researcher's role. A visual representation of the arrangement can be viewed in picture 4 below.

Picture 4 Meeting rooms' arrangements

In the above picture, the red circles show where the observer-researcher was seated while the blue arrows show where the teams were sitting. When sensing directly in the room whether differences could be perceived, it was concluded that the possible differences in the way the observation working platform had been arranged could only be marginally, if at all, traced back to variations in the arrangement of the three meeting rooms.

4.5.2 Meeting process

The data collection took place based on the commitment made to the managers of the teams involved that the participating team members would invest 60 minutes of their time. The running of each data collection meeting consisted of three parts. Each part required using different documents, following different procedural arrangements, and has led to different s. Two of the three parts were audio recorded. As this is research taking place in an organisation, namely a field research, it was important to perform the data collection meetings effectively and efficiently to ensure respect and appreciation for the object of the research, and the professional character of the research approach followed.

To use the least possible time in the teams' calendars, following the culture of the organisation where the data collection took place, several aspects were carefully planned. These aspects related to:

- the comparability of the meeting room structure: tables, seating, available paper, available pens, pin board, pin boards with the visual template for the five meetings with templates;

- the introductory explanation at the start of each meeting to follow up on the invitation received and remind them about the purpose of the data collection;

- the oral explanation of the task for the first part of the meeting;

- the transitions between the different parts of the meeting (opening a part and closing it and then moving on to the next part);

- the elimination of unnecessary oral information to focus on really what participants should know;

- the smooth distribution of documents without wasting time or creating disruption, both when distributing the documents as well as when collecting them upon completion by team members.

Many details have been presented in the sections above. It is worth adding at this stage that promoters of case study research underline vehemently the idea of planning the case study process in detail (Baškarada, 2014; Dasgupta, 2015; Eisenhardt, 1989; Gerring, 2007; Gomm et al., 2000; Stake, 1995, 2005; Yin, 2013).

This research is one more confirmation of this necessity, in particular if the unfolding has several phases and the study of a contemporary phenomenon aims at having the stakeholders involved perform several tasks, if there is a certain degree of complexity coming from the use of technology, like audio-recordings, and if it is a new experience for the researcher.

4.5.3 Team characteristics

The data collection has been organised around ten teams. These ten teams formed two groups. Group A was made up of five teams who received the instruction to perform the meeting task without being invited to document or visualize their conversations. Group B was also made up of five teams who, contrary to Group A, were given the option to use a visual template provided on a pin board in the meeting room.

These ten teams constituted a convenience sample and as Lavrakas (2008, pp. 148, 149) affirms 'convenience sampling differs from purposive sampling in that expert judgement is not used to select a representative sample of the element. Rather, the primary selection criterion relates to the ease of obtaining a sample'. As Robson (2011) states, in social research, judgements are made on the basis of dispersed evidence. He further emphasises that sampling is to be understood in a broad sense to encompass not only the population but also time and place. Convenience sample may be the object of strong critics (Sharan & Tisdell, 2015) focusing on a narrow understanding of the very word 'convenience'. Lavrakas (2008, p. 153) gives as a synonym to the word 'convenience' the notion of 'non-probabilistic' sample. In this context,

convenience is one of three categories of non-probabilistic sampling along with purposive and quota sampling. In the present field research, the need for a convenience sample was implied by the agreement with the organisation; time constraints, period of the data collection, place of the data collection, willingness of managers to allow their teams to take part in a case study.

No probabilistic intention animated this research, and no working hypotheses were built on any demographic parameters. Therefore, the use of a convenience sample was warranted in the case at hand without facing the pitfalls highlighted by Sharan and Tisdell (2015) or the definition of a convenience sample by Richards and Morse (2013) 'in which those invited to participate in the study are simply those available to the researcher'.

Twelve managers known for being supportive of academic research and workplace improvement projects were approached. Some of the managers approached had flagged on past occasions their challenge with meetings not yielding enough benefits, compared to efforts invested in sharing knowledge in meetings.

Ten managers replied swiftly and availed names of participants in their departments. No influence was exerted on who should join and how the teams were to be composed. No demographic criteria were prescribed. It was interesting that naturally the basic demographics information collected showed once analysed and computed an overall homogeneous composition of the ten teams with no outlier between the two groups and within the groups. A detail description of the demographic characteristics of the 55 team members spread across the ten teams can be found in Annex 4 (p.164).

There was no preconceived idea about which teams would be invited to use a visual template and which not. A pragmatic criterion helped with the arbitrary allocation of the teams to group A and group B, namely their calendar availability. The intention was to avoid the group A teams going through the meeting experience potentially being influenced by finding out about five teams in group B being offered the use of a visual template. The information could have travelled and inspired the participants from the teams in Group A to draw a visual template themselves. Later, when the five teams of group B were invited to use a visual template readily available in the meeting room, it was no problem if they were tipped off about the use of the template as all teams in that group would be on a par from that moment onwards.

4.6   Some elements of visual ethnography and journaling

Some important aspects of this research have been informed by knowledge coming from the field of social sciences using visual elements to support the inquiry of a phenomenon as well as the analysis of the data collected. Without going into detail in the field of visual ethnography, it is nevertheless relevant to refer to it.

Visual ethnography became an important framework of reference after realising that this could be integrated and used to help with generating data and later on to interpret the data (Pink, 2001). Therefore, in accordance with the approach selected to report in detail about the research journey, some reference to visual ethnography is included, even if only superficially. It is

appropriate to start with sharing what is understood in the context of this research by ethnography and more specifically by visual ethnography.

First, ethnography is defined as an approach where the researcher is part of the context in which the phenomenon studied is located. The researcher observes what happens, listens, and asks questions. The researcher collects data which can be used to explore the phenomenon in focus (Hammersley & Atkinson, 2007). The elements above enumerated are commonly cited in the literature. They are all relevant for the present research. In this light, it corresponded well to my approach as field researcher. I could mobilise learning from my qualification in the psychology of organisation and change, from which I had been exposed to various research methods, like action research. My several coaching professional certifications helped me greatly with active listening, observing and awareness of biases, values, and judgements. I could also profit from several years as an internal consultant with responsibilities in the organisation having built a unit dealing with strategy, change, organisational development, and the newest tools around the ability to facilitate large scale meetings and complex organisational processes. Having also overseen designing learning and development leadership programs in the organisation where the research was situated also gave me a certain sensitivity and depth that directly benefitted some design choices and made the data collection process effective and efficient.

Second, visual ethnography is combining ethnography with the use of visual elements, in the present case artefacts and photography, to explore the phenomenon studied. Visuals are both objects of inquiry and a medium used for inquiring (Pink, 2013b). Interestingly, sociologists, ethnographers or anthropologists who used, for instance, photography for their research did not necessarily integrate the photos in their final research outputs. Often photographs have been used as a way to capture and memorise information during the research process (Gillian, 2014). In contrast, the idea to use photographs in this research was born during the pilot project when it became clear that a lot would happen in the meetings and there would only be so much captured by the audio-recording, the field notes and the artefacts produced. In the spirit of the research philosophy where meaning is socially constructed and knowing does not only happen in the brain but also in the body and between participants and in relation also to their environment, it became an irresistible idea to take photos.

In the context of this research, the use of photographs was at least twofold. It was employed to study what was happening in the meetings. In this respect, it was a medium to explore the phenomenon. It was also a way to document other information and dimensions that other data sources would not capture (Pink, 2013b). It became an integral part of the research work and only showed its full potential once the whole data collection process was completed, and the data collected were put in visual relation and perspective through display and juxtaposition as exemplified in Picture 5 below.

Picture 5 Example of how visuals were used as a medium of exploration

Through juxtaposing the photos taken during the meetings and the photos of the artefacts and fieldnotes together with the pictures from the meeting output, it became a source of analysis to explore and detect answers to why and how visual templates may change the process of sharing knowledge. Insights, trends, and patterns could be more easily discovered and further researched. This was a way of making the thinking process visible and more material. It reified the thinking process and insights, in line with what visual templates can do to knowledge sharing in face-to-face meetings. The notion of 'reification' may not be using a common English word, yet it is the most appropriate to explain the phenomena at stake, in knowledge management. To 'reify' is defined as giving 'definite content and form to something abstract' (Merriam-Webster Dictionary). Reifying consists of bridging the gap between the abstract and the real (Vandenberghe, 2015). Etymologically, the notion of reification has its root in the Latin term 'res' which means 'thing'. However uncommon the word is in the English language, existing only since the second half of the 19th century, it is suitable in the context of this research (see sub-section 6.2, p. 137).

Working with photography and more generally with visual representation helped materialise what Meyer et al. (2013, p. 492) labelled as 'zone of meaning' which they define as the verbal and the visual mode of meaning construction. A zone of meaning materializes, organizes, communicates, stores, and passes on social knowledge within a particular community. Visualizations constitute complex systems of symbolic signs and can build up and organize zones of meaning. These authors considered that 'visual artefacts are not just add-ons to verbal texts, mere transmitters of information, or means of communication. They have become an elementary mode for the construction, maintenance, and transformation of meaning' (Meyer et al., 2013, p. 489). The zone of meaning constitutes immediately available information mirroring complex systems of symbolic signs. It is contrary to a linear and sequential apprehension of

meaning construction. This approach helps capture the researcher's own process of meaning construction and own relation to knowledge.

Another dimension of using the visual as part of the research methodology was a direct contribution to the construction of meaning. Meyer et al. (2013) elaborate on the fact that visual ethnography can be systematic or can concentrate on particularities. These authors further warn about the challenges posed by such a valuable and challenging approach. Namely visuals can help represent reality, but they can also mask reality or let it mistakenly be perceived as constituting reality. Yet, the pictures taken and displayed remain greatly influenced by the photographer's own views about the world.

This research is informed about the possible shortcomings outlined above. Much of the same shortcomings exist equally in the use of words as a medium to construct or represent reality. Therefore, it is accepted as constitutive of the qualitative paradigm espoused by this research. A key mitigation measure used to counterbalance the enunciated risks is to offer a detailed account of the research methodology, data collected and approach to analyse the data ahead of drawing some insights and findings. This leaves space to the reader to concur with, diverge from or challenge the meaning presented.

Another important mitigation measure was that insights and findings were triangulated with what other researchers have contributed. Finally, explaining intention and motivating reasoning were also playing a role in the realm of accounting for how the researcher knew about what was being reported on. In this approach, the written account of the research was performative and prompts or provokes a dialogue with the reader who may chose a position on the continuum between agreeing and disagreeing. This was in line with the research philosophy adopted.

Two tools were used to keep a reflective journal of what has been described in this sub-section but more generally also in the rest of the thesis. On the one hand a textual document to record the unfolding of the research and visual document in which further insights would be gathered. As Ortlipp (2008) affirms about the use of a research journal, 'The goal is to provide a research "trail" of gradually altering methodologies and reshaping analysis'. In the present research, the data collected were qualitative and the observer-researcher position held by the author was key in the data collection.

Using journaling was instrumental in creating a space to harvest multiple considerations as the research unfolded. A first significant type of journal was a textual document, as example the protocol to prepare ahead of the pilot study containing the documents and scripts for the different steps of the data collection. It also gathers some of the feedback received. It was self-reflective and it helped engage concretely with making presuppositions transparent and account for confirmatory biases, surprises, evolution and change of perspectives. A second type of journaling was thematic compilations of visuals to help document the thinking on various themes such as research methodology, visual templates, group interaction analysis, the data collected or the findings, etc. It is not so easy to share extracts in the body of the thesis as soundbites of the journals were contextual. These journals form the puzzle which form the

blueprint of the drafted thesis and may transpire underneath some parts of the thesis if one reads it with the above in mind.

4.7   Research ethics

The research ethics have been informed by three sources covering both the data collection phase and the writing up of the findings: the guidelines from the University of Gloucestershire, the data protection requirements of the organisation where the field research took place, and the academic literature recommendations— when using photography and visual data in the write up of the thesis.

For the data collection phase, the five ethical principles enumerated by Silverman (2015) were followed. First the participants declared that their participation was voluntary. In the declaration, an explicit reference was made to the different data collected, the audio recordings and the photography. All participants gave their consent. One person requested not to appear in photographs which was obviously respected.

Second, the way the participants were recruited ensured that it would not affect them in their everyday work. When inviting managers to propose a team to participate, it was made clear that this should be voluntary and the decision to participate should have no effect on the participants in their work assignments and relations.

Third, a high degree of anonymity has been arranged. The participating teams were given a number. Codes W1 to W5 for the teams which used a template. WO1 to WO5 for the teams which were not offered a visual template. The name of the organisation is not cited. Except for the outlying team who appears in photographs in section 5.5, no other picture shows details that make people and situations recognisable. Details about the field of expertise or the exact department of the ten teams, in hindsight of the findings, were not adding value and were therefore not revealed.

Fourth, the whole endeavour was known about and agreed with by all internal authorities, from the human resource department, the ethical unit, the data protection unit and the line managers. At no point was reservation expressed and therefore the climate and atmosphere were respectful of the participants' free will.

Fifth, the nature of the data collection, the topic and methodology could not generate physical or psychological harm to the participants. None of the participants was a particularly vulnerable person. The only aspect which was catered for was not to be necessarily transparent in the write up about which team did particularly well and which one less well in terms of delivering an output or not following the meeting replica.

For the write up, some attention was given to the literature on the use of visual data in qualitative research (Ball & Smith, 1992; Banks, 2008). The most challenging ethical question came up when deciding to use the photos from the team with the best example to elicit why and how visual templates help the knowledge sharing in face-to-face meetings. As it was not originally

planned to use the photographs in the write up, it was decided to explicitly ask the five persons for a second declaration of consent that the photographs could be included in the final thesis.

4.8   Chapter conclusion

In this chapter, the key insight gathered was the importance of the planning of the case study and of running a pilot with informants so the data collection with real participants could run smoothly.

The use of visuals was an increasingly important source of information as the research project matured and unfolded. The role of taking photographs appeared valuable during the pilot and was strengthened after being used to detect patterns and trends from the data collected.

The intuitive care given to the planning of the use of the meeting room, the smooth running of the case study meeting process and the compilation of demographic information all prove meaningful for leading to the conclusion, that it would make sense to replicate that approach in future research.

Finally, the explicit care invested in ensuring an adequate level of ethical concern helped make the research project sound for all parties involved during the data collection and in the phase of writing up.

Building on the detailed account of how the data collection was performed and conducted, a deep dive into the actual data and what it may bring up as possible insights will be presented next.

5   Findings and Analysis

5.1   Chapter overview

The sections below use the various data collected to gather elements of answers to the three research questions which focused on the output of the meetings; the behaviours of participants and the perceptions of the participants. For all three dimensions, the researcher's own observations and meeting expertise have been considered.

First the tangible output of the meetings was analysed (5.2). The behaviours during the meeting were coded using the audio-recordings of the meeting discussions as well as the pictures taken during the meetings and the field notes harvested during the ten meetings (5.3).

In addition, the answers to an individual questionnaire and the answers given in the focus group discussions were explored and combined with the field notes to explore the perceptions of the team participants regarding the self-assessment of their knowledge sharing experience (5.4).

Some focus is also given to one of the ten teams identified once all the data had been analysed. The one team in focus had used the visual template in a remarkable way (5.5). This chapter is completed by presenting an intermediary set of conclusions (5.6).

5.2   Meeting output

As a preliminary remark on the meeting dynamic in general, the ten meetings were replicas of real team meetings in that they could not be the exact same duration without introducing a certain degree of artificial character. Therefore, it should be transparently reported that the meeting duration slightly varied across the teams but ended up being of a comparable duration in both groups in average terms, as shown in the table below.

From the logic of detecting patterns versus absolute truth, the slight variations observed, and the very comparable average duration, did not impact the observations and findings made when observing the patterns and trends in the data.

(…)

GROUP A (without visual template)		GROUP B (with visual template)	
Team	Minutes	Team	Minutes
W 01	29	W 1	32
W 02	29	W 2	28
W 03	26	W 3	26
W 04	32	W 4	27
W 05	28	W 5	24
Average duration	28,8	Average duration	27,4

Table 6 Team meeting duration per group in minutes

For this research, meeting output is defined as including both what has been happening during the discussion (the process) as well as the actual output of this process (the result). The question 'Which output was reached?' is subdivided into two further questions. First, it includes the question 'to what extent could each team solve the problem?'. Second, it also includes the question of 'whether the solving of the problem materialised or not in a document harvesting the pieces of knowledge shared'.

A meeting output relates to what the teams would have socially constructed and tangibly have in their hands by the end of the meeting, irrespective of whether they were supported by a visual template or not. It was meant to openly welcome whatever the teams would or would not have to display as the output of the pieces of knowledge they exchanged. In the case of the mapping of the stakeholders having an impact and influencing the successful delivery of their work programmes, it was envisaged that the ten teams would have a list of these stakeholders, yet the way they may present this list was not prescribed.

The problem-solving task was enunciated in a way that left open the format of the output of the discussion process. The actual variety of output from the ten teams forming part of the present case study has been evidence that the enunciation of the problem-solving task was truly non-prescriptive in terms of output.

Notwithstanding the absence of prescription of a specific format for the output generated in the discussion process, the task given to the ten teams implied that the content of the output would possibly cover a list of work programme items as well as a list of stakeholder names. It was a research design choice not to define the exact shape of the output. It was by choice left to each team to form their views on how to share knowledge and what to reach out for. The motivation behind this design choice was to ensure that the meeting process would mirror real life team meetings as closely as possible. Such meetings would rarely set a concrete output ahead of convening, irrespective of whether an agenda and material would be distributed in advance of such a meeting.

On the more quantitative side, aspects to explore the output of the ten meetings were defined. The audio-recordings of the ten meetings in conjunction with the coding of the meeting discussions gave access to a concrete number of stakeholders which were discussed in each meeting, irrespective of whether the meeting was supported by a visual template or not. The artefacts gathered in the meetings together with the pictures of the filled templates were another key source of information to also compare whether a common document was produced; whether the number of stakeholders mentioned orally, and the number of stakeholders documented on paper were the same or different.

On the more qualitative side, aspects to explore the output of the ten meetings were also defined. It was important to explore the artefacts produced by each of the ten teams and also some pictures taken during the meetings. With these artefacts, a certain sense of quality level of the output could be observed. The different levels of details written down or not were considered; the usability of the existing documents; how easy it would be to present the document to third parties after the meeting without reworking it; and whether the document contains more information than originally requested, e.g., prioritisation of work items or weighing stakeholders.

A simple point based ranking system was developed to bring forth patterns in the output observed (+1 if a given aspect is present, -1 when the aspect cannot be observed). A team gets +6 points if all aspects are present. Contrarily, a team can be allocated up to -6 points if none of the aspects can be found.

In the meetings which formed the case study in the present research, the knowledge targeted was often tacit and held by one, two or more individuals. This knowledge related to the stakeholders having an influence on the successful delivery of their annual work programmes. The tacit nature of the knowledge came from the fact that knowledge was relevant in context and it took sharing it to make it explicit and relevant. Two different teams can name the same stakeholder and evaluate their impact completely differently to fit their context. This is the challenge for knowledge management in organisations. Visualizing knowledge is a way to make knowledge shift from tacit to explicit which in turn transforms the way team members can relate and use the knowledge shared, to solve problems. Nonaka and Takeuchi (1995) insisted that the challenge for knowledge sharing was to find means to make explicit individual tacit knowledge.

The knowledge shared in the observed meetings was both connected and contextual. It was connected in that it related to the specific team and pieces of knowledge had meaning in relation to one another. It was contextual as each team operated as singular entity. The knowledge shared in each team was not related across the teams. The present research does not analyse or triangulate the names of stakeholders across the team. It was not the focus of the research to compare whether the team names similar or different stakeholders. It was also not the focus to see if each team evaluates the power and interest of each stakeholder the same way. The focus was not on the stakeholder but on whether and how visual templates might influence the shift in the knowledge sharing process from tacitly held knowledge to explicitly shared.

Figure 9 below presents the overview of what some of the teams delivered as their common output at the end of each 30-minute meeting. It helps appreciate whether there was a common output e and of which quality.

There is no necessity to read the details in the pictures displayed in Figure 9. The purpose of this figure is to present at a glance what was delivered as a common output after the 30-minute meeting and the form the output took.

In summary, teams delivered four types of output: self-drawn matrix we labelled 'fixed' matrix as they wrote directly on paper; nothing, when no common document existed; fixed table, when the team harvested the discussion in that format; and dynamic matrix, when the teams used the visual template distributed and in addition used stickers to write down the stakeholders. Figure 9 below gives an overview of all ten-meeting output. The pictures compiled become readable later in the following paragraphs when analysed in more detail.
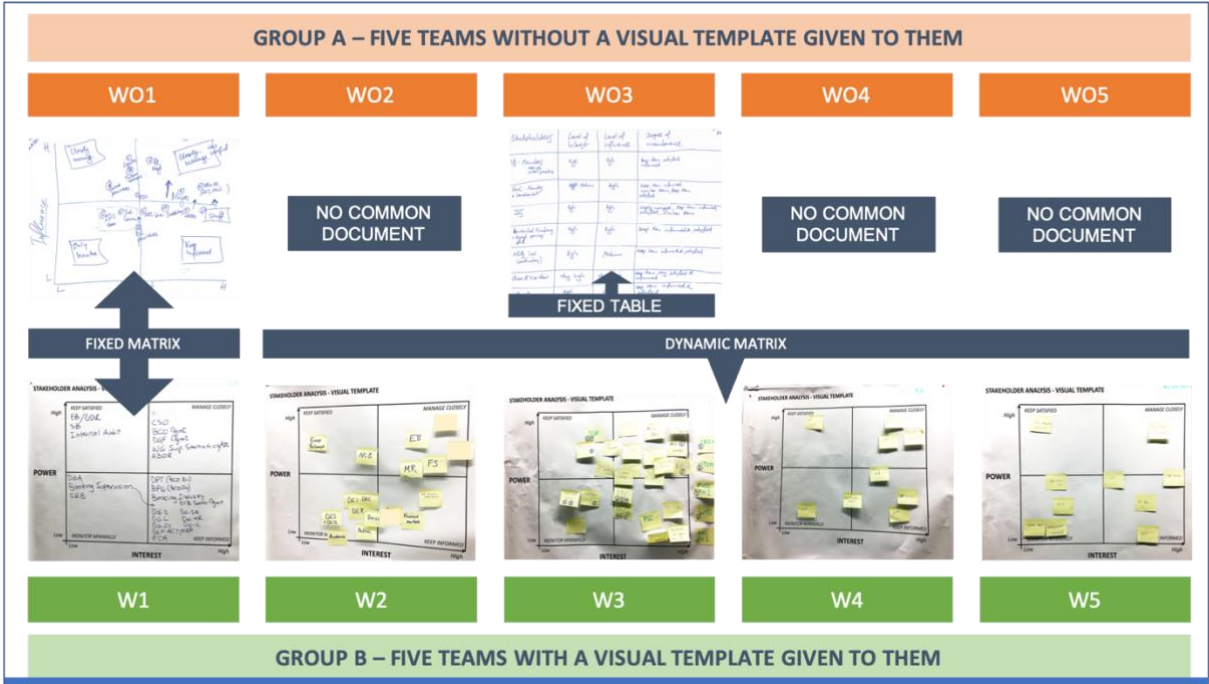
Figure 9 Overview of the output delivered by the ten teams after 30-minute meeting

Table 7 below presents the criteria developed and used to assess and rank the output of the ten teams to bring some tangible point of comparison and account for my own appreciation of the output. The idea was to avoid overly interpretative criteria and rather have elements that any external observer could assess on a binary basis. As an example, 1.1 'Stakeholders have been named orally' calls for a yes or no answer, a binary answer.

Two criteria (2.1 and 2.2) are requiring some interpretation, where two observers might have slightly diverging views yet may not have diametrically opposed views. One person may consider a hand-written document readable while another considers it less readable and not ready for presentation. The goal was to enable points for comparison in relation to the problem-

solving task teams were given. Three criteria applied to the format of the output and the other three criteria related to the content of the output as displayed in Table 7 below.

#	1. ABOUT THE FORMAT	#	2. ABOUT THE CONTENT
1.1	Stakeholders have been named orally	2.1	Items written can easily be read
1.2	Stakeholders have been mapped on a common document comparable to the distributed visual template	2.2	The common document can be presented without further reworking
1.3	Post it notes (available to all teams) have been used to map the stakeholders in an adjustable way	2.3	More usable knowledge than only the names of stakeholders has been documented.

Table 7 Six aspects used to evaluate the meetings' output

Figure 10 below presents the application of the ranking criteria enunciated in Table 8to the actual output. The five teams with the acronym 'WO' refer to the teams in group A 'without' a visual template offered to them. The five teams with the acronym 'W' refer to the teams in group B which were explicitly told they may work 'with' a stakeholder map presented on a flipchart in the meeting room.

	WO 1	WO 2	WO 3	WO 4	WO 5	W1	W2	W3	W4	W5
Total	2	-4	1	-4	-4	2	4	6	4	4
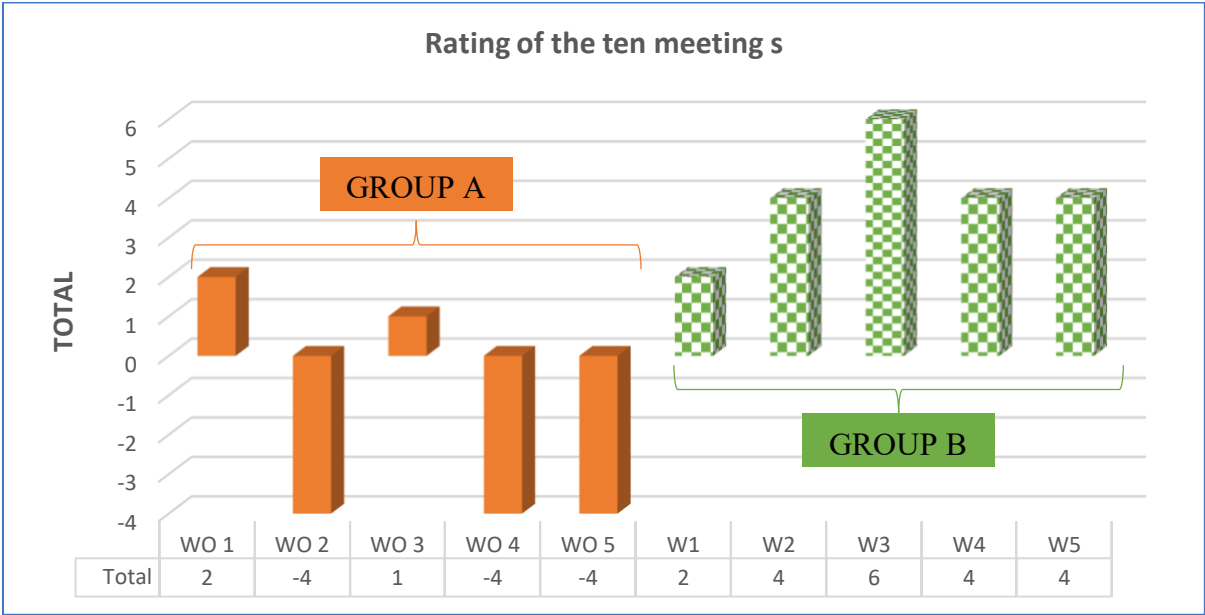
Figure 10 Rating of the meeting output

The above results indicate that three teams did not have a document presenting a common output at the end of the meeting (WO 2, WO 4, WO 5). Another two teams got the same rating, namely + 2 points, one from Group A which was not provided with a visual template, but which created one on their own initiative after carefully reading and drawing a matrix out of the instructions describing the problem-solving task (WO 1), and one team (W1) in Group B which was given the option to use a visual template. Finally, four teams (W 2, W 3, W 4 and W5) got + 4 points and one of them (W 3) got the maximum number of + 6 points. The results are further detailed and discussed in the coming sections.

Table 8 gives an overview of the number of times stakeholder names were said on the one hand (line 1). On the other, it also visualizes the number of stakeholders documented on one common document by the end of the 30-minute meeting (line 2). The discrepancies between line 1 and line 2 derived from the fact that line 1 traced every time a stakeholder name was mentioned in the audio-recording, while line 2 counted only unique stakeholders written down on a common map. In the absence of a common map, a value of 0 was recorded.

	GROUP A					GROUP B				
Names	WO 1	WO 2	WO 3	WO 4	WO 5	W 1	W 2	W 3	W 4	W 5
Spoken	*27*	*18*	*17*	*13*	*18*	*73*	*25*	*27*	*37*	*21*
Written	**14**	**0**	**7**	**0**	**0**	**25**	**18**	**26**	**10**	**10**

Table 8 Number of stakeholders discussed and written down on a common map

The impact of having a visual template to document the output of the meeting discussion showed to observers with access to the overview of the output of the ten meetings that having a common document to visualize the knowledge exchanged could make a significant difference.

Interestingly, the team (W3) which got an output rated as the most advanced (Figure 10), seemed to discuss most efficiently its stakeholders as the number mentioned in the meeting audio-recordings and the number counted on the visual template differed only by one. This was a striking comparative element as this team used in a very optimized way both the visual template as well as the post-its. While it was not originally planned to focus and narrate the dynamics observed in one team, the way team W3 from group B behaved, performed, and perceived the meeting was uniquely exemplative and deserved a special section for a more in-depth analysis. A detailed review of the way this team used the visual template has been presented in Section 5.5 (p. 118).

Three times with no tangible output
For the three groups where there was no output, the result delivered from the perspective of the team members was the oral discussion itself. As the audio-recordings and meeting observations showed, they discussed and somehow solved the problem contained in the task given to the teams, yet they could not deliver anything that could be considered a common output in the form of a written document. Stakeholders have been shared orally but not collectively documented. Often, individual team members took some notes yet these notes, which have been collected as part of the artefacts produced during the meetings, were only partially tracing the discussions, and sometimes not documenting any of it.

In addition, no team member could present anything as a common output after the meeting was finished. This prevents the teams without a common output from taking the conversation forward after the meeting. To reconstitute the exchanges that took place in the meeting, it would take more time than the actual meeting itself with the risk of knowledge loss.

One stakeholder table

One team from group A (without visual template) decided to compile the output of their discussions in a table for which one team member took the initiative to draw to the group. The team agreed to have a note taker to document their discussions.

It was observable that this approach generated ownership on the output as the team defined itself on how to document its discussions. Such a table has some comparable characteristics to a visual template. It can be shared and perfected during and after the meeting.

To contrast with a visual template, such a table is visually less intuitive. It requires reading in more detail to get what the author wanted to share. The table did not cluster the stakeholders according to their needs. The table produced did not allow for easy arrangement of the work programme items according to their priorities. The fact that it was static and not using 'post-its' limited the agility to iterate and readjust but prompted the team to settle and accept what was written down and move on. Such an approach is also very much dependent on the personal efficacy of the team member that takes charge of the note taking.

Two fixed stakeholder templates
The third-best ranked output came from one team from the group which was not offered (WO1) a visual template along with the problem-solving task and one team from the group which was offered a visual template (W1) as show in Figure 11 below.
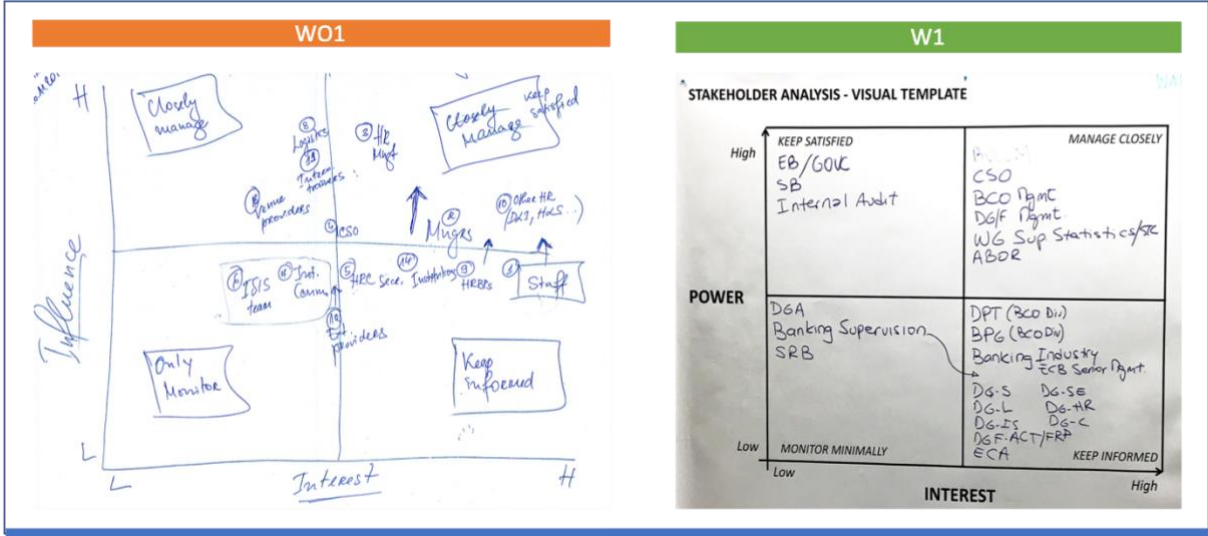
Figure 11 Meeting output: fixed matrix

The information architecture used adequately covered the different dimensions of the task. The stakeholders written down were clustered according to their interest and influence on the ability of the teams to deliver on their annual work programmes. The visual templates used encompassed adequately all the dimensions described in the problem-solving task instructions.

With this approach, the team members were able to share a common understanding and ended up with a common picture of their stakeholder landscape. Tangible conclusions amounting to having solved the problem were reached at the end of the 30-minute meeting.

However, the fixed matrices did not allow for iteration rounds and for shifting stakeholders around as the conversations unfolded. Once written down on paper the stakeholders became fixed and both teams did not move or attempt to move them around. As of the moment they were written down, the discussion in that respect stopped, preventing iteration rounds to possibly evolve their position on the visual template.

Documenting the pieces of knowledge shared directly on a piece of paper as the final output of the meeting presents several disadvantages. First, working directly on the final output makes creating this document the goal and is following the logic of minuting what is being said. Second, not using 'post-its' makes the write up of the knowledge shared fixed and it is not really possible to iterate as time and motivation do not allow rewriting this final document. In contrast, when using a visual template and filling it with 'post-its' that can be replaced individually and move separately, this process lets the document evolve and even several times creates a very different output. Writing on the final document removes the opportunity of adjusting and refining the thinking during the meeting and moving around the pieces of knowledge that are progressively coming together.

Four dynamic stakeholder templates
The last type of meeting output was the visual template provided to five of the ten teams for the purpose of the case study and printed as a matrix to document stakeholders. Four of the five visual templates provided were completed using 'post-its' on which names of stakeholders, work programme items and/or priorities were written down and placed in one of the four quadrants of the stakeholder map printed to serve as a visual template as displayed in Figure 12.

Figure 12 Meeting output: dynamic matrix

The use of visual templates in conjunction with stickers was the most advanced use of the visual template observed in the context of the ten meetings forming the scope of the case study.

Visual templates and post-its together allowed for more refined output. The positioning of a stakeholder on the visual template could evolve as new stakeholders are placed on the template. The visualization of the relative positioning of the stakeholders vis-à-vis one another allowed team members to reconsider and fine-tune the initial positioning they allocated to a particular stakeholder.

One challenge faced by the four teams using visual templates and post-its was to define when to stop iterating and declare the problem-solving task completed. It was tempting for the team members to keep re-opening the discussions. Having a clear ending time for the meeting helped the teams declare the problem-solving task completed.

5.3 Behaviours in the meetings

5.3.1 Approach followed

Through building a body of knowledge relating to meeting science, it has been established that there are links between behaviours of meeting participants and the output of the meetings. Kauffeld and Lehmann-Willenbrock (2012, p. 132) have established that 'To gain insight on the actual behaviours that can promote or inhibit meeting success, participants' actual behaviours during team meetings need to be examined'. What meeting participants say may be used to apply a code to the behaviours they display. In turn, coding team discussions has offered an approach to deepen the understanding of what happens during meetings and how team members interact.

In the present case study, the relations between participants' behaviours, the use or absence of use of the visual template and the meeting output have been explored through the coding and analysis of both their verbal statements and their body language as they interacted or not with the visual template in the meeting room. When exploring the literature on knowledge sharing in meetings, the relevant literature appeared to be best covered by the research on information processing in meetings. Many analytical schemes exist (Brauner et al., 2018). A literature review has depicted the history of the domain (Kauffeld & Meinecke, 2018). Most research in the field of interaction process analysis in meetings has used coding schemes in the context of research using a quantitative methodology. These schemes were applied to team interactions and the meeting process unfolding using large representative samples and were also collecting data over a prolonged period.

In contrast, the method of the present case study was qualitative in nature and the coding scheme was used with the intention to give a framework to the exploration. Before conducting the coding and later when performing a detailed analysis, it was unclear what would be recurrent themes or possible patterns. There was no preconceived working hypothesis as to how discussions would be influenced by the way team members exchange knowledge.

The intention was to mimic an approach that would give a more in-depth understanding of the group interactions than a regular self-defined theme-based discourse analysis (Gonzalez, 2016) of what had been said by case study participants. What mattered was less the content of the discussion than the behaviours associated with the verbal statements of the team members as they were discussing. The goal was to explore whether the use of the visual template would make explicit possible differences or similarities through what people said and how they behaved in the meetings.

With a convenience sample of ten teams totalling fifty-seven participants, it was meaningful to simply borrow an existing scheme rather than develop an entirely new one which could not really be peer reviewed or validated. This would not have been feasible within the organisation where the data collection took place as there was a time limit based on how long managers had agreed to free their teams to participate in the research project (sub-section 4.3).

From this, when searching for coding schemes that were established and validated by previous research (Kauffeld et al., 2018), a coding scheme called 'Act4Teams' rooted in what was originally called the Cassel Competence Grid (Kauffeld, 2006) was selected. The Act4Teams coding scheme presupposes that meeting discussions are conditioned by the behaviour displayed by the participants during their interactions. In turn, the behaviours can be derived from the verbal statements meeting participants made during the discussions. By studying these verbal statements, meeting behaviours can help understand group interactions and specifically for this research the possible role or absence thereof of the visual template on the way teams interacted during the meetings.

While the original article on Act4Teams refers to the term 'competence', a telephone interview with one regular co-author and the model originator (Kauffeld) confirmed that the term behaviour might have been better suited and was also used later on in the subsequent literature (Kauffeld & Meinecke, 2018).

In the present research the term behaviour has been used. It should be understood as equivalent to the term 'competence' in the seminal article (Kauffeld, 2006). In the present research, the coding scheme of reference is the one published in 2018 (Kauffeld et al., 2018). The behaviours coded cover four categories of verbal statements made in meeting conversations:
   a) Problem-focused statements;
   b) Procedural statements;
   c) Socio-emotional statements; and
   d) Action-oriented statements.
   e)
Forty-three indicators form the coding scheme called Act4Teams and were distributed across the four categories of verbal statements. For this research, all forty-three indicators have been retained as shown in table 9 below.

(…)

PROBLEM FOCUSED STATEMENTS	PROCEDURAL STATEMEMTS	SOCIO-EMOTIONAL STATEMEMTS	ACTION-ORIENTED STATEMEMTS
Knowing who	Goal orientation	Encouraging participation	Expressing positivity
Question	Clarifying	Providing support	Taking responsibility
Organisational knowledge	Procedural suggestion	Active listening	Action planning
Problem cross-linking	Procedural question	Reasoned disagreement	No interest in change
Problem description	Prioritizing	Giving feedback	Complaining
Problem identification	Time management	Humour	Seeking someone to blame
Defining the objective	Tasks distribution	Separating opinions from facts	Denying responsibility
Solution description	Visualization	Expressing feelings	Empty talk
Solution identification	Summary	Offering praise	Ending the discussion early
Connection with solutions	Losing the train of thought	Criticism / Backbiting someone	
		Interrupting	
		Side conversation	

Table 9 Act4Teams (Kauffeld & Meinecke, 2018)

Before starting the coding, no pre-defined working hypothesis justified deselecting some of the behaviours as no previous research using this coding approach had indicated proceeding differently. In hindsight, the present research seems to indicate it could possibly be meaningful to consider focusing on some indicators and not including all of them. Selecting out of the complete list would have required some further research to justify the ones to retain and the ones to deselect. A more restrictive approach would also have required having some elements to be able to perform such a selection among the statements and attach them to aspects of the research questions ahead of the data collection. As no previous research used the Act4Teams to explore a visual intervention to understand why and how meetings may be different than without it, I chose to keep them all and let the data inform the research during the analysis phase. This could lay the ground for possible future research.

After listening to a few audio recordings from the ten meetings, it became clear that borrowing the pre-existing definitions for the statements present in Act4Teams would lead to hesitations and inconsistencies when applying the codes. This led to the need to define the behavioural statements to match the context, meeting task and purpose of the present research. This was a key enabler to be able to code as consistently as possible, as the coding would only be performed by one coder, the researcher, without quality control from a second person. This exercise of defining the statements in context also helped to ensure the mutual exclusivity of the codes. For each type of statement, some more detailed explanations were defined to better fit the problem

the meeting participants were invited to solve; explanations around what each indicator meant in relation to mapping the stakeholders that have influence and interest in the successful delivery of their annual work plan.

Annex 7 (pp. 169-172) reproduces the four categories of statement.

The first category covers '*problem focused statements*'. The description established a relation between the abstract definitions from the model and the actual problem-solving task given to the team members participating in the meetings scoped in the case study.

The second cluster related to the category 'procedural statements' and covers the different activities helping or hindering the running of the meeting.

The third cluster related to the category called 'socio-emotional statements' and relates to the way participants were relating to each other during the meeting.

The fourth cluster related to the category '*action-oriented statements*' encompass individual behaviours of participants in the meeting.

By proceeding with tailor-making, the explanations for the indicators, it helped decide how to code a given statement. This was added after realising that without such a convention it would be very difficult to proceed and be consistent as a single coder without any second coder with whom to compare results.

Table 10 below gives an overview of the four categories of statements used. Two columns were added to the original model to give a reference (a letter and a number) and a column after the behavioural indicator to show whether it was used (cross) or not used when coding (0). This updated table informs all the following sections and insights and serves as the reference against which insights and explanations are exposed.

(…)

PROBLEM FOCUSED STATEMENTS			PROCEDURAL STATEMENTS			SOCIO-EMOTIONAL STATEMENTS			ACTION-ORIENTED STATEMENTS		
A1	Knowing who	x	**B1**	Goal orientation	x	**C1**	Encouraging participation	x	**D1**	Expressing positivity	0
A2	Question	x	**B2**	Clarifying	x	**C2**	Providing support	x	**D2**	Taking responsibility	x
A3	Organisational knowledge	x	**B3**	Procedural suggestion	x	**C3**	Active listening	x	**D3**	Action planning	x
A4	Problem cross-linking	x	**B4**	Procedural question	x	**C4**	Reasoned disagreement	x	**D4**	No interest in change	0
A5	Problem description	x	**B5**	Prioritizing	x	**C5**	Giving feedback	x	**D5**	Complaining	x
A6	Problem identification	x	**B6**	Time management	x	**C6**	Humour	x	**D6**	Seeking someone to blame	0
A7	Defining the objective	x	**B7**	Tasks distribution	x	**C7**	Separating opinions from facts	0	**D7**	Denying responsibility	0
A8	Solution description	x	**B8**	Visualization	x	**C8**	Expressing feelings	x	**D8**	Empty talk	x
A9	Solution identification	x	**B9**	Summary	x	**C9**	Offering praise	x	**D9**	Ending the discussion early	x
A10	Connection with solutions	x	**B10**	Losing the train of thought	x	**C10**	Criticism / Backbiting someone	x			
						C11	Interrupting	x			
						C12	Side conversation	x			

* C.7; D.1; D.4; D.6; D.7 do not appear in the data reported
as no occurrences were recorded for the ten teams

Table 10 Act4Teams with specific information from the present study

5.3.2   Two additional codes

Two patterns came out during the listening and coding of the audio-recordings.

The first code was about naming stakeholders. Every time the name of a stakeholder was mentioned, a coding event would be created so it would help with comparing how names were said and how many, if any, were written down during the meeting discussions.

The second code was about blanks in the meeting conversations. Two ideas were attached to this code. One had to do with striving to have codes for the full duration of each meeting. Another one was the fact that a blank indicates a space for participants to think. There was an opportunity to explore whether there was a difference in trends between meetings using a visual template and those which did not in terms of time spent by participants silently together and

whether there would be a difference or not in terms of knowledge sharing observable in the tangible output.

Remarkably, there are interesting differences as explained in the interpretation part of this research in chapter 6. These two codes proved relevant and helped with understanding the phenomenon under exploration in more depth and would be used again if future research is initiated.

5.3.3 Coding decisions

To be able to apply the codes in a systematic way, multiple decisions had to be taken as there are many options for how coding could be conducted. Literature on group interaction coding refers to the need to care for many decision points. To remain coherent with the coding scheme selected, thirteen decision points proposed by Kauffeld and Meinecke (2018) were used building on the wealth of experience of these authors as they wrote all the articles on the Act4Teams coding scheme.

A summary of the decision points is shown in the overview in Figure 13 below.

FOCUS OF INTERACTION (what)	**IMMEDIACY** (when)	**SOURCE** (where from)	**DIRECTION** (who speaks to whom)
EXHAUSTIVENESS (how much)	**SEQUENCES** (how often)	**DURATION** (how long)	**UNITIZING STRATEGY** (what specifically)
GRANULARITY (how detailed)	**DIMENSIONALITY** (how many)	**MAGNITUDE** (how often)	**OBSERVER INFERENCE** (how biased)
APPLICABILITY (how specific)			

Figure 13 Overview of the analytical decisions made to implement the coding scheme

Each of the above decision points are explained together with the motivation of the choice made for this research.

Focus of interaction. There are three possible ways to go about it. One can code the process, the activity, or the content of the interaction. The choice was made to code the verbal statements made and relate them with the behaviours listed in the Act4Teams coding scheme. For example, a participant asking 'Shall we have somebody timekeeping' would be matched with the code 'Time management' from the category of procedural statements.

Immediacy. Two options could be envisaged. Coding *ad hoc* as the meeting unfolds, so-called 'live coding'. Alternatively, another approach would be coding *post hoc*, namely based on audio-recordings. Materially it was simply not possible to both observe the meeting and code without adequate technology and with no coding experience as was the case. Therefore, *post hoc* was the only viable choice for the present research.

Source. The question is whether to look at the group as a whole or at its members and whether to signal the role (facilitator, manager, leader, etc.) or qualities of a member (male or female, experienced or inexperienced, etc). The decision was to code at group level without distinguishing between the group members. The research questions were not concerned with relations between a particular role and a specific behaviour so it would not make sense to place the unit of analysis at the individual role level.

Direction. Another decision was about whether to code the recipient of the statements said in the meetings. The coding scheme as applied here steered away from coding the direction of the verbal statements. Concretely, there was no coding of the sender or the receiver of the knowledge shared. It would not have been useful to gather elements of answers for the specific research questions.

Exhaustiveness. Behaviours coded could be specific and only when they occur. Alternatively, all behaviours could be coded. All behaviours were coded for the present case study. The rationale was the need to let a set of extensive behaviours be coded as there was no hypothesis to start with around which behaviours would best match the problem-solving task and knowledge sharing discussions.

Frequencies and sequences. A sequential analysis focuses on how behaviours follow or precede one another. A frequency analysis focuses on how many behaviours are displayed. The coding software used would allow having both views derived. The data generated by the coding showed upon completion that the frequency analysis was meaningful, while the sequential one was inconclusive. This output was attributed to the size of the convenience sample and the meeting duration.

Duration. The codes can state events or point to events. State events record two time points, the start, and the end of the event. Point events record that a behaviour occurred. State events were used for all codes from the Act4Teams coding scheme. Point events were also used to record every time the name of a stakeholder was mentioned.

Unitizing strategy. Defining the unit of time that serves as reference for the coding is a demanding task. A duration can be used, for instance changing the code every ten seconds, no matter if there is a change of speaker or behaviour of reference. This is called 'time sampling'. Another approach is to code based on speaker or behaviour no matter the duration of the intervention. This is called 'event sampling'. For the coding in the context of the present case study, 'event sampling' was used and led to applying a code for every new statement. This has been one of the most challenging aspects of the whole coding exercise. Once the coding started, after all data were collected, it required some trial and error to settle on one versus the other.

Granularity. This dimension hangs together with the unitizing strategy. The present case study being qualitative meant a coding scheme was used as is often done to find out recurrent or dominating themes in transcripts of discussions. The coding happened one segment of audio

recording at a time and each segment was given one code. It does not exclude the possibility that a segment may have deserved two codes. Yet the code that came to mind first was the code used and recorded. My research questions did not warrant being overly granular. The interpretation stage of the data showed this was an acceptable arbitration.

Dimensionality. A behaviour could be coded from several perspectives ('multifunctional') or one single perspective ('univocal'). Building on the insights gathered around the Act4Teams model, it appeared sufficient to use univocal coding as most research uses it (Kauffeld & Lehman-Willenrock, 2012). One reason for that was the lack of previous research to construct multiple perspectives. The work performed in the present context was exploratory and a first map of the territory.

Magnitude. Two references could come into question. Coding the presence or absence of a behaviour ('occurrence'). Alternatively, one could also rate the quality of the behaviour ('intensity'). As the coding was meant to see if the use or absence of use of a visual template translated in any fashion into a change of behavioural pattern in the meetings, the choice was made to code the occurrence of the behavioural statement not the intensity. For example, the code 'solution description' occurred 114 times in group A and 144 times for the teams in group B.

Level of observer inference. Coders can face a high judgement call. The need to interpret what is heard and choose a code leaves some space for variation. Given the number of codes (43), the novel character of the work, and the absence of quality control by a second coder, observer inference was high. The risk induced by the level of observer inference was the biggest time-consuming factor in the coding process, requiring listening several times to the same audio segment to ponder and conclude which code to use.

Applicability. The coding scheme may be 'universal' in that it is applicable to a wide range of situations or maybe 'setting-specific' as relevant to a particular context. For this research the coding scheme selected was universal. To increase the ability to trace back and account for the work done, a rather specific description of the behavioural statement was tailor-made for the present case study.

A key insight gained by going through the experience of coding was the need to grow the ability to listen to the type of statement made (problem focused, procedural, socio-emotional, action-oriented) rather than to focus on what is said in terms of content (questionable opinions and theories about stakeholder management for instance). This took quite some capability building to be able to apply the coding scheme while listening to the audio-recordings.

5.3.4   Statements coded

Conveniently, once the ethogram and coding pad were created for one audio file, it could be imported and re-used automatically for the other nine files. The built-in features in BORIS allowed for different sorts of queries to explore the coded data quantitively and visually.

Once the coding was completed, the option to export the data to Excel was selected. After this step the Excel document was exported to Tableau. The goal of this step was twofold. First, it was to use software which has multiple built-in functionalities to explore data and expose the relations between variables. Second, it was to produce readable data visualization to use in the body of the thesis.

For the sake of transparency about the approach followed, a statistician colleague of mine helped me set the database and curate the data as well as introduce a few formulas in Tableau to put variables in relation and help make sense of the data I considered useful to have accessible, e.g. units of analysis, information architecture, main comparisons, etc. The exploration through questions and queries has entirely been my doing and responsibility.

It is voluntarily kept simple as the idea is to detect trends and patterns and not to establish realistic truth which would not be appropriate for a social constructionist approach to this qualitative research. Yet, none of it would have been possible without borrowing from a quantitative approach. This is a point which deserves to be underlined.

With the approach selected, it appeared that the current step of analysing the data was richer as for the same questions more perspectives could be combined. This was a valuable insight for me as a qualitative researcher, namely the importance of crossing data and analytical perspectives, not so much to discover the truth but more to enrich the understanding through why and how questions. With the second-by-second coding, I realised that a lot of information and knowledge can be shared in a few seconds. I also became fully appreciative of the practice of actively listening to what is being said and not just relying on approximate memory or impressions. There is a lot of space to further this approach in the future.

5.3.5   Results

This section reports on what the data extracted from BORIS coding software, the use of which is explained in detail in section 5.3 (p. 87).

The analysis uses essentially three units to investigate the patterns and trends the data derived from the coding of the behaviours shows:
  i)   the number of occurrences by categories of behaviours (problem-focused, procedural, socio-emotional and action-oriented statements) or at the level of the individual behaviour belonging to one of the four categories (the indicators belonging to each of the four categories of behaviours);
  ii)   the duration during which certain behaviours or categories of behaviours are displayed; and
  iii)   the mean duration at category level across each group of five teams.

Remaining conscious of the qualitative nature of this study and the intention to use the data to detect patterns and not to test pre-existing hypotheses, I chose to remain at the aggregated level

of the teams, namely group A and group B, made of 5 teams each. As a reminder, group A corresponds to the five teams which were not offered a visual template to harvest the knowledge they would exchange during the meeting. Group B corresponds to the five teams which were offered use of a visual template to visualize the pieces of knowledge they would exchange during the meetings.

The above analytical perspectives were selected to detect elements of answers to the second research question which intended to understand the behaviours displayed by the teams when using or not a visual template. The goal of harvesting these elements was to explore the why and how questions around the use of the visual template to share knowledge in face-to-face meetings at work. The idea was to observe if some behaviours are distinctively present when using or not using the visual template to better understand how the template influences the interactions in the teams.

The coding of the number of times stakeholders were mentioned for a given meeting serves more as the answer to the first question on the meeting output. Yet keeping it in mind also on the part of behaviour helps put the analysis into perspective. Concerning the additional code on blanks, moments where meeting participants do not speak, they are reported along with the other four categories of statements belonging to the Act4Teams coding scheme. Both types of data may also be reported in the section on behaviours for the purpose of contextualising and appreciating the output of the four categories forming the Act4Teams coding scheme.

Building on the above general remarks, the results will be presented successively for each type of verbal statement equating the behaviours displayed in the meetings. The last sub-section will bring all the data together again. Concretely, the data relating to problem focused statements made by meeting participants are described and where possible explained (5.3.5.1); then it is the turn of the procedural statements (5.3.5.2) before socio-emotional statements (5.3.5.3); while continuing with the action-oriented statements (5.3.5.4). Finally, cross insights will be presented bringing in relation dimensions that appeared noticeable to the researcher when proceeding with the above (5.3.5.5).

5.3.5.1 Problem-focused statements

The first category of statements reported on are 'problem-focused statements'. This research has used stakeholder maps and stakeholder management as a pretext and not as a purpose. The focus remains on exploring the impact of knowledge visualization on the way meeting participants interact. This has led to very limited focus on stakeholder management as a body of knowledge informing this research.

While acknowledging the above, it was nevertheless important for the coding phase and the use of the audio-recordings to have a clear understanding of the content of the discussions. And it is necessary to specify a few aspects at this juncture. Having listened attentively several times to the three hours of recordings, the codes were defined in relation to the substance of the discussion. It helped in attributing a unique code to the statements made. In the coding phase, it was necessary to listen to the content of the conversation to allocate codes exhaustively to the

various statements made and used as proxies for qualifying the behaviours of the meeting participants.

From this logic, the problem-focused statements presented below gave more detailed insights into stakeholder management from a pragmatic angle. The descriptions stem from the listening to the audio-recording and obviously from nowhere else as the Act4Teams coding scheme was not used before in this way to help understand a particular meeting intervention like the use of visual template nor obviously to explore discussion about stakeholder management.

In the problem-focused statements, pieces of knowledge exchanged gravitated around the context (knowing who (A1), question (A2) organisational knowledge (A3)). It also covered various dimensions of the problem which in this case amounted to defining the stakeholders of the teams engaged in the case study (problem cross-linking (A4), problem description (A5), problem identification (A6), and defining the objective (A7)).

Finally, the remaining codes of this category give a more precise sense of what the solution to the problem-solving task could be like (solution description (A8), solution identification (A9), connection with solutions (A10) as further displayed in Annex 7 (p. 169).

The output of the coding exercise of this statement category is presented in Table 11 below.

PROBLEM FOCUSED STATEMENTS		Number of occurrences		Duration in seconds	
		WITHOUT	WITH	WITHOUT	WITH
A1	Knowing who	13	9	101	73
A2	Question	85	114	559	523
A3	Organisational knowledge	52	56	726	528
A4	Problem cross-linking	26	23	512	220
A5	Problem description	8	10	101	155
A6	Problem identification	5	2	54	7
A7	Defining the objective	23	24	251	161
A8	Solution description	116	144	1641	1818
A9	Solution identification	40	74	762	938
A10	Connection with solutions	26	37	277	577

Table 11 Observing the output of coding problem-focused statements

Table 11 brings together the two groups and the statements and crosses them with two dimensions: i) the number of occurrences for each group and ii) their total duration in seconds per group and per statement. As the meeting task is a problem-solving task, statements relating to solutions are more numerous and those furbishing most of the time spent on this category as shown by Figure 14 below.

The data shows that there is no correlation between the number of occurrences and their total duration, so both dimensions, occurrences, and time, are needed to explore the data.
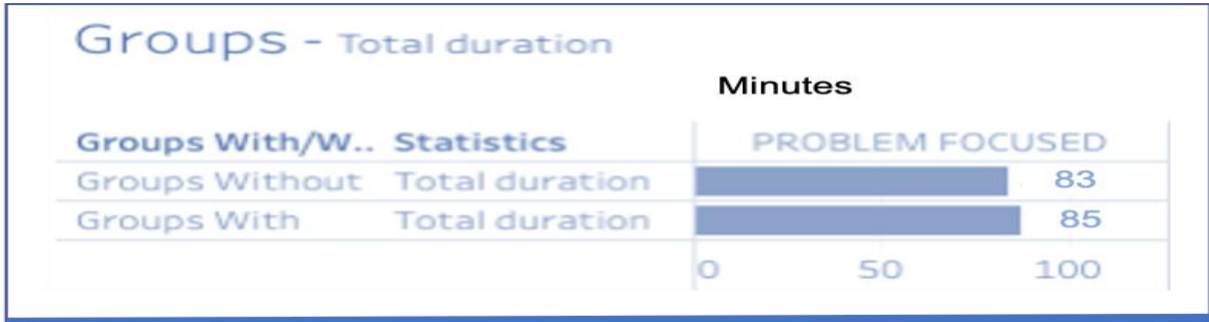
Figure 14 Comparison across groups of total duration of problem-focused statements

As a reminder, the five teams in group A which were not provided a visual template met in total for 144 minutes and the five teams of group B who were provided a visual template met in total for 137 minutes. It means that group A spent 83 minutes out of 144 minutes of total meeting

time on problem-focused statements while group B spent 85 minutes of 137 minutes of total meeting time. So, both groups spent half of their time on this category of meeting behaviours observed through the statements coded out of their recorded discussions.

Even more interesting is that the teams using a visual template had proportionately a significantly higher total number of occurrences in the problem-focused category of statements in a comparable period, namely 493 occurrences recorded against 394 occurrences for group A comprising five teams not invited to use a template while the total time spent on this category only differed by two minutes more.

Several additional observations can be made about the data. These additional observations combine the trends that can be detected in Table 11 together with the field observations which led to formulate some tentative explanations for the output the data showed. More detailed interlinkage with the overall learning will be shown in chapter 6 on the research findings.

Within the problem-focused statement category, the data between the two groups appears to be comparable in many of the cases when comparing number of occurrences. It takes adding the duration of the statement type to understand a particular verbal behaviour in relative terms.

Taking the example of statements about _organisational knowledge_ (A3) is helpful to understand the need for nuance. There were 52 occurrences for group A without the visual template, while there were 56 for group B with a visual template. It appears very comparable for both groups. Yet when also including the dimension of total time spent on this behaviour it appears that group A spent 12 minutes dealing with organisational knowledge while group B spent a little less than 9 minutes. As a matter of approach, no definitive conclusion can be drawn at this stage.

The focus in section 5.3.5 is about detecting data that deserves attention. The discussion will be taking place in chapter 6 in which the various compiled elements are brought together to triangulate interpretation between the data of the case study and other studies and the prevailing body of knowledge and philosophies informing this research.
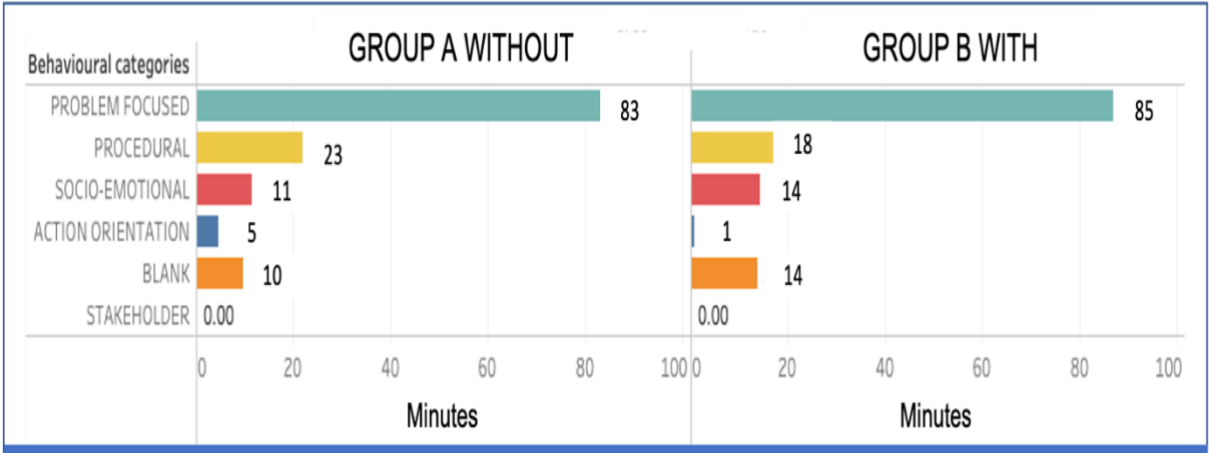
Figure 15 Overview of event duration of the categories of codes

The observation of each of the four categories of statements (problem focused, procedural, socio-emotional, action orientation) will be built according to the same order and logic. This allows for a systematic harvesting of insights and collecting indices which will be synthesised in the next chapters. The three most significant trends defined as the highest number of occurrences and/or total duration for a given statement will be reported from most used to least used. If at times a fourth trend appears, it may also be mentioned and explained why it has been added.

The first category of problem-focused statements relates to *solution description* (A8). Not surprisingly, this type of statement corresponds to the exact task at stake given as the problem-solving task for the case study meetings, namely finding out who are the stakeholders having power and influence on the successful completion of the work programme of the teams for the year ahead. 116 occurrences were reported for group A and 144 for group B. The five teams in group A spent 27 minutes discussing solution identification, in other words discussing their stakeholders, while group B spent 30 minutes. At this point, this data needs to be crossed with another pair of numbers, namely the total number of occurrences in which each group named a stakeholder. Group A referred to a stakeholder 93 times, while group B referred to a stakeholder 183 times. This is not to be confused with the unique number of stakeholders referred to, which belongs to section 5.2 (p. 79) on meeting output. It simply shows that the group with the visual template named stakeholders twice as many times than the group without a visual template.

The second category of problem-focused statements which deserves to be reported explicitly at this juncture, because of being second in terms of total duration, are the statements referring to *solution identification* (A9). Group A had 40 occurrences and spent almost 13 minutes identifying solutions. Group B had 74 occurrences and spent 15.5 minutes identifying solutions. The statements falling under this category are at the heart of the matter, because in these statements, stakeholders were often named and discussed by the teams.

The third category of problem-focused statements which arrives second in terms of number of occurrences and third in terms of total duration are *questions* (A2). The questions were posed among the participants about how they know what they know, from whom they know what they know, and how this knowledge is contextually relevant. In group B using visual templates, all together 114 occurrences were coded against 85 for group A. In this case, more time was spent (12 minutes) by the five teams in group A without the template. Group B with the template spent just short of 9 minutes asking questions to each other. This is a general trait that group B with the template had a high rhythm in general in terms of more occurrences for a given category in less time. An overview of this dynamic is shown in sub-section 5.3.5.6 (p. 107) and expands on this insight.

5.3.5.2 Procedural statements

To analyse the data under the category procedural statements, the approach established under 5.3.5.1 will be repeated. Table 12, the statements, their number, whether they were used for coding and their description are reported.

Overall, the essence of the procedural statements adjusted to fit the case study concentrate on the meeting process. The statements on goal orientation (B1) and clarifying (B2) are about where the discussion should lead. The procedural suggestion related statements (B3) and the procedural question related ones (B4) are about the way the discussion would be unfolding. It also encompasses possible adjustments as the meeting discussions took place.

The other statements: prioritizing (B5), time management (B6), task distribution (B7), visualization (B8) and summary (B9) are to-do tasks generally related to good meeting practices. The last related statement about losing the train of thought (B10) is also a procedural remark relating to occurrences when the participants digressed from discussing the intended meeting topic as detailed in Annex 7 (p.170).

Table 12 displays the number of occurrences and the total duration of each statement under the category procedural statements, as coded with BORIS software and then exported to Excel and visualised in Tableau.

PROCEDURAL STATEMENTS		Number of occurrences		Duration in seconds	
		WITHOUT	WITH	WITHOUT	WITH
B1	Goal orientation	10	8	73	80
B2	Clarifying	20	29	232	190
B3	Procedural suggestion	0	1	0	12
B4	Procedural question	5	29	39	107
B5	Prioritizing	3	4	47	19
B6	Time management	15	12	67	74
B7	Tasks distribution	4	6	36	47
B8	Visualization (only non-verbal code)	43	20	518	198
B9	Summary	11	13	150	273
B10	Losing the train of thought	10	15	193	170

Table 12 Observing the output of coding procedural statements

The three types of statements which were most used are in decreasing order: visualization (B8), clarifying (B2), and time management (B6).

The type of statement most used falls under _visualization_ (B8) with 42 occurrences for group A and 20 occurrences for group B. It interesting that the proportion of references to visualization is double for the group without a visual template. It is even more striking that the time spent is almost 9 minutes for group A and 3 minutes for group B. It is somehow logical that the team

members not invited to use a template have to remind each other to somehow capture the discussion they were having. It is also taking more time to capture the knowledge shared without a pre-set frame for that purpose, than with a visual template to fill. This logically takes time away from discussing the content versus proceeding with the meeting as group B did. As observer, it was striking to see that as soon as teams in group A wanted to document their discussions it was taking time away from progressing the discussions.

The second type of statement by quantitative importance is _clarifying_ (B2). There were 20 occurrences for group A and 29 for group B. Group A spent almost 4 minutes clarifying, while group B managed to have almost 50% more occurrences of statements in this category, in only 3 minutes. This difference in the rhythm between both groups appears to be a red thread across the different categories of statements. Group B showed it switches and cumulates statements more frequently and therefore displays more occurrences, often in proportionately less time.

The third type of statement deserving a reference in this debriefing is _time management_ (B6). For this type of statement, there were 27 occurrences across both groups. Yet the total time spent was only a little more than 2 minutes across the ten meetings. These short segments dedicated to time management represented brief moments to check with the team whether they considered they were on track. Their short duration does not diminish their importance. Teams acted on them swiftly and adjusted their pace accordingly. It is also noticeable that time management check points appeared more often in the second half of the meetings than in the first half when participants wanted to ensure they were on time by the end of the meeting.

The procedural statements, compared to the other 3 categories of statements from the Act4Teams model, were the second most used type of statement after problem-focused statements and ahead of socio-emotional statements and action-orientation ones. Group A spent 23 minutes making procedural statements while group B spent 18 minutes as displayed in Figure 16 below.
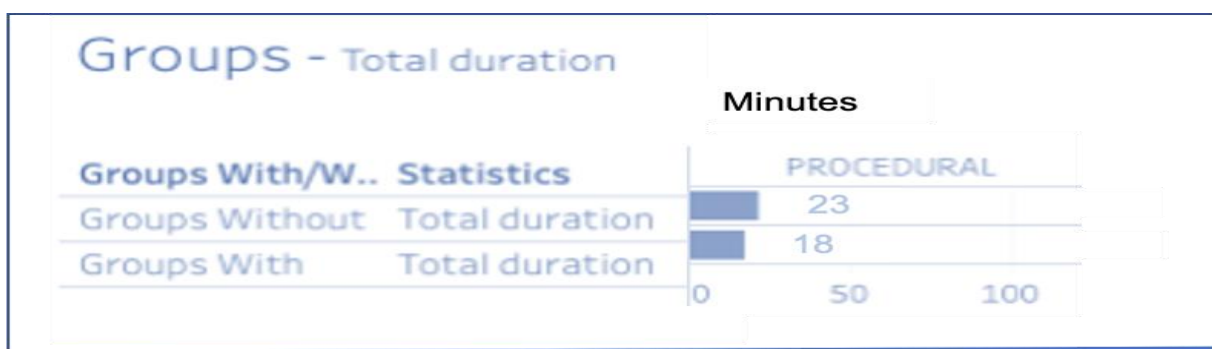
Figure 16 Comparison across groups of total duration of procedural statements

117 occurrences in 23 minutes for group A and 137 for group B in 18 minutes confirm again at category level that there are more exchanges in the group with visual templates than in the group without, in this sample of ten teams and 57 participants.

5.3.5.3 Socio-emotional statements

Nine of the ten socio-emotional statements listed in the Act4Teams model were used as codes in this case study appearing *a posteriori* when analysing the data. This resulted from the coding and was not a design choice, because the code was simply not used. The statement about *separating opinions from facts* (C7) was not used to code the statements from the audio-recordings across the ten teams.

Socio-emotional statements are the third most used category in both number of occurrences and total duration in proportion to the other statements. The ten statements belonging to this category are also depicting the atmosphere in the meeting and depicting the interpersonal dynamics, and how much team members engaged with one another on a more personal level. Some are more about displaying a supportive attitude like encouraging participation (C1) and providing support to help with ideas and suggestions (C2). Other statements are more about feedback in general (C5), reasoned disagreement (C4) and criticising someone (C10). It also extends to situations when humour is used to bring a lighter touch to the conversation (C6) or showing interest with affirmative sounds indicating active listening (C3) as reported in detail in Annex 7 (p. 171).

There are clear front runner types of statements under the socio-emotional category as displayed in Table 13 below.

SOCIO-EMOTIONAL STATEMENTS		Number of occurrences		Duration in seconds	
		WITHOUT	WITH	WITHOUT	WITH
C1	Goal orientation	10	8	73	80
C2	Clarifying	20	29	232	190
C3	Procedural suggestion	0	1	0	12
C4	Procedural question	5	29	39	107
C5	Prioritizing	3	4	47	19
C6	Time management	15	12	67	74
C7	Tasks distribution	4	6	36	47
C8	Visualization	43	20	518	198
C9	Summary	11	13	150	273
C10	Losing the train of thought	10	15	193	170
C11	Interrupting	5	2	35	8

| C12 | Side conversation | 2 | 6 | 24 | 39 |
| C13 | Self-promotion | 4 | 0 | 22 | 0 |

Table 13 Observing the output of coding socio-emotional statements

First, the most used statement is _reasoned disagreement_ (C4). Across both groups, 90 times the code for reasoned disagreement was used for a total of almost 11 minutes. There is a relatively significant difference between group A which was allocated the code reasoned disagreement 27 times, while group B cumulated this code 63 times. That puts the code reasoned disagreement among the codes that have been used more than the average across all statement categories, by slightly more than 7 minutes. It is the code that accounts for half of the time spent by group B in the category of socio-emotional statements as reported in Figure 17 below. This will be further taken up in chapter 6 and when discussing the potential of visual templates to stimulate the debate.

The second most used statement was _humour_ (C6) with an edge in group A which was allocated the code humour 24 times in some 3 minutes during the five meetings of the teams.

The third most used statement was _giving feedback_ (C5). In this instance, the most codes and longest duration were on the side of group B with 21 codes computed and a total of 3 minutes. Group A totalled 13 codes and only spent 1.5 minutes. The support that the visual template brings may explain the ease of pointing out whether a piece of knowledge is new or not, as defined in Table 13 above. By showing knowledge pooled from participants and displaying it on the visual template, it becomes easier to quickly refer to the piece of new or already used knowledge.
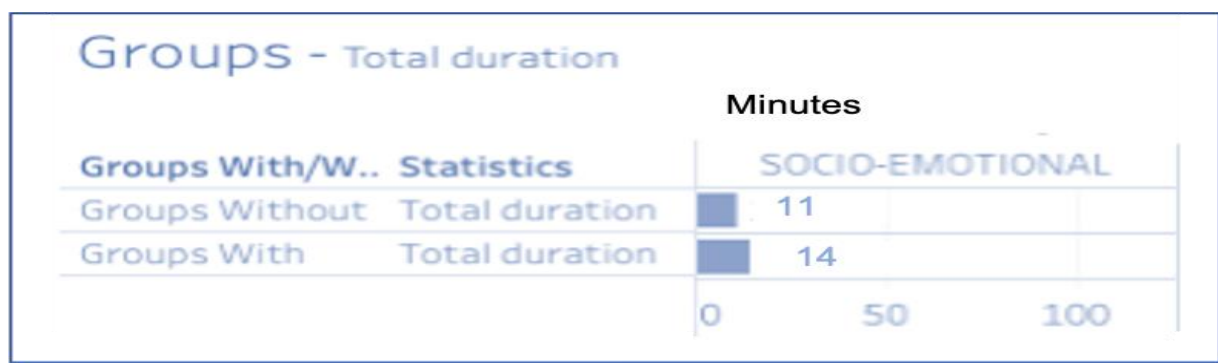
Figure 17 Comparison across groups of total duration of socio-emotional statements

As far as the socio-emotional statements are concerned, they accounted for 11 minutes for group A and 14 minutes for group B of the overall duration of the coding of the ten meetings. Roughly speaking, that corresponds to 10 percent of the total meeting time of each group.

5.3.5.4 Action-oriented statements

The last category of statements is action-oriented statements. Out of nine statements, four were not used for the coding of the audio-recordings, not as a choice ahead of the coding but as an

output. Four statements - namely *expressing positivity* (D1), *no interest in change* (D4), *seeking someone to blame* (D6) and *denying responsibility* (D7) – were not heard. To some extent in a 30-minute meeting, it is plausible that not all statements are used. A second possible factor to explain this output is the type of task in question. In the present study, the type of task was 'problem-solving'. The problem was meant to be solved during the meeting duration. The action-oriented category of statements, as described in Annex 7 (p. 172), mostly refers to organizing follow up actions that take place after the meeting is over.

Different to the other three statement categories reported above, problem focused, procedural and socio emotional, and in view of the total duration across the ten teams this category has lasted, namely 6 minutes, as displayed in 14 below, only the most used statement <u>*action planning*</u> accounting for 4 minutes, will be picked up at this juncture.

ACTION-ORIENTED STATEMENTS		Number of occurrences		Duration in seconds	
		WITHOUT	WITH	WITHOUT	WITH
D2	Taking responsibility	2	2	15	4
D3	Action planning	10	3	216	37
D5	Complaining	3	0	38	0
D8	Empty talk	3	0	45	0
D9	Ending the discussion early	1	0	7	0

Table 14 Observing the output of coding action-oriented statements

Action planning has been the most used type of statement. It was used 10 times by group A and 3 times by group B. The total duration of action-oriented statements for Group A was 5 min, 3.5 min of which was devoted to action planning. Group B spent only 1 minute on the action orientation category, almost exclusively on action planning.
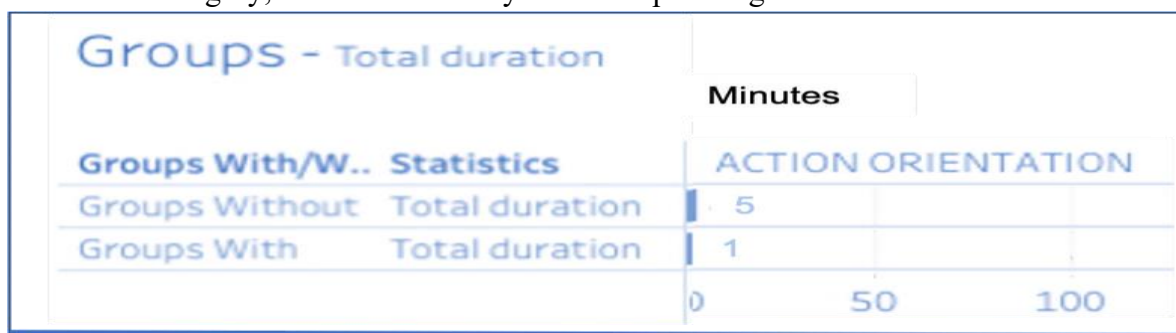
Figure 18 Comparison across groups of total duration of action-oriented statements

The tailor-made description of action planning for this study says that action planning is understood as 'Agreeing upon tasks to be carried out. Correlating names and action'. As most teams in group A did not have a common way to document their discussion, the teams had to

speak more about the issues related to action planning. Teams in group B just did it while teams in group A planned to follow up and do it.

5.3.5.5 Blanks

While I was vaguely aware of the importance of silence in meeting interactions, I was impressed that I had to create a code dedicated to silence when coding the audio-recordings, second by second. This has certainly proven to be an important data point, both while coding took place and while examining the coding output.

When I coded the meeting recordings second by second, I certainly learned more about the meeting interaction than while designing and leading meetings and being very attentive to meeting science and technology over the last quarter of a century as an enthusiastic meeting facilitator. I had never been aware that sixty seconds could contain so much information as when you slow the pace of listening and deconstruct in detail the content of what has been said. The process of deconstructing the 30-minute meeting in second long units became an incredibly rich experience for both the meeting facilitator and the meeting scientist in me.

I will not be able to underpin much of this sub-section with anything else than the recorded data and my own observations, with more academic references about silence in chapter 6 when I will bring all the insights and findings together in a few meta-lessons I intend to draw from the study.

I consider it important to share the insights and, possibly even more, the questions I have gathered as they could serve and inform future research about the role of silence as a research subject and subsequently as a useful evidence-based management intervention to improve meeting effectiveness and efficiency.
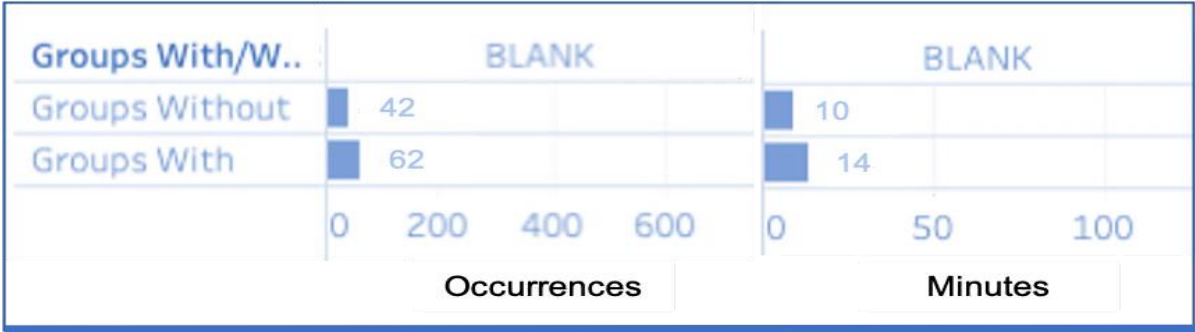
Figure 19 Comparison across groups of total duration of code *blank*

As Figure 19 above shows, teams in group B had more occurrences of moments without speaking than the teams in group A who were not offered a visual template. When looking at the time sequencing data in BORIS, displaying graphically how codes are sequenced, the transcripts and my own observations, the blanks which I qualified as silences are not appearing to have the same function in both groups.

In the teams without a visual template, it appears that blanks appeared more during the first half of the meetings. They seemed more to be moments of hesitation and not knowing how to proceed and what to do.

In the teams with a visual template, blanks correspond to moments of stepping back to find new pieces of knowledge to share.

From a purely quantitative perspective, the teams with a visual template had more happening, including more blanks and yet they named twice as many stakeholders and had altogether the highest number of diverse statements in their meetings. The present study cannot lead to more than acknowledging that there is something to be further explored as the dynamic required a specific handling and showed afterwards that these blanks accounted for 10% of the meetings using a visual template.

5.3.5.6 Data in relation and perspective

Figure 20 and Figure 21 give the big picture of the data collected in terms of occurrences and duration across the Act4Teams' four types of statements and the additional two codes for blanks and stakeholders. It helps understand the most aggregated trends commented in detail in the previous sub-sections of the present chapter 5.
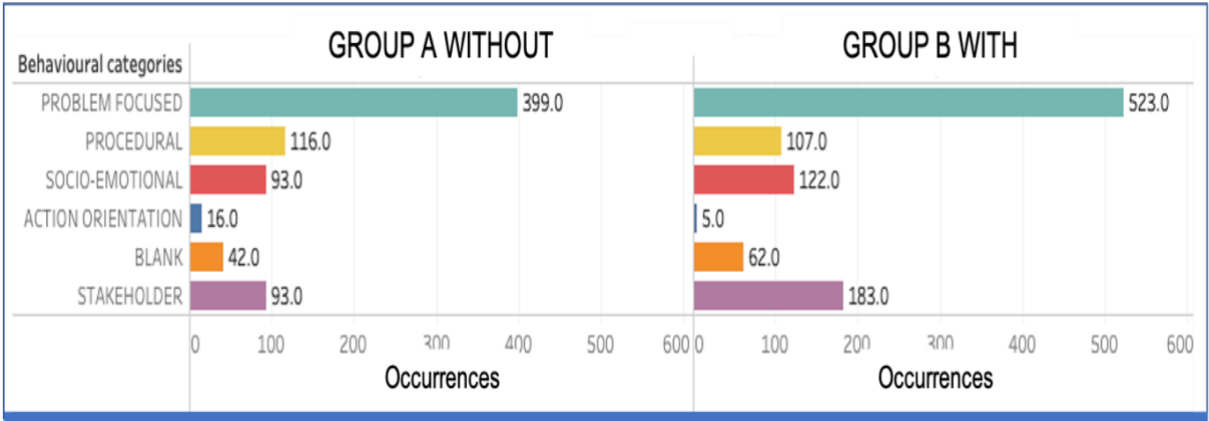
Figure 20 Observing the number of occurrences per statements category and two groups

Altogether, for a comparable total meeting duration, more exchanges, and with more diversity, took place in group B when comparing to the five teams in group A.
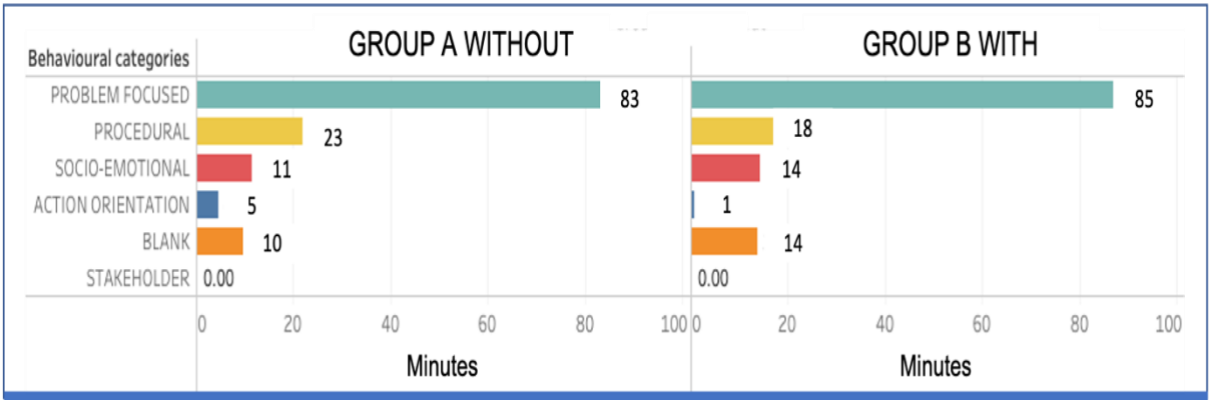
Figure 21 Observing the total duration per statements category and two groups

Both groups showed comparable trends in terms of which category of the four statements (problem focused, procedural, socio-emotional and action oriented) they were most busy with.

The fact the meeting task given to the ten teams was a problem-solving task seems to be having some effect on the fact that problem-focused statements were most used and therefore displayed the highest number of occurrences.

Comparing both groups, group A without the visual template appeared to have spent more time discussing the procedure to go through in the meeting. Group A had 23 occurrences of this type of statement against 18 for group B. The code 'stakeholder' did not measure a duration but the occurrence of hearing the name of a stakeholder and the value in minutes is 0.00.

While there are limitations to the coding approach selected as discussed in chapter 6, it remains a very positive experience which brought to light insights which could not have surfaced alone from the other data collected. This approach warrants some further deepening and possible re-use. Micro-interactions in team meetings can really help analyse in more depth possible interventions to help make meetings more productive and help define a space for meaningful knowledge sharing at work.

5.4   Individual and group perceptions

To better understand the role played by visual templates in the sharing of knowledge during real team meetings in the workplace, participants' perceptions regarding their meeting experience were also included. Considering these aspects was a logical consequence of the social constructionist philosophical paradigm in which this research has been located and even more so in the light of the more specific school of thought of relational social constructionism (chapter 3, p. 38).

In addition, exploring and analysing the objects and environment involved in these interactions matched the other dimension of the philosophical paradigm, namely 4E cognition, which proposes that the generation of knowledge and meaning does not only happen in the brain of the participants but also in their bodies, in relation with the environment they evolve in. This also implies that participants have extended ways of knowing when they also interact with the artefacts they are creating during the meeting (section 3.3 p. 44).

To generate insights and possible trends or tendencies, the responses to the individual questionnaire (5.4.1) and the views of the teams expressed in the focus groups (5.4.2).

5.4.1   The responses to the individual questionnaire

Sub-section 4.3.5 (p. 59) described the type of questionnaire used. It was an affirmation-based questionnaire to make respondents think about which answer was really making sense for them. It helped the respondents ponder on different elements in relation to the six topics for which their perceptions were sought. The affirmations were written in a straightforward way, but still contained a lot of complexity that forced respondents to take a moment and really ponder about them before selecting an answer that made sense for them.

Each of the six themes and their affirmations are reproduced below and the results compiled for group A and group B are reproduced in Annex 8 (p.173). The key results are presented below.

Perception of the knowledge sharing process

Group A, without a visual template given to the teams, did not perceive the absence of structure as preventing them from exchanging knowledge and even perceived the discussion twice as structured than the teams in group B. Conversely, group B was expressing satisfaction with the quantity and conclusiveness of the pieces of knowledge they exchanged.

The questionnaire was answered individually and in silence, just after the meeting replica had finished. The team members did not exchange their impressions and perceptions, because the intention was, by design, to try to capture what each would perceive and believe uninfluenced by the other members of their teams.

Interestingly, in the focus group discussions which followed the 10 minutes dedicated to answering the individual questionnaire, perceptions were tempered. Team members in group B discussed comparable aspects. In several ways, teams in group B expressed that they got more knowledge shared in less time than usual and that they would normally need more than 30 minutes to get to such a complete picture in their normal team meetings. This discrepancy is a useful indicator of the need to work both at the individual and team level when searching for why and how knowledge sharing is shaped in real teams at work. Both dimensions, individual and collective, form the bigger picture of knowledge sharing in team meetings. In chapter 6 on discussions and limitations, this discrepancy will be further exposed as any level, individual and/or group level, can block or enable the other one when searching for ways to foster knowledge sharing in team meetings.

Perceived engagement in the meeting

In this second cluster, the affirmations to unveil the individual perceptions were focusing on how engagement in the case study meeting compared to the engagement in usual meetings the team members have among themselves. No respondent from group A, nor from group B thought the engagement was better in the context of the case study. No respondent thought either that the participants were not engaged. Overall, all ten teams replied that they perceived participants between engaged and very engaged, as displayed in Annex 8 (p. 174).

In a way this is neither crediting nor discrediting the impact of the visual template on engagement level. It speaks more about the challenge of harvesting people perception. Each team member gave its feedback from the individual perspective and not in comparison to the others in the team. Nobody compared their experience to any other team in the group or across groups. Engagement has been perceived in each meeting ecosystem. No benchmark or common understanding was shared by the team members about what engagement is. Participants were simply left to share their perceptions according to their explicit or tacit personal understanding of the theme of engagement. They evaluated whether participants were active through speaking and working together during the meeting.

The perceptions expressed by the participants are not based on evidence but on what comes to mind as they choose a statement. It is impression based and without long lead time. Understanding exactly how respondents know what they know and what reality is made of for them echoes the dilemmas around defining the philosophical paradigm of the present research. While the perceptions the respondents expressed cannot be disputed, the insights these perceptions allow can be triangulated with other data. In the present case that data is made up of what questionnaire respondents had said in the focus group when discussing as a team, as well as team output data and finally my own observations. It is a significant challenge to make use of such perceptions to build possible future interventions to improve the problem at the origin of this research, namely better meeting output and satisfaction through improved knowledge sharing to solve problems.

Relying on people's perceptions is not enough to bring forth change and high performance in organisations, particularly for the knowledge sharing phenomenon. Perceptions do not appear to be the output of a thorough and explicit process. This connects to the issue of being a prisoner of one's own not knowing.

Use of individual opinions
In the third theme of the individual questionnaire, the focus was on the perceived sense of having one's opinion heard and how much this opinion was considered or not by the team in its workings.
The results are interesting to observe as they raise questions which may be left without answers in the context of the present study but could be usefully integrated in future research. Group A is appearing to perceive overall that the individual opinions were more heard and considered than the team members from group B using a visual template in relative terms.

This raises questions around some possible limits of the visual template and questions whether visual templates influence the perception of respondents around some loss of freedom of expression and some sense of not being heard because what they may have to say might not fit the frame proposed by the visual template. It could be that the virtue of the visual template to keep a team focused, contributes to negatively corseting the opinions. It might be limiting the sense of being free to speak up. Therefore, some team members may not feel in a position to be heard. Participants may consider not being welcome to express themselves if they would not see immediately how these opinions could fit with the visual template. This questioning of the limits of visual templates will be further reflected on in the light of existing research on the limitations of the use of visual templates and what is known about some of their possible limitations in chapter 7.

Impression about the knowledge shared
In the fourth theme of the individual questionnaire, statements regarding how knowledge shared got used or not were proposed. Imparting knowledge is a necessary step for this knowledge to be heard and to be used later. The statements were designed to make the respondents reflect on both aspects: on the one hand how much knowledge was shared and on the other hand how

much of this shared knowledge was used or not. More advanced statements are used to check whether the fact of having shared knowledge even helped generate new knowledge, which would not have been shared if previous knowledge pieces had NOT been spoken and retained by participants.

The answers of group A are spread across four statements, including the most negative statement. Two respondents from group A even perceived that pieces of knowledge shared were not picked up, in other words, given attention to and not used by the team. Most respondents from group A considered that all the pieces of knowledge spoken were picked up and used by the team. It is interesting to wonder how the perceptions of respondents were generated. Group A teams have only partially documented the discussion and three teams did not document in one common repository any knowledge shared about the stakeholders having power and interest about the successful implementation of their work programme.

Team members had to rely only on their memories and unwritten traces to conclude whether they felt that their opinions were considered or not. Group B had a slightly more stringent sentiment that some opinions were, in relative terms, not fully considered. One could ask the question whether they based their impressions on more tangible grounds, as they could observe on paper if what they said was documented and visualized or not, which allowed for a more concrete way to form views. It would be interesting to understand better the thinking and feeling process leading to the statement choice made when responding in future research.

Satisfaction with the discussion process
In the fifth theme of the individual questionnaire, the perceptions around the satisfaction of meeting participants with the discussion process were explored. Two dimensions were balanced under the fifth theme. First, it was about the meeting structure. Second, it was about whether the meeting organisation had an impact on the interactions among the participants as displayed in Annex 8 (p. 177).

Group A was overall slightly less positive than group B. Most participants in both groups chose the affirmation under 5.d and underlined that not only was the meeting structure helpful but that it even helped the meeting participants to structure their interactions. Two thirds of group B and half of group A respondents chose this affirmation. Teams with the visual template were more positive about the relation between meeting structure and meeting output than teams without.

Two participants from the teams with a visual template even considered that the meeting structure was not supportive, yet they assessed that it did not affect the meeting interactions. Some questions around the need to include a demonstration on how to use a visual template to guide a meeting appeared relevant and may deserve future research efforts. It is possible that the use of the template with total autonomy and without any induction, only counting on its intuitive usability, might at times be taking too much for granted. It may not be as self-explanatory as I believed it was.

Satisfaction with the discussion output

In the sixth theme of the individual questionnaire, feedback on the perceptions of participants about their satisfaction with the meeting and their impression of whether the problem-solving task was fulfilled was sought after. Participants had to weigh their overall satisfaction with the meeting and their sense of completion of the task as displayed in Annex 8 (p. 178).

Observing the answers, I realised how little I understood about how respondents formed their perceptions, the credibility of these perceptions and the way to make best use of them. Should they be taken at face value or not, given that the observation indicates there could be some incoherence when crossing different data and data sources? How do you stick to socially constructed views of reality when a third-party observation has evidence that another conclusion may have been defendable?

Concretely, sixteen respondents from group A, which represented more than half of the participants in that group, perceived that they fulfilled the task fully and another third was very satisfied even if the task was only partially fulfilled. This raises several questions.

While perceptions are by nature to be taken for what they affirm, it might be questionable to grant them credit without some nuances if other elements concretely go against the views expressed as perceptions. In the present case, it appears surprising, to say the least, that such a high number of respondents from group A were so satisfied with the meeting output when three teams had only a good discussion as an output, but no tangible elements to bring forward. This realisation did not only corroborate my observations, but also crystallised the fourth research question, which until this chapter has not been formulated, namely: how come teams in this study and beyond would not undertake to change something with their meetings when commonly meeting participants express dissatisfaction with attending meetings? It has been a question floating over this research. This is the question that can be explored from the viewpoint of the so-called Dunning-Kruger effect where one's not knowing stands in one's way.

In contrast, most teams in group B declared they were satisfied with the meeting and completion of the problem-solving task. Three participants out of a total of twenty-six in group B considered the problem-solving task only partially fulfilled. I perceived that having a tangible and documented output with an artefact in the form of a portable filled visual template was a strong reason for the teams in group B to feel very positive. Group B could contemplate the output of their efforts during the meeting discussions and the teams of group B could report the task as fulfilled based on the output being visually accessible.

5.4.2 The transcripts of the focus groups

The transcripts of the focus groups were compiled in three different documents. The first document was the compilation of the transcripts of Group A bringing together the five teams which were not offered a visual template to solve the meeting task. The second document assembled the transcripts of Group B comprising the five teams which were offered a visual template to solve the meeting task. The third document was made of the transcripts of both Group A and Group B.

The analysis consisted of two different perspectives. The first perspective was to look at the answers given to a question across the ten teams. A second perspective was a keyword-based search across the transcripts of the five teams not having the visual template at their disposal and another cross search of the transcripts of the five teams having been offered use of the visual template. Keywords to be searched were defined based on the notes taken during the focus groups. The choice was made following two criteria. The first criterion was the frequency of the appearance of the word. The second criterion was the subjective impact some discussions generated during the live discussions and which appeared in the field notes (Annex 15, p.188) as more intense in nature than discussions around other keywords. Frequency and intensity became proxies for indicating an issue deserving attention. I decided to explore those issues, while keeping in mind information that helps understand how the teams collectively perceived the meeting experience they had just undergone.

After proceeding with a semantic analysis of the audio transcripts of the focus groups in combination with the remarks I harvested in my field notes, I identified the themes mapped in Figure 22 and further detailed in the paragraphs below.

About the meeting structure	Task	Duration	Agenda	Templates
About the team interactions	Team	Everybody	Trust	
About the meeting process	See	Write	Feel	Move

Figure 22 Key themes stemming from the ten focus group meetings

The key outlying topics which were retained for the analysis have been structured under three headings as displayed in Figure 22 above. These headlines came out of the analysis of the transcript and were not planned of running the focus groups.

<u>About the meeting structure</u>
Under this heading, four elements have been identified. They cover exchanges about the task requested from the teams, the duration of the meeting, the absence of a pre-set agenda and the use of visual templates.

Discussing the task at hand
The word task was spoken 51 times by the meeting participants. The meeting participants have extensively discussed whether it would have been better to be informed ahead of the meeting about the task or not. Another focus was on whether the task was perceived as clear or not. No consensus could be detected, yet the controversy around this aspect was actively discussed. One aspect which was particularly stressed and could be seen as important from the joint perspective of knowledge visualization and meeting science viewpoint is the fact that the task was handed to each meeting participant individually and in writing. The visual elements of having the task document available at all times appeared to have had a positive impact on the unfolding of the meeting discussion. Even if the task implied the need for it to be discussed and clarified, the

visual element of having it to hand was perceived as a positive contribution to its performance and completion.

Duration of the meeting

The expression '30 minutes', the duration in which meeting participants had to solve the problem they received, appeared 13 times in the transcript. A consensus was found towards acknowledging the usefulness of a tighter duration than the team would usually have had. It was reported that time constraints implied finding ways to progress through the meeting faster. For instance, one team used voting to complete sub-parts of the meeting. Most teams appointed a timekeeper as they felt from the start the need to control the time and impose a rhythm to their discussions. Several teams expressed their desire to use the experience from the case study in their daily meeting practice. By imposing a shorter meeting duration, they would try to increase the motivation for finding ways to make the best use of the limited time available.

It was also noted that what was felt as a short duration was also a valuable way of keeping participants engaged; with less time available it is easier to stay engaged and have a sense of urgency which helps sustain the attention needed to get to the end of the problem-solving process. When reflecting on what worked well, some participants reported that the tight time gave them the impression they were more creative with managing the meeting progression.

Meeting agenda

The word agenda appeared 20 times. Three main remarks caught my attention. Several teams reported the practice of having an agenda helpful for their meetings. They were reporting that not knowing ahead of the meeting what the topic would be, had disadvantages and advantages. The absence of an agenda sent in advance meant that thinking about the meeting task could only start after the meeting had started. Having in mind a tight deadline the teams had to comply with may not be an ideal approach. On the positive side of things, the absence of an agenda sent in advance placed all meeting participants on the same footing and gave everyone a chance to think on their feet. Some participants noted that the absence of an agenda helped prevent some participants coming prepared and imposing their views during the meeting. Several participants noticed that sending an agenda in advance is so established in their usual work meeting practice, that their teams would not meet without it. They appreciated this habit and see it as positive.

Visual templates

This topic of 'visual template' as a keyword was not much used by the meeting participants during the focus group. One person from the teams having been invited to use a visual template to harvest their stakeholders explained that having the visual template to support the meeting discussion was a positive element. According to that person it helped with solving the task the teams were asked to perform during the meeting. It was also mentioned that having the template visible in the meeting room at all times helped with proceeding swiftly through the meeting. I trace the absence of verbal reference to the visual template to the fact that it was not explicitly named anywhere as 'visual template' and that as such it was not a known concept to the meeting participants. Therefore, it did not naturally come into the focus group discussions. Judging by the challenge I had to define the term for this research as reported in sub-section 2.4.3 (p. 24),

this is a rather confirmatory insight about the need to have clear names for tools and that these conventions need to be used regularly for them to be explicitly referred to.

<u>About the team interactions</u>
Under this heading three elements have been identified, covering discussions about the reference to the team; concern whether 'everybody' was adequately involved; and the impact of 'trust' on meeting interactions.

Team
The word team was used more than 50 times. It was a very present dimension in the focus group discussions across group A and B alike. Three main aspects relating to the topic of 'team' appeared to me when analysing the transcripts of the focus groups covering: the impact of being a team beyond the case study; the power of solving the task as a team; and the roles in the team.

On the first aspect, several participants underlined the fact that they knew each other before participating in the case study which had a positive impact on how they approached the task placed in front of them in the meeting replica. Some participants viewed the satisfaction with the output despite the short meeting duration in relation to this fact. They also wondered whether knowing each other was the key reason for being able to deliver the output on time. Some expressed the sentiment that there were some reactions which built on their habits in their daily teamwork. They wondered if the teams had not been real teams and had been composed of participants, they did not know whether they could have delivered comparable results.

Regarding the second aspect, the fact of tackling the problem-solving task as a team helped to deliver a useful output. Some voices underlined that the diverse backgrounds of the team members added value and brought a different perspective to the table. Also, according to some participants, having everyone engaged while working as a team helped to deliver better results.

Finally, some remarks had to do with the roles some participants actively took in the team. Praise was expressed for those who took the initiative to lead the meeting, took notes and/or were timekeepers. As observer, I recall this was a rather informal and spontaneous process. At times it would be the most senior, other times a more extroverted participant. Others were simply enthusiastic. I cannot remember anyone going against an offer to embrace one of those roles in any of the teams.

Everybody
The word 'everybody' was used 63 times. The participants placed a lot of importance on wondering about three dimensions: the extent to which everybody had space to be heard; whether everybody contributed; and for group B with the visual template that everyone had equal visual exposure to the knowledge shared on the visual template.

This idea that every meeting participant should have equal chances and should be kept engaged, appeared to be an important trait and motivational factor for team members. This should be kept in mind when taking on the challenge of fostering knowledge sharing in meetings.

Interventions or solutions are to be designed while keeping in mind that everyone should be kept engaged. By making sharing of knowledge visible to all meeting participants, visual templates appear to naturally enable this key aspect of meeting satisfaction and generate support within the group for such an approach.

Trust

Using the same logic of underlying the value and importance of having been a team before the case study, several participants stressed the importance of the value of trust within the team to support the solving of the problem given to the teams to work with. The quality of human interactions between team members was a central source of attention. It was not overly articulated by the meeting participants but sufficiently stressed and repeated to be noted as an important insight into the perceptions of the meeting participants.

About the meeting process

Under this heading four active verbs have been retrieved from the meeting transcripts to describe what has been important during the focus group discussions: the intense use of the verb 'see'; the interesting use of the verb 'write'; the metaphor attached to the verb 'move'; and finally, the frequently used verb 'feel'.

See

The verb 'see' was used 60 times in the focus group transcripts. It is one of the most used active verbs. It shows how the cognitive function of seeing is a key part of the discussions, literally or metaphorically. What the participants meant when they used the verb 'see' was not immediately obvious. I only realised once reading the transcripts that it was used by the meeting participants essentially to cover three different meanings.

First, a literal meaning, 'see' was used to designate the physical action of seeing, often to refer to the visual template and mentioning that all participants could see the stakeholders mapped on the visual templates. Second, it was used as a synonym of the verb 'understand' as in the expression 'you see what I mean' with the intent to check whether the counterparts 'understood' what the person meant. Third, the verb 'see' was used on several occasions in conjunction with the expression 'from my perspective' to express a subjective view of the world.

Interestingly enough, I could not really detect a conscious understanding by the participants about the importance of seeing and vision in their apprehension of their environment; the use of the verb 'see' appeared to me as automatic, unrelated to the use of the visual template.

Write

This was an interesting realisation. The meeting participants did not use the verb 'visualise' but the verb 'write' to literally express the fact of having added the name of a stakeholder to the visual template or more generally having written down on paper the name of a stakeholder. This informed very directly the research about the importance of the semantic gap between what the research framework may use as a technical term and what non-informed practitioners may naturally refer to.

Some additional reference to writing was made to refer to the fact that in several teams someone took the initiative to be writing down the gist of the discussion on behalf of the team, in particular the list of stakeholder names relevant to the problem-solving task the teams were working on.

It was interesting to observe that the group B teams, having been invited to use a visual template, did not really speak of seeing or visualizing but were more literal and used the verb 'write' instead.

Several participants noted that thoughts and pieces of knowledge shared orally, but not written down, were not really considered, and further developed in the discussion.

Move
A third active verb commonly used and referring to the body and expressing the action of moving was the verb 'move'. This verb was used as a synonym of the verb 'progress'. It was meant to express a sense of dynamic in the meeting discussion. The point of noticing it is a bridge back to 4E cognition (for more details see sub-section 3.3.2 p. 46). The semantic used by the meeting participants in the focus group discussion could indicate an implicit importance given to motion in the realm of the semantic attached to the body to help generate sense using the verb 'move'.

Feel
Finally, the verb 'feel' was used 44 times in the focus group transcripts. This verb was associated with the expression of sentiments, a state of being of the meeting participants. They expressed whether they felt at ease, or if they considered the meeting process to be productive or unproductive. Several participants spoke as if they knew what the other felt and expressed with general statements what they considered to be the team sentiment. The verb 'feel' was often used in conjunction with the words 'everybody' and 'nobody'. This created the sense that some meeting participants had an urge to be the spokespersons of the whole group and claim to have a sense of how the team as a collective felt. While, they did not speak with each other to check on their beliefs, yet still expressed themselves as if they knew what was going on in the whole team.

The verb 'feel' was used by a team member to express what he or she presented as his or her social observations. From the use observed in the transcripts, it appeared that the use of 'feel' gave a certain assertive tone to the statement made, while keeping the eventuality of being contradicted and even possibly wrong in what was expressed.

The intention behind analysing in detail the meeting transcript was to try to understand how the meeting participants perceived the meeting process and the possible influence of the way they worked together as a team when exchanging knowledge. One expectation was to understand how aware meeting participants were of the meeting process and how teams invited to use the visual template would perceive its use.

To some extent, this expectation was met, but possibly from a different angle than the one explicitly planned. I had imagined that the meeting participants would more explicitly reflect on the way they shaped their meetings, the way the visual template was used or not. In other words, I imagined that the meeting participants would have more built-in self-reflexive reflexes to observe their experience from a distance and self-reflect on it individually and collectively. This reveals my unmet expectations which in turn can also be a reason why managers get it wrong if they are not conscious of their expectations and the impact an unmet expectation may have on problem-solving.

Meeting participants across both groups looked back rather literally and not so much with distance. This led the meeting participants to give answers to questions starting with 'what' rather than with 'why'. When looking at the transcripts, the questions implicitly answered were mostly: what did we do? What was important? What was remarkable about our team? The participants focused on what they knew, saw, and felt. They hardly wondered about 'why' the meeting unfolded as it did.

This insight above is very important to help understand some aspects of why despite having powerful interventions to improve knowledge sharing in meetings it does only happen seldomly. It also helped understand that in the absence of a benchmark and a third-party review, the participants remain in their comfort zone when discussing among themselves their experience and prefer comforting each other than challenging each other. It also helped understand, in this context, how generally the questions 'what reality is made of' and 'how we know what we know' are not commonly reflected on. It is important to have these insights in mind when designing interventions to change habits and practices in teams.

As a researcher, I had a very narrow focus to explore and observe. As meeting participants, they had their own logic. Without having had this focus group experience, I would probably have lacked empathy and insights about people's preoccupations. It makes me wonder whether this can be a reason why despite the availability of many tools and interventions, teams are ignoring them and in turn helping themselves to improve their meetings. Further research is required to deepen the relation between the team's self-awareness about its performance and its ability to take the initiative to improve its own processes, as in the present case the process of sharing knowledge in team meetings.

5.5   An outlying team

Three moments were decisive in relation to choosing to expose the insights generated by the team presented as the outlying team. The first key moment was during the meeting replica of the outlying team. It is the eighth team appearing in the data collection and was given the code W3. While I had decided from the pilot onwards to take pictures at the start, at the middle point and at the end of each of the ten meetings, just after a few minutes with this eighth team, I decided to intensify the picture-taking activity because what I was observing did not compare to any of the first seven teams. At that time though, I had no concept of what would come out of these photographs.

The second decisive moment took place after I organised all the material collected, including audio-recordings, transcripts, artefacts, and photographs, and realised that my initial reaction during the meeting was in retrospect meaningful when looking at the collected pictures as basically, without really having been aware, the pictures taken were telling a particularly interesting story.

The third decisive moment happened while working to complete the philosophy chapter, or to be even more specific, the branch of social constructionism I would be exploring in the research. When discovering relational social constructionism and sometime thereafter 4E cognition, I realised that the photographs I had intuitively taken of the outlying team were a unique application of these two aspects of the philosophical paradigm of this research. What was originally an imposed academic exercise - to reflect on the philosophical aspects of the research - became a real adventure with a lot of potential for growth, both intellectual and personal. I started to see how I could turn 20 years of personal observation and ethnography as a hobby into a set of qualitative observations and experiences which could help answer in part the research questions I had been following in this study. It helped me a great deal to hone my qualitative research skills as I progressed through the research process.

The motivation to share the above three moments was to trace and document the self-reflection that led to some of the choices made in this study. The degree of methodological flexibility displayed was balanced by the liability to account for the thinking process and arguments underpinning the choices made and presented. Having both the sense of freedom of choice and of liability about the reasoning, should enable others to give feedback and criticise and choose to replicate or not comparable approaches. These are new possibilities I did not consider and practice before this research project. It corresponds to a definition of what having a scientific approach in social sciences means for me with a frame that can be adjusted with accountability and transparency around the thinking and concluding process.

Against the above insights and thinking process, I have accounted for the observations and analysis of the outlying team by exposing elements of answers to each of the three research questions: elements regarding the output the outlying team reached; the behaviours the team displayed; and the perceptions the team members shared (5.5.1). Against this broad overview of comparable elements to those already exposed for all ten teams, a specific dive into the working of team W3 is shared, building on 18 photographs covering the meeting replica. Reflections about 4E cognition, the relational dimension of socially constructed meaning and the role of silence structure the detailed exploration of what made team W3 the outlying team (5.5)

5.5.1 Output, behaviours, perceptions

The overarching research goal has been to understand how knowledge sharing in team meetings could be supported and whether knowledge visualization through the visual template could

influence the output, behaviours and perceptions of team members with the goal of helping share more, better and conclusive pieces of knowledge. Some elements provided by observing team W3 are presented below in relation to the three research questions dealing with the meeting output, the participants' behaviours and the participants' perceptions.

About the output of the meeting of the outlying team W3

When rating the meeting output, team W3 from group B, one of the five teams having been invited to use a visual template, was allocated the maximum six points from the criteria defined for the purpose of this research. It meant that the team got one point for each of the six criteria defined in Table 7 (p. 83) that:

i)   Stakeholders were named orally.
ii)   Stakeholders were written on the visual template.
iii)   The team members used post-its and rearranged them as they iterated steps of the knowledge sharing process.
iv)   The output on the visual template was easy to read.
v)   The common document could be presented to other persons without reworking.
vi)   Much more valuable knowledge than only the names of the stakeholders was recorded visually on the visual template.

No other team cumulated all six elements in the output they delivered at the end of the meeting. Picture 6 below shows the filled visual template from team W3.

Picture 6 Meeting output of outlying team W3

It was interesting to observe this team from the perspective of wanting to understand why and how knowledge visualization may impact the way knowledge could be shared in meetings. I wish to reiterate that while participating teams were part of a convenience sample in the sense

that managers volunteered teams who were willing to be part of the experience, the sequence in which the teams would be brought into the data collection process was according to their availability in relation to pre-set slots in the calendar which in turn were determined by the availability of meeting rooms. So, I lined up possible slots in my calendar according to room availability and decided after the pilot that the first five appointments would be dedicated to collecting data from five teams without a template, while the following five slots would serve the purpose of harvesting data from the team which would be offered use of a visual template. So, the fact that team W3 ended in group B and came 8th in the sequence was a result of calendar opportunity not a forced choice of mine. The team could equally have been in group A therefore there was no pre-conceived idea on my side or planning to have them become an outlying team.

Remarkably, team W3 was the one with the shortest meeting time registered yet had the greatest number of stakeholders written down at the end of their meeting. The meeting lasted 26 minutes from the planned 30 minutes. The team members designated on their own initiative a timekeeper and a facilitator.

As Picture 6 shows, the output reached by team W3 has been remarkable in many ways. They were not only able to discuss their work programme in broad terms but managed also to cluster key items and projects in their work programme, as shown on the numbered post-its displayed on the right-hand side of the visual template. The team was also able to see which stakeholder was common to which projects and how each of these stakeholders would deserve to be taken care of accordingly. The team had a detailed understanding of their stakeholders.

About the behaviours team W3 expressed
In terms of trends, the behaviours are comparable to what was described in section 5.3 above. The dominating category of behaviours from the four categories from Act4Teams was problem-focused behaviour with a total of 110 categories and 26 occurrences in the category procedural behaviours. The most displayed behaviour was solution description with 42 occurrences which took 16 minutes out of a total meeting duration of 26 minutes. The second most displayed behaviour was question with 27 occurrences. The third most displayed behaviour was disagreement with 14 occurrences.

Remarkably, team W3 had the shortest meeting, but the highest qualitatively assessed output in terms of quantity and refinement of the information displayed on the visual template. It also had the highest number of occurrences of the code blank with 28 of them. The combination of the codes 'question', 'disagreement' and 'blank' shows a reflexive group which had tendencies to tame groupthink (Janis, 1972; Janis, 2008; Janis & Productions, 1991; Lehrer, 2012; Russell et al., 2015) and had a high rhythm of knowledge exchange in their meeting while also having time to think in silence.

About the perceptions team W3 shared
The transcript of the focus group for group W3 contains many statements proving a natural inclination of the team members and the team for self-reflection. To underpin this point, in the

27 minutes the focus group meeting lasted, comparable with all other teams, the total number of words transcribed was 6205 words. This is by far the highest number of words exchanged in a focus group, between two and three times as much as most of the other teams.

The outlying team had the same semi-structured process in which to discuss their perceptions in the focus group meeting and the same questions as the other teams. Yet their natural inclination to self-reflect and analyse their experience gave many more insights on how a meeting supported by a visual template could influence the way the team solved the problem they were asked to discuss and how they shared their knowledge to achieve it. This team also made several references to comparing their perceptions in the replica meeting with their habitual meetings outside the research which the other teams did not necessarily do.

To explore the extensive meeting transcript of team W3's focus group meeting, the same three perspectives as for all the other teams was used: the meeting structure; the team interactions; and the meeting process.

Meeting structure
Regarding the duration of the meeting, team W3 underlined the virtue of having a short meeting which they normally do not have. Unlike the other teams, they considered that not having an agenda distributed ahead of the meeting placed them all on a par and they appreciated developing their own agenda on how to use the 30 minutes at their disposal. Having a time constraint was perceived as an advantage and they expressed the idea of planning shorter meetings in the future. They quickly agreed that one team member would take the role of timekeeper.

W3 team members underlined that the existence of what they called a 'framework' to harvest ideas was key. By framework they meant the visual template. The visual template was also perceived as a positive constraint. They affirmed that without it 'we would not have come so far in 30 minutes'. W3 team members agreed that without a whiteboard (another word W3 used to designate the visual template), they would not have managed to gather the same amount of information. Team members nodded explicitly when one team member said 'I think the effect of the whiteboard is fundamental'. Another interesting remark made by team W3 was that because their thoughts were written on the template, the communication was of a better quality. They considered that team members did not feel the need to repeat themselves out of fear that their ideas are not being considered and said that 'my thoughts are on the whiteboard, so I do not need to repeat myself'. One team member said 'Our meetings are too oral', underlying the need to visualize more the exchange of knowledge as it takes place. Another team member affirmed that the visual template 'helps us see the same image and we can work on that'. This remark fits remarkably well into the concept of 'reifying knowledge', which is one of the key contributions a visual template can offer to meeting participants and is further examined in sub-section 6.2 (p. 137).
Regarding the task, they considered that being experts of their domain and having recently had some discussions about the year ahead, had been an advantage when tackling the task and might also have contributed to making the meeting focused and conclusive.

Team interactions

When discussing their perceptions about how the meeting replica went, what went well, less well, what they learned etc, several remarks reflected how the team interacted together. Several remarks emphasised that the communication was open. The team members affirmed that each of them could express their opinions freely.

As for the other teams which took part in the case study, the word trust came up a few times as a key ingredient for having a well-functioning team meeting. Equally, the word respect was also mentioned.

Team members of team W3 perceived their members to have shown motivation throughout the meeting, from start to finish. They also stressed the importance of having displayed listening skills which helped both at interpersonal level and to deliver a better result because active listening helped the team to build on each other's input.

The W3 team members described their team interactions as engaged and that they saw team members being curious from start to finish. They underlined also how they experienced that everybody was given space to speak. Team W3 was also aware of its ability to disagree and its ability to take feedback and disagreement as a valuable input to progress the meeting discussions even further than in the absence of disagreement. They even used the expression 'avoid groupthink'.

Meeting process

Team W3 did not have such strong repetitive words in their focus group transcript. In the same way that they expressed themselves with many different behaviours, they also were varied in their reflection about the meeting process. They were among the few teams actively thinking of mentioning the post-its as support to progress through the meeting process.

Team W3 comparably to other teams employed the verb 'feel' and the word 'feeling' to express their subjective understanding of what happened during the meeting discussion.

A verb that was particularly present and used 17 times during the W3 focus group meeting was 'prepare'. Team members discussed without concluding whether and how much one would need to prepare to have so efficient meetings when working outside the case study. Opinions were split, some believing that preparing a visual template ahead of the meeting is key while others considering that even if spontaneously created during the meeting they would still be beneficial. They all appeared to agree that prepared ahead or created on the spot, in any case, having a meeting template is of essence for meetings where a problem should be solved.

5.5.2 Insights about the role of a visual template

This sub-section first presents some analytical considerations (5.5.2.1) before proceeding with a detailed photograph-based analysis of what happened during the meeting replica (5.5.2.2).

5.5.2.1 Analytical considerations

During the pilot meeting, it became clear that what was happening in the room beyond verbal cues needed to be recorded and the idea of taking photographs was born. Indeed, more than the verbal cues, the way the participants interacted between themselves and with their own note taking and the visual templates were part of the aspects which could help find elements of answers to the research questions.

Some of the non-verbal cues could be harvested by taking field notes. Yet even the field notes would miss out on some moments that actual photographs could better keep track of. Photographs were taken rather regularly and in addition when I saw it as opportune. For instance, when the meeting scenes involved interacting with the visual templates on the board, it was interesting to capture some of the actions and sequences. The analysis of the photographs consisted of retrieving those seen as representative of underlying behaviours demonstrated in the meetings.

Opportunities and risks of using photographs

Following the insights gained when reading about doing visual ethnography, it is important to recall a number of fundamental principles when proceeding with photographs in field research. Pink (2013b) eloquently explains that images are an integral part of our experience. It is part of the way we learn, the way we know. It is also part of how we communicate, but also how we represent what we know.

When using photographs doing field work, it becomes possible to bridge the spaces where the field is explored and the academic space where the data are analysed. Some authors, while acknowledging the risks, see in the use of visual artefacts a visuality and materiality that texts or talk do not offer in the same way (Comi & Whyte, 2017). These authors also underlined the added value of using visual artefacts which offer a map of the experience to others not present during the case study. It gives first-hand experience of a scene that could have been witnessed if the reader had attended the meetings (Meyer et al., 2013). Combining different data types to interpret the situations allows different iterations and triangulations which otherwise would not be possible. This is how photographs become a powerful medium to connect situations and issues to a textual explanation given of what has been observed in the mind's eye of the researcher and can be shared and shown to the physical eyes of the reader (Gillian, 2014).

Pink (2011) explained how much performing visual ethnography is motivated by the drive to return to the situation observed and to share as concretely as possible with others who were not witnessing it. While sharing a photograph does not ensure that we experience the situation the same way, it does help in conjunction with words used to describe the situation to bring the experiences closer together. Words alone, equally as photographs alone, would not be enough yet they enrich each other. From this point of view, it helps to learn that one engages with what one sees. It also makes us explore the non-verbal dimensions of the experience or the account of what took place. By including photographs of the meetings of this case study, an attempt was made to also create some sensory learning. Knowing is not only embodied but it is also emplaced.

To be able to mobilise some of the above opportunities, another important aspect has been to take a number of decisions to have an ethically sound and methodologically accountable use of photographs when exploring the experience with the outlying team. Building on some principles stemming from visual ethnography, the decisions presented below account for the governance of the way photographs have been used.

Consent of the participants
As explained in section 4.7 (p.77) on ethics, participants gave their consent to be part of this case study. As the declaration did not explicitly mention that photographs would be used for more than to remember the meetings and considering that no reference was made in the original declaration about the possible use of non-blurred photographs during the write up, I took the initiative to ask explicitly the five team members of W3 to express their free consent to have their unblurred pictures replicated in the thesis. It was important to be able to show the photos unblurred to increase the shared meaning with the readers and viewers.

Overview of the selected photographs
The total inventory of photographs taken during the ten meetings amounted to 288. More photographs were taken during the meetings of group B invited to use a visual template than during group A meetings. Looking back at the photographs, more action was happening in the room in group B and among the team members when they were using an artefact to harvest the knowledge they exchanged. This led to the natural tendency to take more photographs to capture in greater detail the diversity of the scenes observed.

Two approaches were considered to integrate the photographs in the thesis. The initial approach was to take photographs which appeared to illustrate a point, picking and choosing from across the ten teams. The second approach was to focus on one team and analyse the data in detail. The second approach was the one implemented to mitigate known risks and limits in visual ethnography. The idea was not to build a visual story to prove my biases but more to give access to the actual experience and learn what could have influenced such a different overall output for team W3. It was more about endeavouring to report what had taken place during the meeting, rather than proving what I wanted to see.

Among the 81 photographs I gathered for team W3, I selected 18 after displaying them all side by side and in the order they were taken. The selected 18 photographs appeared to me as non-redundant and of an acceptable rendering to be reproduced. A third of the photographs were not perfectly sharp. I displayed them in the sequence they were taken from start to end of the meeting and gave a complete overview of all of them as shown in Picture 7 below. The idea was to allow viewing each of them in context.

*Sub-selection of photographs to illustrate some specific aspects*
The next ethical consideration was to have a reference system which could help identify the photographs by a unique number to be used no matter which composition or context. With this approach, any reader can place a given photograph in the original sequence and between what preceded and followed it in my records, as per the overview shown in Picture 8.

Taking these measures did not remove the possibility of making the photographs generate inadequate or subjective meaning yet it made the approach challengeable which avails a degree of checks and balances when interpreting the data. Proceeding like this was sufficient for me to consider it an acceptable way forward.

As already explained in sub-section 4.6 on the use of photographs, using the photographs with team W3 was a unique way to return visually to the experience of the case study. It elicited more empathy and understanding in me for the team dynamics and helped generate new meaning. One aim has also been to stimulate a relation between the third-party reader and the photographs which can only be achieved partially by using words alone to describe the experience. It allows recreation of a part of the actual experience during the meeting replica and making it available for sharing. Such an approach may generate a space to show what I saw as researcher-observer and may bring to life some aspects of what I shared beyond the use of the written words. The ambition was to feed the knowledge production process from a broader perspective also involving the senses, in particular the sense of seeing.

Against this background, the overview reproduced in Picture 7 was a way to address the above concerns, risks, and limits. This overview has sequenced the 18 pictures used in the thesis and placed them in context. The photographs have been taken from my physical seat in the room, maintaining essentially the same angle to allow comparison among them and progression over time. It is less about creating a story than it is about sharing the experience as I saw it.

(…)
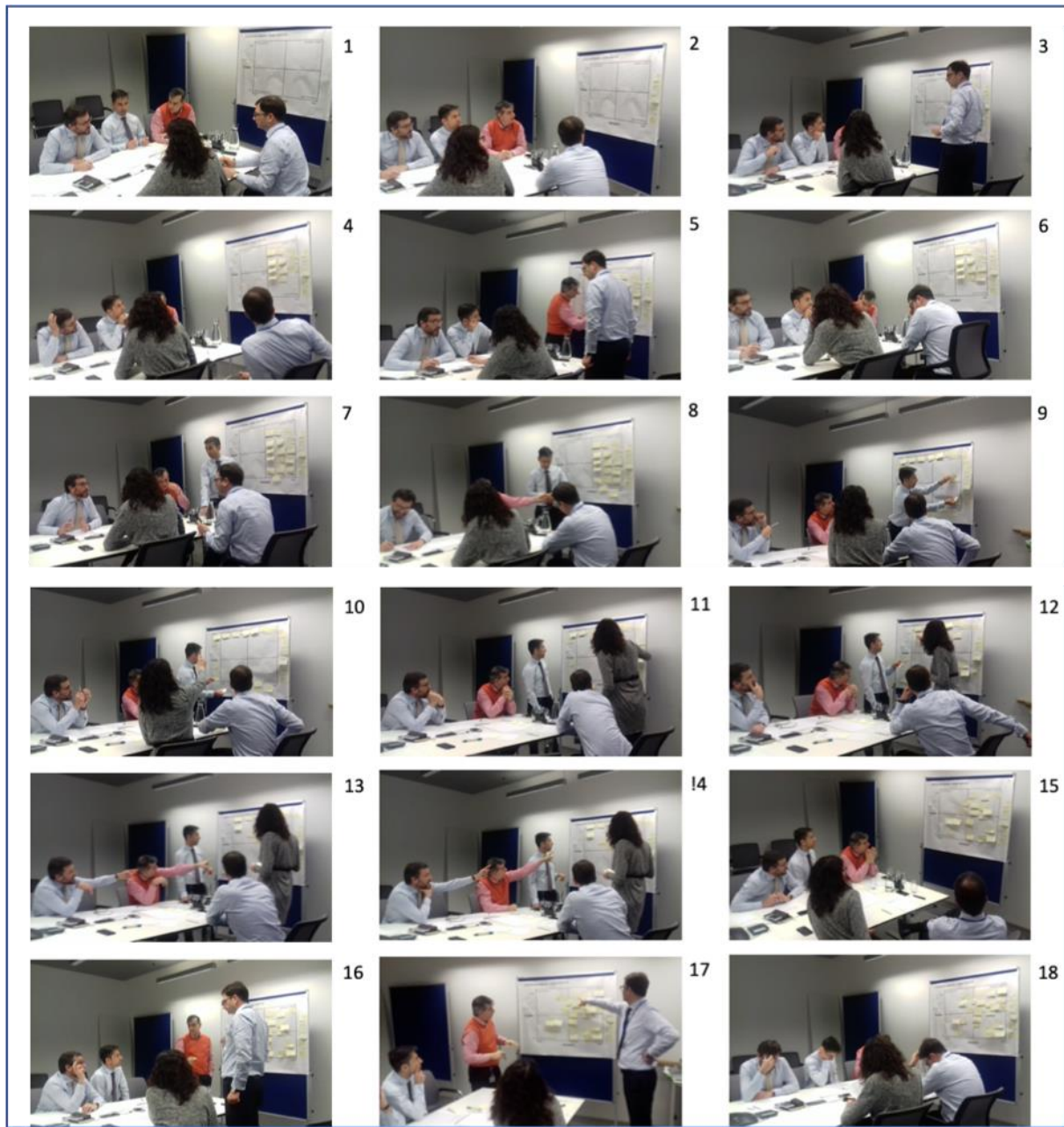
Picture 7 Photographic reportage of outlying team

An additional important element was the field notes I took when observing team W3. The unedited field notes for team W3 are shown in Annex 13 (p. 184). The field notes are reproduced in full to enable access to the actual experience as I recorded it in my notes so a third party can access which topics and issues were in my focus and which not. It proceeded with the same ideas as sharing the photographs, so the interpretation is shared based on what I saw not only with the words written after the experience took place.

With this approach, I meant to not only discuss knowledge visualization but also practice it as I experienced it in my double role of researcher-observer. Another reason to reproduce the field notes was that I could also not find field notes from other researchers when surveying the literature and thought it might be helpful for others. A lot of recipes and principles are published

but not the actual field notes and I missed out on reading the notes to understand how to best take field notes and how they complement the analytical write up.

The main intention behind the field notes was to capture observations and ideas prompted by what was happening during the meetings and during the full hour case study participants would be active. The field notes ended up being a mix of facts, questions and reflections that were arising all along the research process with some more intense phases, such as when the participants went through the thirty-minute meetings but also during the focus group discussions and less systematically, but nevertheless recurrently, during any other part of the process. The reflections and insights gained from the fieldnotes have been used across the discussions of the results. An example of field notes can be found in Annex 13 (p. 183). Some of the elements captured in the raw field notes displayed in Annex 13 will be integrated in the detailed interpretation below.

5.5.2.2 Detailed interpretation

Team W3 has achieved and shown an advanced level of capability for knowledge sharing in the meeting replica. To be explicit, the deep dive into the proceedings of team W3 aims at generating new understanding of what visual templates have the potential to enable in each context. For the context of this study, W3 was a small team that usually worked together. They had in common some challenges. Team members possibly were holding unique pieces of knowledge that a meeting discussion was supposed to help them share with the others.

The sets of photographs below are meant to help detect some additional answers to the why and how questions guiding the case study. Three aspects structure the analysis: first the relational dimension of the meeting discussion; second the extended cognition aspects; and third, moments of silence observed and photographed to round up the detailed interpretation.

First dimension, the relational dimension
Picture 8 below shows six photographs selected for capturing, according to my observations, the relational dimension of the conversation when filling the visual template.

Picture 8 Six pictures displaying the RELATIONAL dimension during the discussions

Taking team member 1 (appearing in photo 1 on the upper left corner as a speaker of reference), it was interesting to observe the sequence of interactions that were generated. On photo 1, taken early in the unfolding meeting, all team members were having their gaze converging to the centre of the team. They were joining and building the team relations to prepare for solving the problem they received as a meeting task.

In photo 5, the relational dimension is expressed in different ways. On both sides of the table, team member 1 and team member 5, sitting opposite from each other, are looking at each other. Team member 2 is looking at the visual template and at what team member 3 is pinning on the board while team member 4 is looking at team member 1 together with team member 5. As surprising as it may read, I observed much fewer active relations in the other teams, in the three teams which did not use a common document to harvest the knowledge the team members shared.

As documented in my field notes and as also visible in the photographs, I could observe that basically the meeting participants often combined speaking and looking at each other. I noticed they searched for confirming looks in the gazes of others as well as checking the body language of the other participants when perceiving divergences of views (point i) in the field notes. The role of looking at each other was key and was even more important when the meeting was supported by a visual template which gave a surface to watch, turning the focus of the relation towards one focal point.

Three questions came to mind. First, whether the fact the knowledge shared is written down makes meeting participants more accountable and committed than just relying on words which fly away once pronounced. A second question is related to the sense of joint accountability of the team. While one team member contributes the piece of knowledge which is agreeable to the others and that piece of knowledge gets pinned on the template, it is de-personified from its author and becomes a team commitment. A third question under the relational dimension of the meeting discussion would be to what extent does the fact of looking in the same direction and together at the visual template help the team to listen better to each other and build on each other's input.

Towards the end of the meeting process, the relational dimension became again a topic of attention in my observation work. Team W3 had a facilitator and a timekeeper. When there was about ten minutes of the meeting left, team members started to speak of reviewing what had been pinned on the visual template and without turning all their thoughts into words, they started to become physically active and started to look around and visually cross-check each other's reactions, and what was on the visual template.

Beyond words, they revisited some agreements and adjusted the post-its on the visual template. The strong relational dimension among team members that had grown and unfolded during the meeting culminated when towards the end of the meeting team members felt under time pressure. They could rely on their perceptions of what they believed the other team members would support when performing the final fine-tuning rounds of their output. It appeared to me

that the team members had grown trust in their understanding of the others' input. This trust helped them add new pieces of knowledge and integrate what was previously said and shared. The relational dimension of the meeting had become a key actor in the network of knowledge pooling and meaning generation for team W3. This observation was also made in the other teams part of this study possibly at times less explicitly, while for team W3 what was said, the pictures and what was observed showed how much the relational dimension in the meeting played an important role.

Three perspectives are brought together: 4E cognition, the relational dimension of meaning socially constructed, and a striking aspect of the role of silence in meeting discussions.

Second dimension, the extended cognition

Picture 9 below displays six pictures which represent just a few examples of how much the body movements of the meeting participants were a key part of the work and how embodiment was in direct interaction with the environment, in particular the visual template on the board.
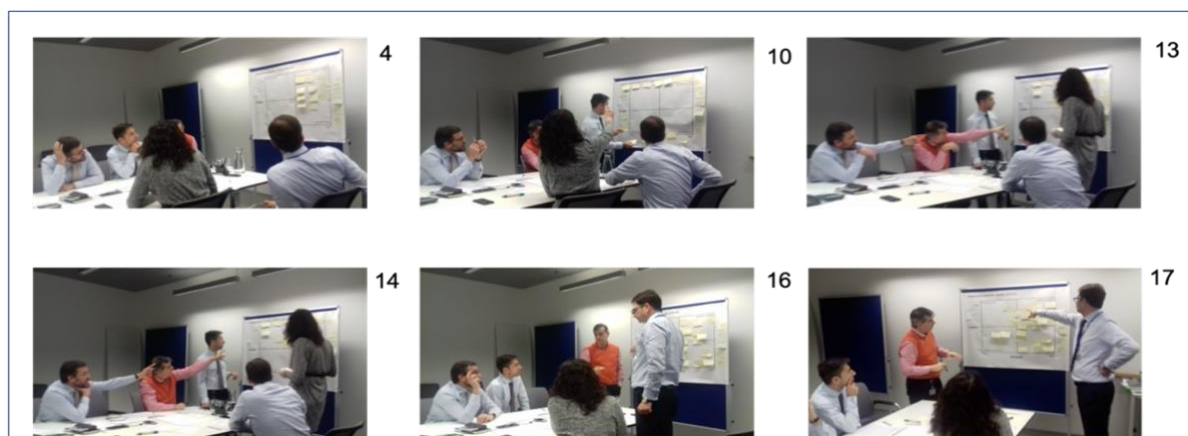
Picture 9 Six pictures displaying the EMBODIED dimension during the discussions

Combining what is visible on the photographs, what I documented in my field notes and also what I remember from my experience, four of the five team members were standing during the meeting, at different times, some more than others. The fifth team member was the self-appointed note taker and informal facilitator. I believe he did not stand up because he felt responsible to take notes, particularly at the start, but also during the remainder of the meeting. He left to his peers to stand and pin the post-its with stakeholder names or with the project they were referencing on the board or any other piece of knowledge shared during the meeting.

The embodiment took place ostensibly through the facial expressions of the participants, the whole body when standing, the moving of hands and arms of the meeting participants as the six photographs in Picture 9 show. What the photographs do not explain is that at times, some of these gestures and visual body expressions that manifest embodied cognition were not accompanied by any spoken words, when the visual template was involved in the network of actors that people and artefacts formed on that occasion. The interesting thing is that the more the time was passing, and the meeting was getting closer to its end, the more intensive the

embodiment was. As observer, I perceived that the embodiment was a lever to speed up and intensify the meaning generation and fine-tuning. This is certainly a space to be further researched.

A final aspect deserving attention is the way the body of the meeting participants was key to building and expressing consensus as I documented in the field notes under points h) and o). I observed it with the other teams too, not only team W3. It appeared on the photographs when the teams documented the knowledge they exchanged on the given visual template or on one of their making. The most obvious form was the nodding with the head and more subtly was expressed by participants' posture embodying engagement and showing agreement by moving on to the next item for discussion.

Enactive cognition

Taken in isolation, it may seem rather obvious that meeting discussions lead to actions during the meetings. Yet, over the ten teams this did not happen to the same extent in each team. Even the teams invited to use a visual template, but that used it less intensively, could not fully tap the enactive cognition to the same extent. Picture 10 below captures various aspects which I have associated to a few verbs of action: write, stand, pin, iterate.

Picture 10 Six pictures displaying the ENACTIVE dimension during the discussions

The discussions led team W3 to write. As photographs 5 and 8 show, the writing took place on a different medium and was performed by more team members than the self-appointed facilitator. The enactive cognition was supported by tangible (e.g. writing, standing) and intangible actions (taking a moment to think).

The exchange of knowledge and the discussions also prompted team members to pin post-its on the board. Not only did it bring action in the form of writing a post-it and sticking it on the visual template, it also encouraged the meeting participants to adjust and further elaborate the output pinned on the board. Several dimensions of cognition may cumulate in a given photograph.

In this case study, and in the meeting with team W3, action could also be no action, taking a moment to pause. Such moments of pause would often be followed by adding more knowledge to the board or by iterating and improving on what had already been placed on the board. It could also be a time to rearrange things around and across the board.

Team W3 had the most sophisticated and advanced results in comparison to the other nine teams. Their being so cognitively active gave them opportunities to iterate and control quality, act, react and act again in iterative cycles.

Embedded cognition
The output of team W3 is a display of the level of excellence five people can perform in thirty minutes with a tangible and sophisticated result in their hands to conclude and leave the meeting with.

The notion of interacting with the environment which is at the heart of embedded cognition can be well observed in Picture 11 below.

Picture 11 Six pictures displaying the EMBEDDED dimension during the discussions

Photograph 2 in Picture 12 displays the visual template at the start of the meeting process. Several post-its have been placed on its right. The following five photographs show how the embedded cognition intensified as the meeting time passed and how the colleagues interacted with the environment and what they saw.

The visual template played the role of knowledge repository and a carrier of new meaning every time it received a new piece of knowledge or existing pieces of knowledge were rearranged on its surface. The environment became a part of the conversation and allowed cross checking among participants, between participants and the environment and the environment as a surface carrying meaning and prompting the viewer to enact a new insight or start a new thread in the discussion.

Third dimension, the moments of silence in the meeting of team W3
Another dimension which was made apparent earlier when coding the audio-recordings of the replica meeting (sub-section 4.3.2, p. 55) and of the team W3 was the presence of silent

moments in the meeting discussion process despite the fact that team W3 finished in the shortest time. During these periods, no meeting participant would be speaking. The five photographs reproduced in Picture 12 below are capturing these moments of silence.
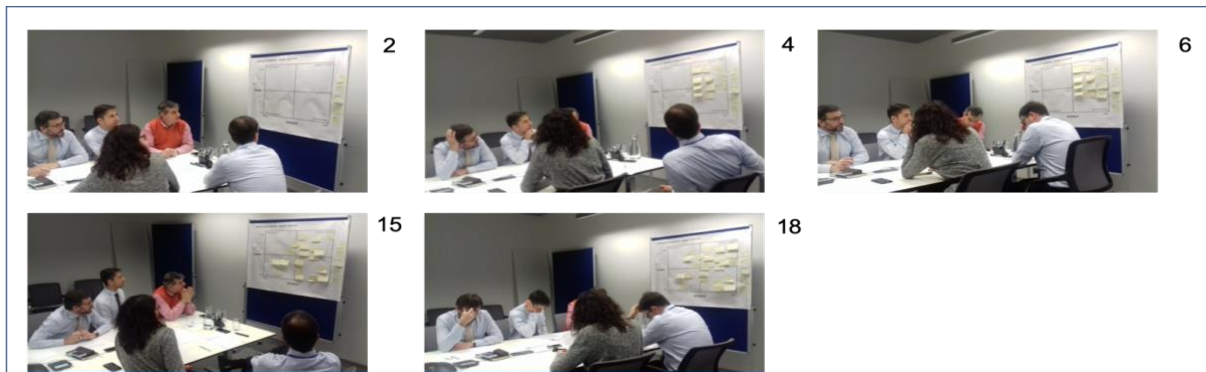
Picture 12 Five pictures displaying moments of SILENCE during the discussions

From the photographs in Picture 12 and my field notes, different aspects of silence were expressed. Reminding ourselves that team W3 is the team which had the most varied number of behaviours when applying the Act4Teams coding scheme; the highest number of pieces of knowledge exchanged; the highest quality of output; and the highest and most frequent number of silent moments, studying in more detail what team W3 did and possibly did different during and around moments of silence appeared an important aspect.

The silent moments captured in the photographs and as observed during the meetings were rather different in the quality they displayed and the following actions they enabled. Some silent moments allowed team members to take distance (photograph 4). Pausing allowed the team to take time to analyse and choose a way forward (photograph 2). On other occasions, it helped the team realise how much knowledge they shared during the meeting and may not have accessed as a team before.

Silent moments created opportunities where each team member could take a step back to consult his or her own memory or allow new insights to be generated (photograph 18). Silent moments could be used individually or collectively to assess whether something was missing or misplaced on the visual template (photograph 6).

Observing the team was also interesting. Team members were sitting together in silence looking at the visual template at different stages of its evolution (photograph 15).

Silence was a virtuous disruption to change pace and shift from individual to collective or vice versa. The teams which did not use a common repository to harvest and contemplate the shared knowledge did not recourse to silence in the same way as team W3. Silence holds a power which would need to be further researched also when using knowledge visualization intervention, as it could be that the use of a visual template enables moments of silence which in turn appear to influence positively the output of the meeting.

5.6   Chapter conclusion

This chapter has been linking the research questions to the data collected through a multi-fold analysis. It endeavoured as well, where relevant and possible, to bring insights across the data collected to enrich the understanding on why and how visual templates may or may not influence the sharing of knowledge in team meetings. The data relating to three research questions has successively been analysed and the case of an outlying team has been explored in a dedicated subsection. The paragraphs below summarise some conclusions reached in each of these four perspectives.

Key conclusions on the theme of meeting output

In essence, the pooling and sharing of knowledge has been more explicit when the teams have documented their exchanges with a template of their own creation or with a template given to them as part of the case study. The output has been even enriched when the teams decided to use sticky notes on the visual template which enabled them to iterate the knowledge sharing process as the meeting unfolded.

Key conclusions on the theme of meeting behaviours

The four categories of behaviours from the Act4Teams coding scheme gave valuable information on which behaviours were most stimulated during the problem-solving task meeting the ten teams went through. Most codes across the ten teams belonged to the category problem-solving which fits well with the nature of the task given in the meeting. The second most frequently coded category of statements belonged to the procedural category. Teams using a visual template referred twice as often to their stakeholders compared to the team without a visual template. Teams using a visual template also displayed more blanks, which means pauses in the meeting discussions, compared to the others.

Key conclusions on the theme of meeting perceptions

This theme has been the one bringing most surprises, in the sense that the differences of individual perceptions expressed comparing participants from group A and group B were in some respect counter intuitive. It brought up several questions on the use of perceptions and how to respect them while realising they only express a particular part of the bigger picture. The observations by the researcher and other data needed to be brought into relation with the trends observed in the perceptions expressed. The data under perceptions also brings a fourth research question into the foreground: how do you enable teams to help themselves improve knowledge sharing in their meetings, when team members don't appear to have a readily common understanding of what to expect from their meetings?

Key conclusions regarding the outlying team

The outlying team was declared outlying once the data were analysed and it became clear this team had something so different that it was meaningful to explore in more detail, both in absolute and relative terms. The outlying team came eighth in the data collection process and belonged to group B, the group of five teams having been offered use of a visual template to document their meeting discussions. Thanks to the intensification of the photographic documentation of what was happening during their meeting, a deeper exploration of the

workings of this team could be conducted to illustrate the importance of extended cognition to support knowledge sharing. It also helped visualise and materialise different roles of the visual templates as discussed in chapter 6 (p. 136).

6   Discussion

6.1   Chapter overview

This research used a case study approach to collect data. The overarching goal of the research was to understand 'why' and 'how' visual templates help (or not) knowledge sharing in real life team meetings at work. The data analysed and presented in chapter 5 (p.79) answered the three research questions which were focussing on three aspects of team meetings geared at knowledge sharing in real meetings, namely, i) meeting output, ii) team members' behaviours, and iii) perception of meeting participants about their experience during the meetings.

The first research question read '*Why the output of a problem-solving meeting may (or not) differ when the discussions are supported by a visual template in comparison to when no visual template is used*'. The objective was to understand 'the factors which influence the results delivered when using or not a visual template to solve a problem' as detailed originally in sub-section 1.2.1 (p. 13).

The second research question read '*How do meeting participants' behaviours vary when the meeting discussions are not supported by a visual template in comparison to when a visual template supports the discussions?*' The objective was to continue exploring factors that can help grow an understanding for the impact (or l6.2.ack thereof) of visual templates on the way a meeting unfolds as detailed originally in sub-section 1.2.2 (p. 14).

The third research question read '*How do participants perceive the process and output of discussions not supported by a visual template and of discussions supported by a visual template?*'. The objective pursued was to explore 'Various aspects of the way team members would report their apprehension of their immediate experience brought together and forming the basis of the five questions asked to participants. A sub-concern of the third research question came from the intention to explore the level of awareness of meeting participants of how the meeting process should unfold and whether the process they just experienced matched their understanding' as detailed originally in sub-section 1.2.3 (p. 14).

In this research, the data assembled helped gather elements to answer whether visual templates help the knowledge-sharing process in real life team meetings at work for a problem-solving task. After presenting an overview of the present chapter (6.1), the impact of visual template on making knowledge more tangible is explained (6.2). It is followed by some insights on the recall effect of visual templates (6.3); before the nudging effect is highlighted (6.4). It is notable that visual templates appear to stimulate disagreement and mitigate groupthink (6.5); as well as enable silence (6.6). As it helps to organise ideas iteratively it also increases the quality control of the knowledge shared (6.7). Finally, some possible pitfalls experienced in the context of the case study when some teams used the visual templates are also pointed out (6.8). The chapter is completed with some intermediary concluding remarks (6.9).

6.2   More tangible knowledge

Part of the challenge in knowledge sharing is making knowledge tangible. More precisely, it is about making knowledge transform from being tacit to being explicit. It is also about shifting knowledge held individually into a form where it can become a common good. If A knows something and is meeting with C, D, E, F and G, until A has shared their knowledge and materialised it for instance on a post-it, C, D, E, F and G cannot dispose of it easily. The moment the piece of knowledge is shared on the visual template, it becomes a common good that can integrate the inventory of all the pieces of knowledge shared.

Giving a tangible form to knowledge concerns the process of making the knowledge explicit. It also concerns the tangible result delivered by the process of making knowledge explicit. These two perspectives, the process and the result, are two key findings informing why and how knowledge visualization plays a key role in team meetings at work.

The process of 'reifying' knowledge through visualization (Comi & Whyte, 2017) has been explored in detail in this research, in particular through the interpretation of the photographs taken but also during the field observations and the analysis of the artefacts. The teams which used visualization during their meetings had a different process to solve the task they were entrusted with.

In line with the relevant literature, visualizing knowledge can help the process of reifying knowledge. It embodies knowledge and contributes to making knowledge become a tangible asset. Another function of the reified knowledge is that by becoming a tangible and shared asset, new interactions become possible and call for shaping the future differently than if they had not materialised. Knowledge becomes embedded in the environment where the meeting is taking place and becomes part of the conversation by being made visible.

'Visual artefacts, we contend, are performative because they give form to abstract imaginings of the future. They bring an imagined future into the present and make it amenable to further work' (Comi & Whyte, 2017, p. 2). Lehtonen (2014, p. 38) asserts that 'A performative stance to visual knowing and visualizing knowledge assumes that the visual gives rise to action in connection to other actors looking at or creating it'. The performative nature of visuals is of particular importance when teams are sharing knowledge to shape their future course of action as was the case in the present case study. In this example, teams reflected on the implementation of their work program for the year ahead.

The process of visualizing their stakeholders helped the teams to co-create an output building individually held pieces of knowledge into a commonly owned bigger picture. The team could leave unchanged or adjust the bigger picture once their sharing had become visible to the team. Visualizing knowledge helped team members generate their thinking. This empowered both the person sharing the knowledge as well as those receiving the knowledge to be able to interact in a different way than when knowledge is only shared orally.

The teams using their own or a given visual template underwent a different knowledge sharing process and could harvest a different output because of the reification compared with the teams having limited their knowledge sharing to orality.

Orlikowski said that 'human knowledgeability is inextricably entangled with materiality' (Orlikowski, 2006, p. 466) and the present case study helped anchor this affirmation. The teams which solved the problem they were entrusted with are the teams which materialised their knowledge through visualizing it and making it visibly available to all for further processing.

6.3   Increased recall effect

Two authors of the St Gallen School of knowledge visualization have affirmed that 'Visuals that are developed within the course of a conversation help participants to keep in mind the current state of the conversation and can be used as a mnemonic device of what has been discussed earlier on and what are open issues in the conversation [Kraut, et al. 2003].'. The authors add that 'Dynamic visuals serve as artefacts and real time persistent reference points around which conversers can coordinate their contributions, both in terms of time and content. They are constantly reminded of the big picture to which they contribute with their single statements' (Mengis & Eppler, 2006, p. 155).

The present research has shown that for real-life teams at work, visual templates become a knowledge repository embedded in the meeting rooms where they were displayed. The data analysed showed that the visual templates helped make the discussions progress. The teams having used visual templates had a quicker pace when it came to giving input. They could also see the stakeholders having already been named and could either work again or further with a given one. They could move on as each stakeholder's name was being recalled to their attention by being visibly pinned on the visual template or written down on the common paper used to harvest the discussion as it evolved.

Another important aspect of the recall function of visual templates is the possibility to build on the knowledge shared a moment before and add to it or combine it in new ways as the discussion unfolds. A piece of knowledge may be shared and documented early on and become used and activated later in the conversation. In comparison, pieces of knowledge orally may not be re-used as they go forgotten or attention is given to what is visible. This is an important aspect. It is one thing to share knowledge. It is yet another to use the knowledge shared to solve the problem. Visual templates in that sense extend the memory capacity of the team and extend the team cognition. Visual templates increase the chance to use the knowledge made visible during the discussions and later when following up on the meeting output.

Past research in the field of knowledge visualization has noted the power of knowledge visualization to augment team cognition. 'Visually displaying ideas offers the benefits to force participants to externalize thoughts and their connections, thus making it easier for the

discussants to build on each other's ideas and to remember the discussed topics' (Perez & Bresciani, 2015, p. 342).

6.4 Explicit nudging effect

The formulation of the task given to the teams, in particular Group B, *did not impose* the use of a visual template. The last sentence of the instruction offered use of the template as shown in Table 4 (p. 64).

The enunciation of the instruction to group B read:

> 'Imagine you need to prepare the annual work programme for your team. The task of this meeting is to discuss among yourself who has a stake on the planning of your work to support its successful delivery.
>
> You have up to 30 min to identify the stakeholders of relevance; the level of their interest and influence and whether you need to closely manage them; keep them satisfied; keep them informed or only monitor them.
>
> You may use the visual template on the pin board.'

In behavioural terms, this sentence offered a nudge otherwise described as an architectural choice to proceed differently than possibly the default mode teams would have followed without it. Meeting participants were offered to consider using a visual template yet not told to do so. Sunstein (2014b, p. 583) defines nudges as 'liberty-preserving approaches that steer people in particular directions, but that also allow them to go their own way '. Sunstein continues by affirming that 'the goal of many nudges is to make life simpler, safer, or easier for people to navigate' (Sunstein, 2014b, p. 584).

Viewing the visual template as a nudge mechanism for meeting purposes is a novel approach (see details in sub-section 2.7.2, p. 33) applied to meeting research (Eppler & Kernbach, 2020). Previously, Sunstein and Hastie (2015) had dedicated attention to using nudges to get beyond groupthink to make decisions. Groupthink is known to be a blocker for knowledge sharing purposes. Some nudges are needed to lever diversity through more diverse opinions, higher participation and dissent. Visual templates used in this case study showed they could support a higher diversity of behaviour and a faster pace in knowledge sharing.

How does a visual template as observed in this research nudge the behaviour of meeting participants? From the field research and the observations made it prompts participants to engage with the task, to stand up and interact with the visual template. Without asking permission and prompted by what participants see as a need to contribute, participants simply follow their urge to write on post-its or on the board or decided to re-arrange the post-its. It appeared as if the visual template available in the room empowers meeting participants to feel authorized to use the template. In contrast, when no common document was used, participants did not appear as empowered to offer their ideas.

The visual templates appeared to take the role of a facilitator to prompt participants to be active. The participants were watching the evolution of the visual template during the meeting. The visual templates brought motion to the participants' bodies. The visual templates gave the observer the impression they were helping the participants know beyond the mind. Participants' bodies and the relations they were experiencing with the other participants as well as with the environment supported sharing more pieces of knowledge than without a visual template and at a greater pace, which created a positive dynamic among the meeting participants.

The data collected and analysed showed that the teams using a visual template had more interactions, more disagreements, a more sustained rhythm and spoke twice as much of their stakeholders than teams without visual templates. The meeting participants took the invitation to use the visual template, in other words answered the nudging power of a visual template in a quantifiable and qualifiable manner. This showed the value and possible impact of an alternative architectural choice available in the meeting room to intensify the knowledge sharing process and the meeting output.

The visual template played the role of passive facilitator. The 'passive' dimension comes from offering a guide for the discussion by hinting at the aspects to be discussed through what is written on the template. It 'facilitates' the discussion of the team. In that context a visual template functions like a nudge. It offers a choice to support the discussion of the meeting participant to embed on its surface new or evolving pieces of knowledge. The team brought the pieces of knowledge into a more and more sophisticated network of valuable understanding that the team did not have at its disposal when starting the meeting. Searching the literature, no reference was found connecting visual template and their possible role as 'passive facilitator'.

6.5   Less groupthink

The phenomenon coined as 'groupthink' can be defined as 'a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action' (Janis, 1972, p. 9).

When exploring whether visual templates have an influence on the sharing of knowledge, there was no pre-conceived idea about the type of behaviours which would be displayed by the meeting participants. When the coding scheme was applied and the result computed, it was interesting to conclude that among the behaviours most displayed in this case study, disagreement was the socio-emotional behaviour code most applied (90 times, see Annex 7, p.175). It was three times more expressed in Group B using visual templates than in group A.

Mengis & Eppler observed that 'Without the visual aid, conversers tend to give more importance to equal participation and have difficulties in dealing with conflict in a constructive way. (…) Future research could examine whether this moderating effect can be replicated in different settings and for different decision making tasks' (2006, p. 159). The findings of the data collected in the context of the present case study contribute to this research agenda and confirm that for the phenomena under exploration, knowledge sharing in real-life teams in the

organisation where the data were collected, visual templates helped increase the time and occurrences of disagreements in the conversations and mitigate groupthink.

Visual templates helped the participants to depersonalise the conversation. When a piece of knowledge is written down on a post-it, it is authored by that post-it and not by the person who initially said it. The decoupling between who said it and what was said transformed the relation to the knowledge shared and allowed other meeting participants to engage more freely with the knowledge written down. The three teams in Group A which did not visualize their knowledge exchange remained more agreeable and avoided challenging what was exchanged. In the focus groups they insisted that the fact of knowing each other and trusting each other was a factor of their satisfaction with the meeting output. As observer though, it was manifest that the great proximity of the team members combined with not visualizing the knowledge shared led to less diversity in the thought expressed and altogether fewer thoughts expressed. No one really challenged the process or questioned the output, or the absence thereof.

Recent research shows there is space for furthering the understanding of how visual support could help introduce disagreement in the conversation to enrich the process and output of the conversation (Alexander et al., 2018).

Groupthink and its mitigation have a strong relational dimension. Groupthink is encouraged if cognition is not extended, and communication is oral and from one person to many. Embodied cognition appeared to help debunk groupthink as the study of the outlying team showed (see body language in Picture 8 in sub-section 5.5.2.2 (p. 129). The bodies of the participants when seeing the pieces of knowledge pinned on the visual template became active. It was as if the bodies of the meeting participants knew before their minds could articulate in words what they wanted to add or rectify from what was written down on the visual template. They reacted to what was visible. Meeting participants using visual templates appeared more likely to enact the drive to contradict, correct or adjust what had been visualized through finger pointing, arm stretching or standing up in the direction of the visual template. This was a useful example of extended cognition and a great hint at why and how the visual template may influence knowledge sharing in team meetings.

6.6   More silence

As introduced in sub-section 4.3.7 (p. 62) and further developed in sub-section 5.3.5.5 (p. 106) and further quantified in Figure 19 (p. 106), the exploration of the data provided by the code entitled 'blank' informed the research of the importance of silence in meeting interactions. In a nutshell, the total duration of silence in Group B (the five teams offered a visual template) was twice as long as Group A (the five teams which were NOT offered a visual template).

Silence is often opposed to engagement in organisational communication and management research. Silence often bears a negative connotation as if people are holding something back. Yet, silence is a rather unexplored space in the analysis of the relations among meeting participants, the discussion process and the task to be delivered. Rogelberg and Kreamer (2019) underlined the importance of silence in meetings both to unveil unshared information as well

as to create a productive space separating talking from thinking in an explicit way. The above authors affirmed that 'Attendees often hold back in meetings, waiting to hear what others say and what their boss might say out of fear of being perceived as difficult, out of touch, or off the mark. Silence can be a solution to this problem, allowing space for unique knowledge and novel ideas to emerge' (Rogelberg & Kreamer, 2019, p. 3).

The moments of silence observed in the present case study were particularly diverse in types and effects. The number of occurrences of silent moments was unveiled by the coding of the ten meetings of 30 minutes. An additional code had to be created to ensure that all parts of the meeting audio-recordings got covered, for the parts where no words were spoken. The code added was labelled 'blank' (see details in sub-section 5.3.5.5, p. 106). The total number of silent occurrences (104) was significant, for the teams who used a visual template (62). Noticeably, the outlying team experienced both the highest total number of behavioural occurrences in general and of blank events. That team also expressed the highest number of disagreements.

The analysis of why and how the visual template influences the sharing of knowledge was enriched by the visual exploration of the photographs showing moments of silence in the outlying team (see details in sub-section 5.5.2.2, p. 128 and in Picture 13 in the same sub-section).

Combining the insights gained from coding behaviours and the photographs showing moments of silence together with some input from the literature about silence gave valuable new perspectives on why and how visual templates can help teams with knowledge sharing. Tannen and Saville-Troike (1985, p. 10) defined silence as 'the absence of something else'. These authors see silence as a 'joint production' (Tannen & Saville-Troike, 1985, p. 100).

When analysing meeting interactions, Mengis and Eppler (2008, p. 302) affirmed that 'Moments of silence are important to calm down frenetic or aggressive discussions and to allow participants to reflect upon assumptions, arguments or emotions'.

In the present research, moments of silence appeared when using a visual template allowing meeting participants to take a step back. The participants became silent and either gazed at the visual template or retreated from the discussions as shown by their body language and went to into processing information for themselves. Their body language indicated a leaning forward interpreted as still being engaged but not speaking on the output of their cognition. The total duration of the meeting time coded has been overall too short to draw definitive conclusions yet the data are sufficiently explicit to underline that silence is noticed and valued.

It was observed that the moments of silence in the case study were followed by moments adding new information to the visual template or revisiting the position of pieces of knowledge already pinned on the board. This links to the notion of performativity (drive to act) of communication and shows the power of a piece of knowledge to be shared or already shared and leading to action or further action. This in turn matches the dimension of enactive cognition (writing on a post-it or on the visual template) present in the meeting interactions. Becoming silent is an

active act withdrawing from the oral discussion. It was observed that the stepping out of a moment of silence was followed by acting. As an observer this gave a strong sense of silence as a generative source of input and as a moment helping individuals and the team to bring depth to their exchanges. It appeared to be renewing the ability of the teams to complete their exchange of knowledge and fine-tune the visual template they were filling.

6.7   More quality controls

One common pitfall about meetings is the lack of clarity on what is supposed to have been achieved when it is over. Having a visual template was a way to support having a sense of what the meeting discussion process could bring as an output. In basic terms, it helped move away from nothing specific to a concrete and documented output reflecting the discussions in the form of a filled visual template.

The visual template displayed the categories of sub-topics of interest. It also displayed visibly and visually the progress made on each of them. A visual template is 'a relatively frozen background (which) provides a graphic setting for knowledge mapping. On the other hand, relatively fluid items are interactively mapped by organizational participants within such a setting' (Comi & Eppler, 2011, p. 5).

During the focus group discussions, some teams reported that having a visual template serving as a repository of the pieces of knowledge exchanged was key to completing the task within the time constraints. It was the case that the three teams which had neither a template nor a self-organised document had no output to share at the end of the meeting and to continue to elaborate on after the meeting was over.

What was striking as observer was to see the place occupied by the visual template in the discussions. The more the team made it an integral part of their work, the more the visual template could positively influence the process and the output of the knowledge sharing endeavour.

Knowledge pieces shared started to exist and it was acceptable to move them. No initial author of a piece of knowledge shared voiced opposition to having other participants move the post-it around.

The iterations observed could be about writing more post-its but also exchanging verbally the relation between the pieces pinned on the board. For the outlying team, it was in addition an opportunity to have multiple layers of knowledge beyond the fulfilling of the problem-solving task. After having the initial round of knowledge sharing, the team decided to cluster the knowledge shared about their stakeholders even more explicitly with the projects they related to by adding labels. In the next iteration, some items pinned on the board got a date. Finally, the meeting participants decided to add some prioritisation elements to the knowledge pinned

on the board. Had this team only shared knowledge orally, it might never have come to such an advanced level of knowledge mapping.

The iterative process, verbal – visual - textual, enabled by a visual template can become a constitutive element of its key impact. It can help to scope what to discuss; to guide and host the discussion; to visualize the progress of the discussion; and the visual template can be delegated to memorize the knowledge shared. The visual template freed the mind of the meeting participants. They could concentrate on deepening their understanding of the problem they had to solve.

The teams having used a visual template expressed a higher variety of behaviours as shown in the results displayed when coding their discussions in Act4Teams (see Figure 20, p. 107). These teams also got a better rating of their meeting results than the team which did not visualize on paper their discussions (see Figure 10, p. 83). This seems to indicate that visual templates significantly increase the number of interactions and iterations during the same meeting duration and that more interaction leading to more iterations leads to a higher quality output.

To conclude on this finding, it was also helpful to realise that the above was an archetype of extended cognition. Exploring the iterative knowledge sharing process undergone by teams using a visual template was a powerful way to understand applied extended cognition. The use of post-its was about enactive cognition bringing meeting participants to act and share their knowledge. The re-positioning of the existing post-its had an extended cognitive aspect in that it used knowledge contained outside the participants' brains. By having the pieces of knowledge written down, the embodied dimension of knowledge was made manifest. Finally, the interactions between the visual template on the board and the meeting participants exemplified the embedded dimension of cognition where the environment interacted with the meeting process and participants.

6.8 Potential pitfalls of visual templates

While in the context of this case study the use of a visual template was overwhelmingly positive, some possible pitfalls were identified when listening to the meeting discussions as well as the focus group discussions. On a limited number of occasions, remarks were made about the limitations of having a visual template to hand.

The teams provided with a visual template used it. One team used it to write on it, the other four used it writing on post-its they stuck on the visual template. Past research performing a literature review of 51 articles about the pitfalls of visual representation approaches have established a classification of possible pitfalls (Bresciani & Eppler, 2015). The mentioned studies were more geared at examining the visualization dimension and possibly less what was the focus of the present research namely the knowledge sharing process between the meeting participants and their relation to the visual template or its absence. Five pitfalls were observed in the present case study.

The first potential pitfall had to do with how intuitive the visual template was: do participants correlate the task they were given with the information appearing on the visual template? This case study was not about assessing whether the stakeholder map was intuitive or not. Yet, by listening to the conversations, some teams could directly relate to it and started working with it early in the meeting discussions. Other teams needed to first discuss the information written down on the visual template before beginning to fill it. This leads to reflecting on the readability of the template or the lack thereof. If the visual template is not intuitive this could lead to productivity losses, confusion, and unproductive discussions. Such a potential pitfall would achieve the opposite of what is intended when using a visual template. One of the intended effects of using a visual template is to focus more on the task at hand and speed up the knowledge transfer. Ideally, limited time should be needed to analyse how to use the visual template.

The second potential pitfall was the sense of having to fill the template as it stood. Participants were invited to use the template not instructed to use it. They could have disregarded it or they could have adjusted it. A few participants reported in the focus group discussions having been disturbed by the visual template; in particular, they perceived it as a 'straight corset'. One participant said to have felt 'inhibited' by it and felt insecure, wondering whether the input to be shared was fit for the visual template. This sense of self-censorship is feeding the opposite output of the template's use, yet it needs to be given space and possibly mitigated.

The third pitfall was related to the written character of the knowledge shared. While for most of the cases having a written output was both effective and efficient, a few participants noted that once a piece of knowledge was written and was not questioned any more, it became a sort of commonly agreed 'truth'. It was perceived as harder to re-open the discussion and more difficult to question it.

The fourth potential pitfall mentioned had to do with limiting the creativity of the meeting discussions. It was noted that some participants considered that the normal open discussions, undocumented, bring some useful digressions. It was reported that sometimes some out-of-scope discussion about matters at first sight less directly relevant bring other perspectives and insights. By defocusing from the defined scope appearing on the visual templates, other insights can be brought to the foreground. This could be lost when using visual templates.

The fifth potential pitfall detected related to a false sense of completeness of the discussion. The conversations heard could be summarised as 'If the template is filled it must mean the discussion is completed'. The verbal and undocumented character of a discussion not using a template leaves the meeting participants with a sense of open-endedness. There is no real final moment in which the meeting discussion appears complete except through an implicit sense, communicated or not, that the exchange of knowledge is complete. This sense of completion is not material and not visible.

The above potential pitfalls prompt further consideration. The convenience sample, the qualitative nature of the case study and the number of participants having voiced the above

remarks do not allow for claiming the pitfalls reported are generalisable. They nevertheless deserve consideration by the plausible character of their content and compared with the pre-existing experience and knowledge of the researcher with knowledge sharing at work using knowledge visualization-based interventions.

6.9 Chapter conclusion

Visual templates can support knowledge sharing in more ways than encompassed in this chapter. What is presented here is what has been experienced and observed as part of this case study. The literature relating to knowledge visualization in the St Gallen School tradition or other researchers may indicate other aspects. Early on in this research, an acronym – CARMEN (sub-section 2.4.2, p. 21) - was borrowed from the work of St Gallen School key authors (Eppler & Burkhard, 2004, p. 20) to depict and memorise the previously established and later on confirmed impact of knowledge visualization interventions like visual templates.

The insights stemming from this research echo the above heuristic, CARMEN, without being limited by it and is guided by the field observations harvested in the present case study. Indeed, the data collection and analysis in this research were not performed to prove, disprove, or expand the above heuristic. Therefore, the findings are narrated following another organising principle. What indeed guided the narration was to explain how a visual template – such as a stakeholder map used in this research – may or may not influence the knowledge sharing process taking the chronology of the meeting unfolding, from start to end, to report the learning. The sections below follow the chronology in which the impact of the use of a visual template during a meeting could be observed. As an example, one observes the reification of knowledge before one can observe how meeting participants review the quality of the pieces of knowledge shared. The latter generally happens in the second part of the meeting or even at the end of the meeting when enough knowledge has been reified on the template.

7 Conclusion

7.1 Chapter overview

This chapter reminds the reader of the research limitations (7.2), provides a recap of the contributions to philosophy (7.3), its contribution to methodology (7.4), its contribution to knowledge (7.5). It also mentions some early impact (7.6) and possible future developments (7.7) and then some final considerations (7.8).

7.2 Research limitations

Three aspects are explained in this sub-section and relate to the coding scheme used; collecting participants' perceptions and opinions; and finally, doing field research. They are presented as learning which could be meaningful in the context of future research.

First, the use of the coding scheme 'Act4Teams' yielded many benefits which are made explicit in the next sub-section. It was not without challenge to use and it appears to be the first time it was applied to the type of research presented in this thesis; it would be helpful to repeat its use in future research to confirm its relevance. While the coding was conducted carefully, it remains the work of the author as the only coder. It is common practice to train and use two coders and then compare the results. Yet the present research proceeded from a qualitative paradigm and used the coding not to establish a replicable truth but to unveil patterns and insights.

Second, the collection of the perceptions and opinions of the meeting participants helped with understanding in general terms what they were experiencing and could be useful to sharpen the methodology. The script of the focus group and the individual questionnaires were useful tools. The issue that was underestimated was how much the participants could mobilise in terms of self-reflection about their immediate experience in a semi-structured way. The learning was that the questions of the focus groups might have deserved to be more structured and hinting more at the research objectives. It did not make the data harvested less useful, yet it required more imagination to exploit them. As the body of the thesis shows, direct quotes or statements of participants were not integrated. This was not because the idea of using them was not present but that there were no real revealing or adding-value quotes. The findings stemmed from a systemic analysis of what had been said rather than from ad hoc quotes.

Third, qualitative field research in one organisation over a limited period reaches some limits in terms of what can be done. The time was optimised in relation to the research objectives and the one hour of availability agreed with the managers of the ten teams. More time could have helped for instance with doing some follow up debriefing of the findings to prompt additional feedback or insights from the participants themselves or a sub-set of them. This being said, the data was already extensive, and more may not have helped explore better the visual templates' influence on sharing of knowledge in real life teams.

7.3   Contribution to philosophy

The chapter on research philosophy was key. While originally tackled as a 'must do', it became in the end a key to understanding why and how visual templates help knowledge sharing in real life teams at work. The two questions of 'what is reality made of' and 'how do I know what I know' have brought a breadth and a depth which was not present at the start of the research project. It took deep reading and reflecting to determine the philosophy of this research. This changed with discovering the work on relational social constructionism and later 4E cognition. With both philosophical streams, the quest to contribute became self-driven. They helped answer the why and how questions about the way visual templates may or may not influence knowledge sharing in real life team meetings.

There has not been research found using a combination of specifically relational social constructionism and 4E cognition. Yet, cognitivism and constructivism were already part of a philosophical paradigm in seminal research on knowledge visualization (Burkhard, 2005a, p. 24).

4E cognition brought structure to scattered insights. Apprehending cognition beyond the activity in one's own brain, making space for the body, the relations to other participants and the environment were articulated in the present research and deserve more work to deepen, nuance, criticise the initial findings made. Figure 23 below is a summary of some of the insights gained in the present case study.
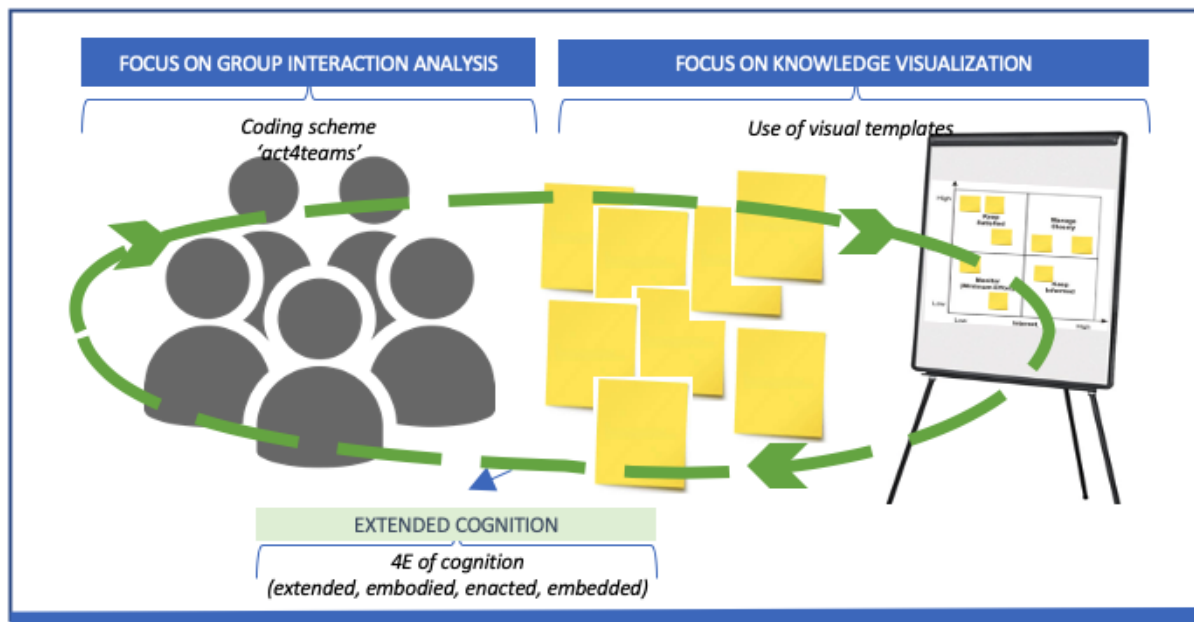

Figure 23 Overview of the contribution to knowledge (Saintot)

7.4   Contributions to methodology

Conducting qualitative field research
Research analysing meeting interactions of real-life teams in their organisations is not common in the literature. Equally, research involving knowledge visualization interventions is also rarely conducted directly in organisations and with real teams. Both fields of study are mainly quantitative and require sample size and controlled conditions which are such that it is rarely possible to find the adequate conditions in the field. Generally, it is not easy to gain access to organisations for multiple reasons. As an outside researcher, to establish links to professionals ready to invest time and effort to help with research projects is difficult.

Issues of trust and confidentiality are also present and may prevent researchers from having access to organisations. Gavrilova et al. (2017, p. 17) observed that 'the scientific community currently possesses an extremely restricted set of data on what is actually happening in visualization practice in business. This situation raises the issue of the importance and prospects of further study of this field using descriptive methods with the aim of identifying prevailing approaches to visualization in business' (see sub-section 2.4.2, p. 21).

The present research contributes some insights to the study of group interaction using visual templates in a real organisation with professionals in real life teams. It was not without inconvenience or limits. Duration of the meeting time with case study participants was limited. The problem-solving task needed to be relevant and naturally motivate the team members to perform in the case study. The aspect of being an employee and a researcher at the same time had to be considered to clarify the role and avoid ethical conflicts. Overall, it can be stated that the reflections invested to ensure relevance of the meeting tasks, understanding the organisational actuality, and the logistical constraints (accessing a list of names to invite to meeting rooms, booking meeting rooms, etc) were facilitated by being an employee of the organisation.

Building a partnership with the organisation and being able to highlight the possible benefits of the research for the organisation is key. Going the extra mile and offering evidence-based feedback and capability building activities could be an incentive offered by researchers to overcome possible hurdles and motivate organisations to cooperate.

Using photography and artefacts
When reflecting on the use of visual methods, Davison et al. (2012, p. 7) observed that 'Within qualitative visual theory and method it is possible to see a division between those studies which tend to focus on pre-existing visual material and those which generate visual material for the purposes of the research, whether by the researcher, or by the research participants'. In the present study, both types of visual were generated and used.

The visual dimension was also present with the use of the principle of visual ethnography to ensure that the way the visuals were used would avoid making the data say what one wanted to see, as exposed in sub-section 4.6 (p. 73).

The combinations of the visualization of the behavioural codes applied to the audio-recording, photographs and artefacts were a key success factor to exploit the data collected. Their display on large (A0) printed posters helped unveil patterns and insights which may not have become visible otherwise. It appears that this is not commonly used in the area of group interaction analysis as explored in the literature referred in this research.

A third and final aspect of using photography and artefacts was to integrate not all but a representative sub-set in the body of the thesis. Davison et al. (2012, p. 11) confirmed the added value of this approach. 'Not only does this emphasize the role of visual studies in terms of data collection as already discussed, but also how the authors seek to rethink the ways in which they conceptualize the visual and its performative role in relation to practices of organizing and the production of accounts'. Field study as such is already in the scope of this research a contribution as limited data are collected from real teams. Reproducing the actual artefacts produced by the real teams is also an important contribution in that it shows actual data and work from real teams. To make this possible, the consent compiled at the start referred to using the photographs for instance for the purpose of analysing the data. This was later complemented by an additional declaration of consent from the members of the outlying team whose team photographs have been reproduced unblurred. This ethical dimension needs to be duly taken of.

Coding group interactions with Act4Teams in BORIS
It has been acknowledged that 'There is a growing realization in management and organizational studies (MOS) that both the *process* and *output* of visually-supported discussions should be investigated in depth – the *conversations which evolve around* visuals' (Alexander et al., 2016, p. 33). In line with this acknowledgement from researchers in the field of knowledge visualization and following the logic of small group interaction analysis, the two parts of the body of knowledge of reference were brought together using the coding scheme Act4Teams to explore the discussions held by the ten teams.

It brought new insights into three types of behaviours: the use of disagreement, the use of silence, the speedier and more extensive display of varied behaviours when using visual templates by the five teams. The five teams which did not use the visual template had a slower rhythm and therefore had fewer behaviours coded and named their stakeholders less often.

At this juncture, it appears that Act4Teams is a usable coding scheme for the above purpose and had not been used yet for this purpose. Equally, the use of the open source software BORIS (Friard & Gamba, 2016) has not be applied to date in combination with Act4Teams. It helped achieved the research goal and could be used in more instances in the future.

Another contribution was the tailor-making of the definitions of the behavioural indicators taken from Act4Teams and used to help increase the consistency of the coding. By coding group interaction, the focus of the exploration is placed on the process more than on the output. The present thesis helps appreciate the value of focusing on the discussion process. This study also contributed to the contextualisation of the definition of the behavioural indicators used to code the verbal statements in the audio recordings. It helped formulate some suggestions on what

would be useful to concentrate on or remove in future studies in terms of relevant behavioural indicators to study further the impact of knowledge visualization on the effectiveness of knowledge sharing in meetings.

In turn it also enables the use of a behavioural coding scheme such as Act4Teams to investigate the impact of particular interventions, like the use of visual templates, to help better understand the interplay with the participants, the task at hand and the environment where the interactions are taking place.

Future research could explore meeting interaction using the Act4Teams coding scheme to explore temporal interactions analysis. It would help understand better how patterns of behaviours are displayed over time (Lehmann-Willenbrock & Allen, 2017) and how behaviours may induce a certain follow up behaviour. This was not in the scope of the present qualitative research. This would require locating the research paradigm in a mixed method approach if not a quantitative paradigm. Another sampling method than a convenience sample – which was suited to the present research objectives – would be needed like a representative sample method. The limitation in turn would be that the research would most likely not be field research in view of the number of persons and teams which would need to be engaged to generate a reliable quantitative data set.

A final point to comment on was that while Act4Teams performed with INTERACT software from Mangold, it would be useful to have discussions on how it compares with BORIS. The latter appeared to offer comparable functionalities to visualize behavioural patterns. In any case, the data retrieved from BORIS could also be exported to data analysis and data visualization tools, for instance to Tableau to expand the built-in functionalities in BORIS.

7.5   Contributions to knowledge

Revealing the presence of the Dunning-Kruger effect
The so-called Dunning-Kruger effect has been presented in sub-section 2.2 (p. 17). It should be noted that a key and unexpected insight has been the understanding of why teams may keep being dissatisfied with meetings yet may not take action to change the situation. The fact that some teams were not aware of the existence or possible use of visual templates to facilitate meeting discussions was only partially explaining the outputs observed.

More significantly, the absence of expectations about how meetings are supposed to be run and what meetings are supposed to bring appear to leave teams with a blind spot preventing them from even trying to change their experience. One wonders if it has to do with the fact that no senior person was present in the meeting room. There is no indication from this field research or from the researcher's own business experience that would support this alternative explanation. When asking one of the authors of the Act4Teams coding scheme, the researcher confirms a similar finding in their extensive application of the code scheme.

In addition, an inadequate sense of satisfaction with the experience of some teams was a surprise. During the focus groups, several teams, those without a filled visual template at hand, affirmed that their team did so well because they are good at running meetings and using meetings to deliver what was expected from them.

Revealing the tendency towards self-complacency of teams
What could be learned from this surprising experience for the observer-researcher-practitioner was the need to offer norms and standards of what well-run and useful meeting outputs are. Without norms externally set, teams appear inclined to self-complacency and might not only avoid self-improvement but not even realise there are better ways of working. The need for harmony and social comfort could be a key reason for the fact that despite all the meeting interventions and facilitation toolboxes available, efforts to improve knowledge sharing in team meetings at work are not readily mobilised. Studying the impact of third-party feedback on the meeting culture of a team could be beneficial to assess whether it should be more commonly promoted in leadership and management training programs. The idea would be to develop a feedback culture based on norms defining quality. The quality standards would then be evaluated, and data driven feedback given back to help professionals discover their blind spots and help them self-assess their performance with more objectivity.

7.6   Impact observed

Business impact
The research started at a point in time when the organisation was interested in exploring concrete ways to help cross-departmental sharing of knowledge. The time spent in meetings evaluated from the number of meetings booked in the central database on meeting room management indicated that a significant amount of organisational working time was happening in meetings.

Other data points coming from internal surveys showed that some teams were believing they could benefit from more information and knowledge sharing and would appreciate being faced with fewer silos physically and digitally.

A community of practice around meeting facilitation and knowledge sharing was put in place to help identify tools which could contribute to building a toolbox relevant for different needs and purposes. The first phase brought managers from almost all departments together to define the needs and test tools.

The approach chosen to develop the tools stemmed from knowledge visualization methods and tools to grow meeting facilitation capabilities and define powerful interventions to make meeting processes and outputs tangibly more satisfying. Visual templates were one type of tool among others. The experience and learning journey was summarised and published in a management journal dedicated to furthering organisational development (Saintot & Friedrich, 2016) where the community of practice activities and the tools developed were presented.

Several professionals from outside the organisation requested calls and presentations. For a six-month period, the work was presented in several private companies as peer practice sharing to share the know-how. The central concept developed was the notion of 'return on time'. It pointed to the fact that productive meetings impart on participants a sense of having used their time meaningfully.

Around 1000 individuals have been exposed in the organisation to the use of knowledge visualization tools and processes to increase the quality of the process and output of their meetings. Visual templates have been made available on the internal document repository system accessible by all. Meeting rooms have been equipped with toolboxes to foster interaction and stimulate 4E cognition. The feedback received from the participants has been positive. Four years later, the physical and online tools are still in use and have in 2020 been part moved to virtual interfaces. To some degree and in some projects, it helped adjust to the remote and virtual working operating mode. The COVID-19 pandemic in 2020 has given a push to rethink many aspects of organisational life, in particular the meeting culture and practices.

Academic impact
In August 2020, this research was presented at the 20th doctoral colloquium organised by SKEMA in cooperation with Swiss Business School (SBS) and the European Institute for Advanced Studies in Management (EIASM).

The presentation was followed by some discussions with the audience (Saintot, 2020). The focus was on the use of the 4E cognition framework in the present case study to explore how meeting participants relate to each other and use their body to know and relate to the visual template and their environment.

The fact it was primary field research has raised particular interest and has been assigned a high value in comparison to data collected from students or an online survey. The insights generated by crossing the meeting output, the meeting participants' behaviours, the perceptions of the meeting participants with the researcher's own observations was also noted from a methodology viewpoint.

One of the co-chairs of the conference integrated in the summary of the conference several of the slides from the present research. After the conference, further exchanges took place to explore opportunities for future research and joint publications.

7.7   Future developments

Looking at future endeavours, three perspectives retain attention.

The first perspective is about group interaction analysis
Coding group interaction analysis is a valuable approach to understanding what happens in meetings and how to possibly devise context relevant and helpful interventions. Two hurdles need to be overcome: without unduly simplifying the coding scheme, the existing schemes need to undergo at least two evolutions.

The first is a tailor making of code lists to be relevant for the meeting tasks explored. This requires quantitative research to ensure a certain validity of the lists of codes identified in relation to the meeting purpose. The second hurdle to be overcome is to find reliable ways to by-pass the high costs of currently existing software. It is likely that apps used for sentiment analysis could be adjusted and be more affordable than the commercial software. It is simply too demanding for organisations to train some of their employees to code meeting audio-recordings or to hire consultants to do so.

Over time, it is feasible that artificial intelligence could be used to help with this endeavour providing the possible ethical and data protection issues can be adequately managed. Growing the autonomy of teams to generate their own feedback objectified through known good practices deserves to be explored and evaluated to help teams identify their blind spots and improve their skills and tools to achieve better knowledge-sharing processes and overall meeting satisfaction.

The second perspective is about developing nudges to help teams on the go
To help increase awareness about what one may not be aware of, it is helpful to use external prompting. Posters in meeting rooms as a reminder of some principles and internal communications about the importance of investing efforts in building capability is of the essence. Building on existing and ongoing research in the field of knowledge visualization, it is useful to keep the connection between what researchers identify as useful formats and processes and their use in the field. Bridging academia and organisational endeavours could be an avenue, also allowing access to more researchers to work with real life teams. It would be interesting to explore and identify which sorts and how much training would be needed to build a critical mass of competent meeting facilitators in a given organisation. The role of communities of practice in the area of knowledge sharing and knowledge visualization would be another aspect worth exploring. It would also possibly make sense that some of the future research uses action research as a methodology or mixed methods with a clear quantitative component combined with ethnographic elements (Alexander et al., 2016).

The third perspective is about developing a more refined understanding of extended cognition
After reading for more than a decade about the various themes presented in this thesis, the discovery of 4E cognition was the missing piece I had been looking for. It cannot be overlooked that when 2020 turned out to be a year working virtually, a moment of doubt was experienced.

It is no evidence but the community of co-workers who used knowledge visualization tools to run virtual meetings appeared less at a loss and less disturbed by the situation. This being said, virtual meetings are a new space where knowledge visualization appears even more important. Meeting participants cannot just be reduced to their small portrait appearing on a computer screen as they attend virtual meetings. In the physical world, the senses, the body and the environment are starting to become clear actors in meeting interactions. Going virtual generates various limitations that could take the development of a high performing meeting culture backwards. Defining research questions in cooperation with real life teams can be key in providing evidence of the issues and supporting the exploration of possible interventions to mitigate the new challenges brought by virtual interactions and meetings.

7.8 Final remarks

On 25 July 2020, the Wall Street Journal published on its Instagram account the picture below of a survey output about working from home. The survey was realised by Upwork and involved 1500 hiring managers as shown in Picture 13. It would be easy to draw obvious conclusions but the figures echo well what one can read in the media on this topic. It is striking that people name reduction of the number of meetings as the second best thing about being at home instead of going to work, the absence of commuting being the best thing during confinement.

(…)
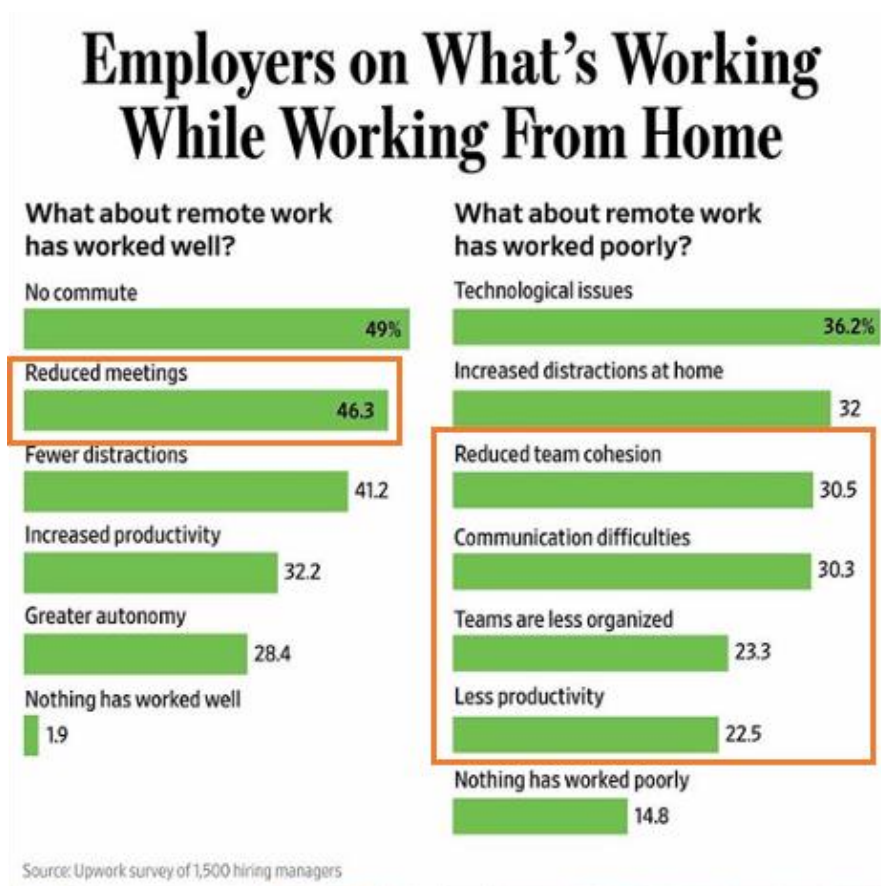
Picture 13 Survey results about working from home during COVID 19

The common attitude to complaining about attending meetings and not being satisfied with meetings should be accompanied by a quest for self-efficacy and more awareness about the need to mitigate self-complacency. As Lehmann-Willenbrock et al. (2016, p. 1293) affirmed 'we have a love/hate relationship with meetings'.

As the final considerations, the manager in the researcher cannot hold back. One reason I undertook this research project was to avoid promoting my personal preference of using knowledge visualization without elements supporting its usefulness beyond my person. Despite the limitations and the impossibility to claim that the findings are workable for all cases which is also not a relevant goal, there is sufficient evidence compiled in this thesis to offer using knowledge visualization at least as a possible alternative to be tried out.

The quest to identify the levers that the use of visual and visible thinking allows in a paradigm where the senses, the body and the environment have space at the meeting table, for instance using a visual template, places at the centre of attention the behavioural choices participants make to question or not their habits of running meetings.

Organisational habits evolve through feedback and learning. Developing a visual thinking culture to support knowledge-sharing and problem-solving activities has become key in a volatile and complex world where meetings will more often than in the past be held remotely. Using more than our brains to process information and making knowledge a common good at the disposal of the many can be a game changer to address the multiple challenges faced.

2020, the year during which this thesis has been completed has imparted a sense of urgency to promote the core messages: knowledge unshared or undocumented is an unaffordable waste. Efforts to change the way we interact in meetings and how we share knowledge have become a necessity. The challenge is how quickly and how many will understand, but even more importantly care, to upgrade their knowledge sharing and visualization appetite to build powerful skillsets and toolboxes.

The COVID19 pandemic has relied on remote working and the use of online meeting via visio-conference platforms. This was a real acceleration of the need to recourse to tools fostering online knowledge sharing. Knowledge visualization tools and in particular visual templates were key to compensate for the absence of physical meetings. This trend has come to stay and the object of this research will only grow in pertinence.

Following the insights and learning gained and strengthened during this project, the motivation and drive to keep researching academically and sharing the vision in the workplace will continue to guide my future research and work agenda.

Annexes

ANNEX 1 CONFIDENTIALITY DECLARATION

Dear Colleagues,
In the context of an academic research project, I am working on, you are invited to take part in a study on meeting culture.

Your consent is kindly sought. To recap, you will take part in a 60-minute structured meeting:
- *30 min = fulfilment of a task to be presented at the start of the meeting (I attend as observer, take notes and audio record the meeting for analytical purposes)*
- *10 min = filling an individual questionnaire*
- *20 min = focus group discussion to debrief on the experience*

The (NNN) is supporting this project and your management has given its consent to the principle of having this study performed in your business area. Your participation is fully voluntary.

Individual names and names of organisational units will not be referred to in the write up. Pictures will be taken to help remember each group when coding the data. The coding system will render anonym the data sources.

The data will be kept strictly confidential. Within 12 months of graduation or in any case no later than December 2020, the records referring to names will be destroyed.

With kind regards,
Valérie Saintot

CONSENT
I have understood what the study is about.
I confirm I am participating on a voluntary basis.
At any point in time, I retain the option to withdraw from the study.

*Name*_____   *First name*_____
*Date*_____   *Signature*_____

ANNEX 2 ADDITIONAL CONFIDENTIALITY DECLARATION

ADDITIONAL CONFIDENTIALITY DECLARATION FOR TEAM W3 TO USE THEIR PHOTOGRAPHS

Dear Colleagues,

In 2018, you attended a one-hour meeting which was part of my PhD research project to collect data about how teams share knowledge in their meetings.

I am now completing the write up of the thesis and I would like to ask for your consent to use the pictures I took of your team in my thesis.

To recap, once completed and the degree awarded a digital copy of the thesis will be stored in the UK central repository for PhD thesis and some 15 printed copies will be distributed to my supervisors and family.

At this point, no further publication is planned or intended. In case publishing the thesis would be considered, I would either remove your pictures or ask again for your consent.

Regarding anonymity, your department or your names are not mentioned either. Your team is called W3 as per my coding scheme. In search engines or other electronic search tools, you would not appear.

Content wise, you appear in chapter 5 on data analysis under 'Outlying team'. You are featured as the team having been most successful in completing the problem-solving task, so all what is being written about your team is placing your work and team under an advantageous light.

Using the real pictures makes a big difference in terms of quality so I would very much appreciate to be able to use the pictures unaltered. The overarching arguments I deploy is how much you interacted among yourself, moved, stood up, iterated on the board etc. With clear pictures it is better for the readers to understand.

Here below and on next page you find the 18 pictures I would like to use for your review and consent. As you can see it is very much about what you do and how you interact and not about each of you as a target of the reporting. I thank you in advance for considering consenting to this   request.

With kind regards,
Valérie Saintot
PICTURES ENVISAGED
(see body of thesis)

CONSENT

I have understood what my consent to use my picture means.
My picture can be used without being blurred for the purpose described by V Saintot in the context of her PhD thesis. I confirm I am agreeing voluntarily.

*Name*_____   *First name*_____

*Date*_____   *Signature*_____

ANNEX 3 INDIVIDUAL QUESTIONNAIRE

Family name		Gender	M/F	Years of work experience	
Nationality		Age		Years at the (NNN)	

>>> Indicate the statement you believe is correct for you by ticking one box per topic

1)   Knowledge sharing process

1.a	I perceived that the absence of a given discussion structure prevented us from exchanging as many pieces of knowledge as we needed to reach a conclusion	
1.b	I perceived that the absence of a given discussion structure did not prevent us from exchanging as many pieces of knowledge as we needed but we could not conclude	
1.c	I was not affected by the absence of pre-set discussion structure and I believe we could exchange well pieces of knowledge and broadly agree on the conclusions	
1.d	I perceive the discussion was structured, we could not exchange all pieces of knowledge available, but we could nevertheless conclude	
1.e	I perceive the discussion was well structured, we could exchange a lot of pieces of knowledge and we could easily conclude	

2)   Level of engagement

2.a	It seems to me that participants were not really engaged during the meeting	
2.b	It seems to me that participants were somewhat engaged during the meeting	
2.c	It seems to me that participants were engaged during the meeting	
2.d	It seems to me that participants were very engaged during the meeting	
2.e	It seems to me that participants were engaged beyond what I usually experience in our team	

3) Respect of individual opinions

3.a	At no time during the meeting did I feel able to express an/my individual opinion	
3.b	I was able to express my individual opinion, but I don't think it was listened to much	
3.c	I was able to express my individual opinion occasionally and it did count for something	
3.d	I was able to express my individual opinion and I felt that it was respected and listened to	
3.e	I felt able to express my individual opinion at all times, it was respected, and my contribution made a difference	

4) Use of knowledge shared

4.a	I have the impression that most of the pieces of knowledge spoken were not picked up and not used by the group	
4.b	I have the impression that some of the pieces of knowledge spoken were picked up but not really used by the group	
4.c	I have the impression that a fair amount of the pieces of knowledge spoken were picked up and used by the group	
4.d	I have the impression that all the pieces of knowledge spoken were picked up and used by the group	
4.e	I have the impression that the pieces of knowledge spoken helped generate new knowledge individual group member did not have before	

5) Satisfaction with discussion process

5.a	I perceive the set-up of the meeting did not support the discussion and impacted negatively the interaction among the meeting participants	
5.b	I perceive the set up was not supportive of the discussion, but it did not really affect the interaction among the meeting participants	

5.c	I perceive the set up was supportive of the discussion but did not help the interaction among the meeting participants	
5.d	I perceive the set up was supportive of the discussion and was key to help the meeting participant structure their interactions	
5.e	I perceive the set up was supportive of the discussion and brought the interactions much further than we usually do in the given time	

6)　　Satisfaction with output

6.a	Today's meeting was very unsatisfactory as we did not fulfil the task at hand	
6.b	Today's meeting was unsatisfactory as we only partially fulfilled the task at hand	
6.c	Today's meeting was satisfactory even if we did not fully fulfil the task at hand	
6.d	Today's meeting was very satisfactory even if we only partially fulfilled the task at hand	
6.e	Today's meeting was very satisfactory as we fulfilled the task at hand	

ANNEX 4 CHARACTERISTICS OF THE TEN TEAMS

The ten teams came from ten different departments. This choice had a double justification. First, it avoided participants getting to know the other meeting participants during the data collection period and influencing their way of experiencing the meeting and changing their behaviours from their natural way of unfolding. It was also meant to preserve the 'being new' effect of the participants vis-à-vis the research. Second, it was also interesting to explore whether the observations and the findings would lead to patterns across the organisation and could lead to some learning of value for the organisation as a whole rather than for the subset of the participating departments.

The organisation where the data were collected was composed of some 20 departments categorised in support areas and core areas. The support areas include among others human resources (HR), accounting, information systems (IS) or premises management. The core areas include analytical departments, research, legal, etc. and are in charge of the mission of the organisation. The ten teams came equally from support and core areas. The field of expertise of the teams is not revealed in the write up as it is perceived as non-relevant for the study of the phenomenon.

Team members' profiles
A significant learning element from the meeting pilot was the need to collect basic demographic information about the team members to have a basic understanding of the team composition. Despite the fact that the teams selected to be part of the data collection process were a convenience sample, having information about the team members enriched the analysis and helped define or disregard some influencing factors. Five pieces of demographic information were requested from the team members: age, years of professional experience, years of experience in the organisation, gender, nationality.

The teams were composed of four to seven members. The five teams that performed the meeting task without being invited to use a visual template (group A) totalled twenty-eight participants. The five teams that performed the meeting task with an invitation to use a visual template (group B) totalled twenty-seven participants.

Both groups of five teams had each two teams with a manager present and three teams without a manager present. Fifteen nationalities were represented across the ten teams. No team was composed of less than three nationalities.

When answering the individual questionnaires, participants were invited to share five pieces of demographic information: age, gender, nationality, the number of years of professional experience they had, the number of years they had been working for the organisation as shown below.

Demographic information collected for each team member

INDIVIDUAL QUESTIONNAIRE / MEETING CULTURE

| Family name | | Gender | M/F | Years of work experience | 6 |
| Nationality | Romanian | Age | 28 | Years at the ECB | < 1 |

There were 34 female participants and 21 male participants. Six nationalities had one representative; all the others had two or more. To the best of the researcher's observation and experience, fundamental differences of behaviours based on gender or nationality could not be identified.

The balance spread of basic demographic characteristics can be appreciated in the below table.

	GROUP A	GROUP B	ALL
# PARTICIPANTS	28	27	55
# GENDER	18F + 10M	16F + 11M	34F + 21M
# NATIONALITIES	13	10	15

Three pieces of demographic data relating to the age of the participants, their years of work experience and their tenure in the organisation were collected.

First, when analysing the age of the participants across the ten teams, the team composition appeared naturally and without any intervention to be comparable across the two groups. The average age across the 55 participants was 36 years. It was also noticeable that the oldest and youngest participants in each group of five teams were comparable. Second, when analysing the years of experience of the participants across the ten teams, it appeared that the number of years of experience was comparable. The average number of years of experience across the ten teams was 11.6 years as shown the below table.

	GROUP A	GROUP B	ALL
AVERAGE	35,7	36,5	36
MIN.	24	23	23
MAX.	49	58	58

It was also noticeable that the minimum and maximum years of experience from participants in each group of ten teams were comparable.

Third, the work tenure in the organisation where the case study took place was also surveyed. A high degree of comparability was also observed on this aspect as shown in the table below.

	GROUP A	GROUP B	ALL
AVERAGE	4,87	5,85	5,35
MIN.	1	0	0
MAX.	16	19	19

It was unclear whether the above data would be included in the thesis. Logically, a qualitative study embedded in a social constructionist paradigm may not really care for these aspects. Yet, while listening to the feedback and reactions of various counterparts to whom the findings were presented, many asked about the above parameters as possible sources of divergence and explanations across the groups.

Had it been that there was fundamental divergence, nothing could have been done afterwards with the reality of the team composition. Yet, as they were so comparable by a fact of life and not by planned research design, it seemed opportune to mention these points to be able to focus on interpreting the data rather than possibly doubting that the discrepancies in the way teams shared knowledge and used the visual template could stem from diverging demographics. It reflects the demographic mix of the organisation within which the case study took place and that teams appear balanced in these three demographic variables.

Further feedback received when discussing the findings with the colleagues aware of the study and who were curious about the findings involved whether some participants were versed in knowledge visualization. They even asked about whether some teams or participants were trained visual facilitators or known to be using knowledge visualization in their day-to-day meetings beyond the common use made of pin boards or PowerPoint presentations in the workplace. To the best of our knowledge, the answer was no as an internal survey in the organisation shortly before the start of the data collection had shown that facilitation and even visual facilitation were not common skills across the organisation. It was another important factor to appreciate in context of the possible influence of such parameters. This one could also be disregarded.

It is interesting to observe that while the teams participating were gathered following a convenience sample approach, the team demographics could not be identified as a major source of divergence and offer 'obvious' explanations for divergence in the findings. It seemed the divergences had to come from somewhere else and that the environment offered an interesting platform to explore the role of the visual template for knowledge sharing purposes in face-to-face workplace meetings.

ANNEX 5 FOCUS GROUP – FACILITATOR SCRIPT

SEQUENCE	NB	REMARKS / QUESTIONS
Opening	--	a) This focus group is part of the data collection. It is about sharing your experience of how the meeting went for you at the level of your perceptions without really analysing what comes to you. b) I will facilitate the discussion without commenting or giving feedback, and act more as a timekeeper. We can have a debriefing of my observations of how you worked together during the 30 min I observed in a separate session if you would express a need for it.
Discussion	1	Please exchange about what worked really well.
	2	Please do the same for what worked less well.
	3	How engaged or motivated did you feel the group was?
	4	Taking a step back, overall, can you name the factors you think influence the efficiency of knowledge sharing in meetings?
	5	***For meetings WITH visual template:*** > How do you assess the influence of the stakeholder map template on your discussion? What did it change, allow, reduce or prevent?
	6	Is there anything we should have talked about and we did not? And if so what?
Conclusion	--	Thank you for volunteering for this session today. Once I have some first findings in a few months, I will strive to share the insights gained with all participants. Based on this, I will add a data point through 8 individual semi-structured interviews I will conduct early next year. I may contact you to ask for your support in this respect. Meanwhile, big thanks for availing.

ANNEX 6 CODING SOFTWARE - BORIS

Based on the Act4Teams coding scheme, an ethogram was developed in the open source software selected called 'BORIS' which stands for Behavioural Observation Research Interactive (Friard & Gamba, 2016). The ethogram consisted of a table matching a code defined by its type (point or state event), a code description, a category of codes, in the present case the statement clusters (problem focused, procedural, socio-emotional, action-oriented), plus the additional two codes named 'blanks' and 'stakeholders'.

Key	Code	Type	Description	Category
A	PN id	State event	Identifying a problem	Problem focused
B	PB Desc.	State event	Describing a problem	Problem focused
C	PB X-link	State event	Cross-linking problems	Problem focused
D	PB Coz&E	State event	Problem cause and effect	Problem focused
E	TarG def.	State event	Target definition	Problem focused
F	SOL id	State event	Solution identification	Problem focused
G	SOL desc	State event	Solution description	Problem focused
H	OD KN	State event	Organisational knowledge	Problem focused
I	KNg who	State event	Knowing who	Problem focused
J	Q?	State event	Question	Problem focused
K	Goal O.	State event	Goal orientation	Problem focused
L	Clary.	State event	Clarifying	Problem focused
M	To the .	State event	To the point	Problem focused
N	PRO sug	State event	Procedural suggestion	Problem focused
O	PRO Q?	State event	Procedural question	Problem focused
P	Prio.	State event	Prioritisation	Problem focused
43 + 2 CODES		**2 EVENT TYPES**	**CODE SHORT DESCRIPTION**	**6 CATEGORIES**

Ethogram created for coding with the software BORIS

To facilitate the coding, the functionality available in BORIS called 'coding pad' as shown in **Error! Reference source not found.** below was used. After some hesitation on how to proceed, using the coding pad proved to be an extremely convenient feature. It is composed of the elements that appear as shortcuts in the ethogram. In hindsight, it was worth investing time creating it and learning to use it. Altogether using BORIS, open-source software, was very intuitive. The software kept being improved and updated during the present research by the active community of researchers from the University of Torino in Italy. For the sake of transparency, no contact was established as no particular need justified entering into dialogue with this community.

Coding pad created with the software BORIS

The coding represented more than a hundred hours of work. The coding pad rapidly became a key success factor in driving the coding work to its end.

ANNEX 7 CODES TO THE MEETINGS' INTERACTIONS

1) Tailor-made definitions for the cluster 'problem focused'

#	PROBLEM FOCUSED	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
A1	Knowing who	Yes	Reference to specialists. Pointing to persons of reference who can help with stakeholder mapping.
A2	Question	Yes	Question about knowledge shared. Inquire how/why/where from the participant on what s/he affirms about given stakeholder(s).
A3	Organisational knowledge	Yes	Knowledge about the organization and processes. Referring to the broader context within which stakeholders are mapped including the processes they relate to.
A4	Problem cross-linking	Yes	Discussing issues only indirectly related to the problem-solving task.
A5	Problem description	Yes	Scoping the discussion around the task given: which dossier(s) to include or not, which part(s) of the teamwork are included in the discussion or not.
A6	Problem identification	Yes	Defining the task to perform.
A7	Defining the objective	Yes	Discussing what the task means/requires the participants to do.
A8	Solution description	Yes	Define how to identify the stakeholder. Explain the characteristics of the stakeholders for them to be relevant to the task performed. Explain what the output should look like and positioning of stakeholders in relation to each other.
A9	Solution identification	Yes	About the stakeholder of the team performing the task. Naming and discussing a way to communicate with a stakeholder.
A10	Connection with solutions	Yes	Naming advantages of the solutions. Explaining why referring to one or more stakeholders helps the task to be performed.

2) Tailor-made definitions for the cluster 'procedural statements'

#	PROCEDURAL	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
B1	Goal orientation	Yes	Focusing on meeting goal.
B2	Clarifying	Yes	Making sure that the stakeholder quoted or discussed is relevant to the task.
B3	Procedural suggestion	Yes	Giving input that structures the way the task will be performed/delivered. Giving concrete guidance on how to proceed with delivering the tasks: in which order, using which means.
B4	Procedural question	Yes	Questions whether the procedure followed is the right one or still helpful. Express concerns or doubts or ideas in the form of questions with the goal of optimizing the procedure being followed to bring a relevant and complete list of stakeholders.
B5	Prioritizing	Yes	Putting emphasis on stakeholder management regarding the successful delivery of work programme. Pointing out the secondary nature of a discussion or even the low importance or impact of some stakeholders being discussed.
B6	Time management	Yes	Reference to time. Timekeeping. Questioning whether there is enough time left, questioning whether too much time is spent on a type of stakeholder versus another one.
B7	Tasks distribution	Yes	Delegating tasks during the discussion. Giving roles: timekeeper, note taker, facilitator. Also for after the meeting.
B8	Visualization *(only non-verbal code)*	Yes	Using flipchart and similar tools. Using available paper: A3, post-it, visual template, write up.
B9	Summary	Yes	Summarising results. Reading or showing findings.
B10	Losing the train of thought	Yes	Giving examples not directly relevant to the goal. Long monologues. Explaining about out of scope aspects or holding the floor alone without output usable for group task.

3) Tailor-made definitions for the cluster 'socio-emotional statements'

#	SOCIO-EMOTIONAL	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
C1	**Encouraging participation**	Yes	Checking whether the silent or quieter participants are still engaged or have something to add and ensuring participation.
C2	**Providing support**	Yes	Behaviours that support group dynamics. Agreeing to suggestions, ideas, etc.
C3	**Active listening**	Yes	Signalling interest with words like 'Yeah, mm, yes, great'.
C4	**Reasoned disagreement**	Yes	Contradicting based on facts.
C5	**Giving feedback**	Yes	Ensuring participation. Signalling whether something is new or already known.
C6	**Humour**	Yes	Jokes or non-result-oriented remarks which bring laughter.
C7	**Separating opinions from facts**	No	Signalling interest. Marking one's own opinion as opinion not as fact.
C8	**Expressing feelings**	Yes	Contradicting not based on facts. Mentioning feelings like anger or joy.
C9	**Offering praise**	Yes	Expressing appreciation for the contribution. Mentioning positive remarks about others.
C10	**Criticism/ Backbiting someone**	Yes	Criticizing at personal level. Making negative comments about others.

*4) Tailor-made definitions for the cluster 'action-oriented statements'*

#	ACTION ORIENTED	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
D1	**Expressing positivity**	No	Explicit support to change the way the participants look at stakeholder management.
D2	**Taking responsibility**	Yes	Accept to take charge. Participants volunteering to take the stakeholder map further.
D3	**Action planning**	Yes	Agreeing upon tasks to be carried out. Correlating names and actions.
D4	**No interest in change**	No	Denial of optimization opportunities. Explaining why it cannot work.
D5	**Complaining**	Yes	Emphasis on the negative status quo, pessimism, killer phrases.
D6	**Seeking someone to blame**	No	Pointing out hierarchies and competencies.
D7	**Denying responsibility**	No	Personalizing the problem.
D8	**Empty talk**	Yes	Talking without usable content.
D9	**Ending the discussion early**	Yes	Ending or trying to end the discussion early.

ANNEX 8 MEETING PERCEPTION – GROUP A & B

1) Knowledge sharing process – Affirmations and answers from Group A and Group B

| 1.a	I perceived that the absence of a given discussion structure prevented us exchanging as many pieces of knowledge as we needed to reach a conclusion.
1.b	I perceived that the absence of a given discussion structure did not prevent us exchanging as many pieces of knowledge as we needed but we could not conclude.
1.c	I was not affected by the absence of a pre-set discussion structure and I believe we could exchange well pieces of knowledge and broadly agree on the conclusions.
1.d	I perceive the discussion was structured, we could not exchange all pieces of knowledge available, but we could nevertheless conclude.
1.e	I perceive the discussion was well structured, we could exchange a lot of pieces of knowledge, and we could easily conclude.

AFFIRMATIONS

ANSWERS

173
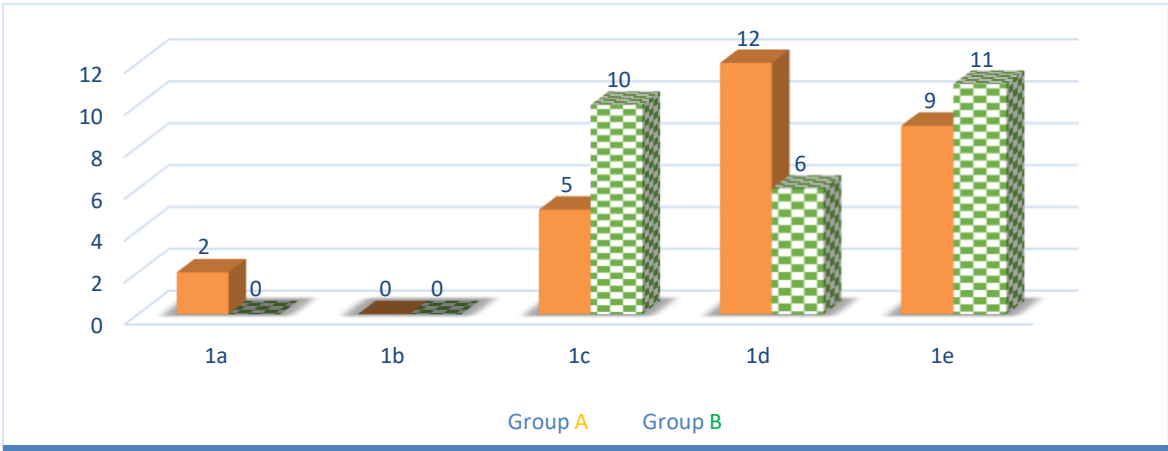
2) Perceived engagement - Affirmations and answers from Group A and Group B

| 2.a | It seems to me that team members were not really engaged during the meeting. |
2.b	It seems to me that team members were somewhat engaged during the meeting.
2.c	It seems to me that team members were engaged during the meeting.
2.d	It seems to me that team members were very engaged during the meeting.
2.e	It seems to me that team members were engaged beyond what I usually experience in our team.

AFFIRMATIONS
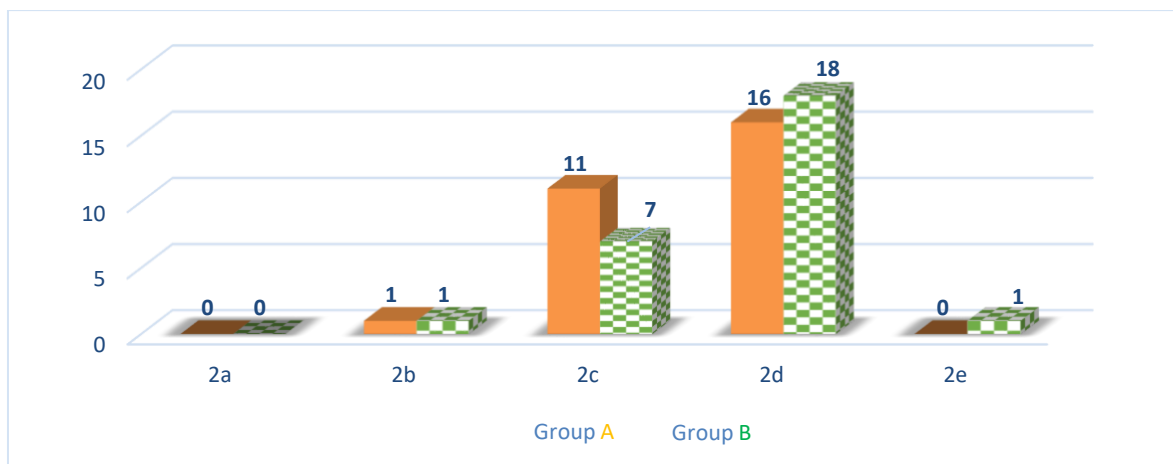
ANSWERS

3) Use of individual opinions

| 3.a	At no time during the meeting did I feel able to express an/my individual opinion.
3.b	I was able to express my individual opinion, but I don't think it was too much heard.
3.c	I was able to express my individual opinion occasionally and it did count for something.
3.d	I was able to express my individual opinion and I felt that it was respected and listened to.
3.e	I felt able to express my individual opinion at all times, it was respected, and my contribution made a difference.

AFFIRMATIONS
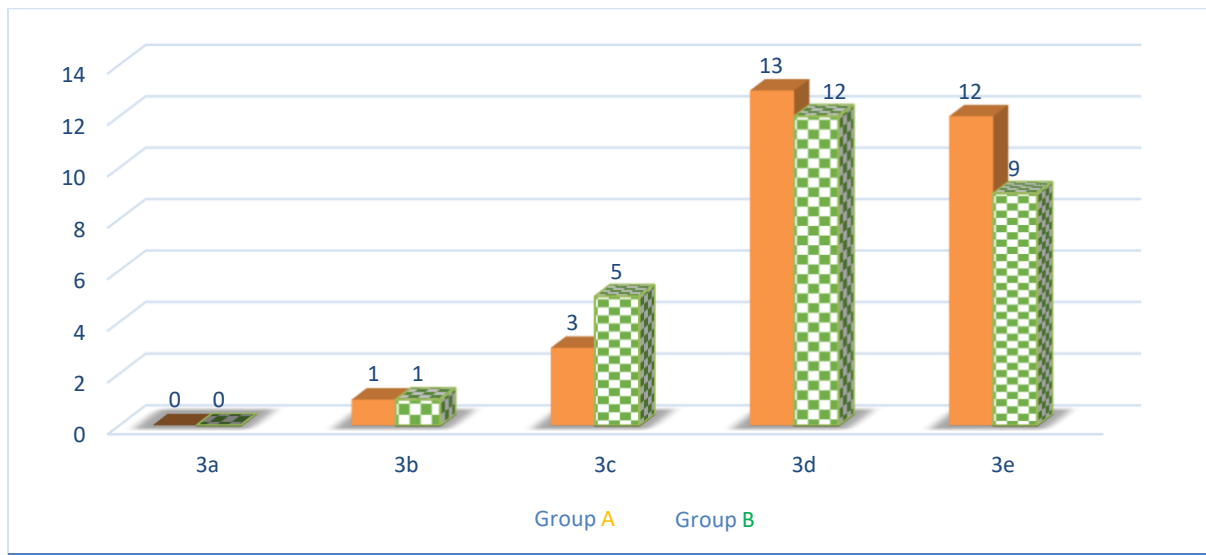
ANSWERS

4) Impression about the knowledge shared

| 4.a	I have the impression that most of the pieces of knowledge spoken were not picked up and not used by the team.
4.b	I have the impression that some of the pieces of knowledge spoken were picked up but not really used by the team.
4.c	I have the impression that a fair amount of the pieces of knowledge spoken were picked up and used by the team.
4.d	I have the impression that all the pieces of knowledge spoken were picked up and used by the team.
4.e	I have the impression that the pieces of knowledge spoken helped generate new knowledge individual team members did not have before

AFFIRMATIONS
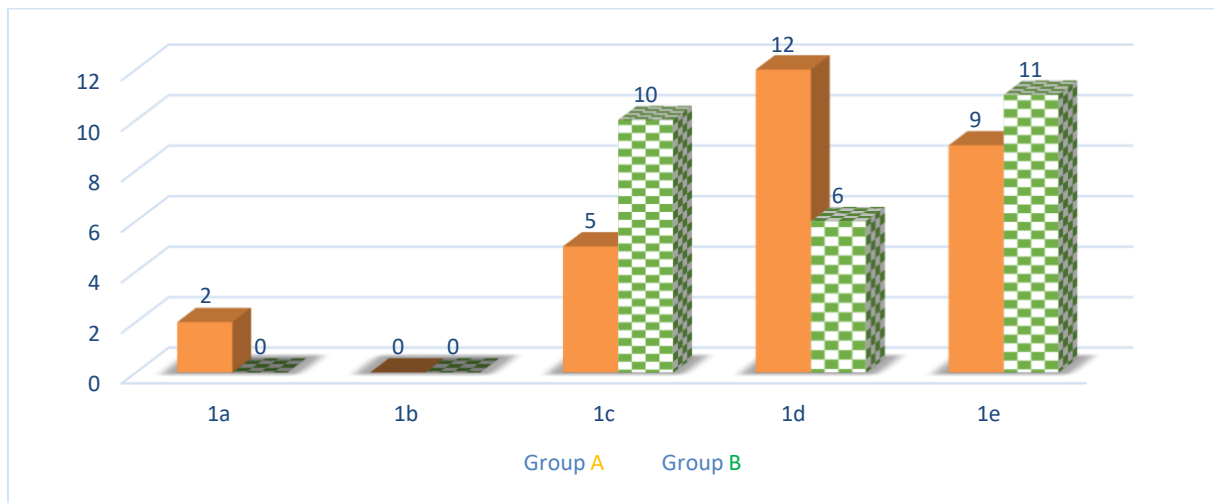
ANSWERS

5) Satisfaction with the discussion process

5.a	I perceive the meeting structure did not support the discussion and impacted negatively the interaction among the meeting participants.
5.b	I perceive the meeting structure was not supportive of the discussion, but it did not really affect the interaction among the meeting participants.
5.c	I perceive the meeting structure was supportive of the discussion but did not help the interaction among the meeting participants.
5.d	I perceive the meeting structure was supportive of the discussion and was key to helping the meeting participant structure their interactions.
5.e	I perceive the meeting structure was supportive of the discussion and brought the interactions much further than we usually do in the given time.

AFFIRMATIONS
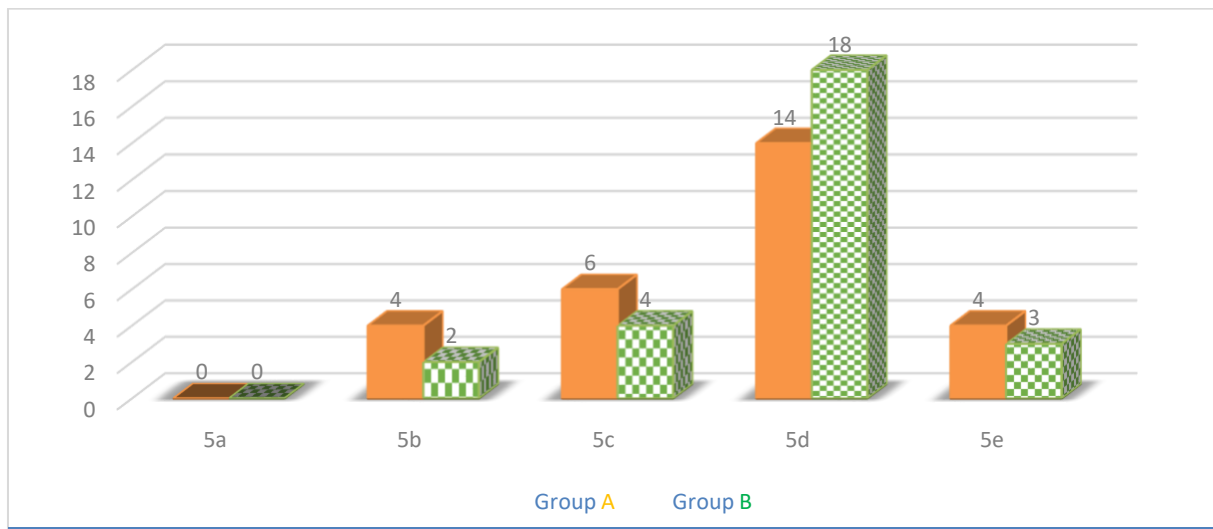
ANSWERS

6) Satisfaction with the discussion output

6.a	Today's meeting was very unsatisfactory as we did not fulfil the task at hand.
6.b	Today's meeting was unsatisfactory as we only partially fulfilled the task at hand.
6.c	Today's meeting was satisfactory even if we did not fully fulfil the task at hand.
6.d	Today's meeting was very satisfactory even if we only partially fulfilled the task at hand.
6.e	Today's meeting was very satisfactory as we fulfilled the task at hand.

AFFIRMATIONS

6. Satisfaction with discussion

Answer	Group A	Group B
6a	0	0
6b	1	0
6c	3	1
6d	8	2
6e	16	23
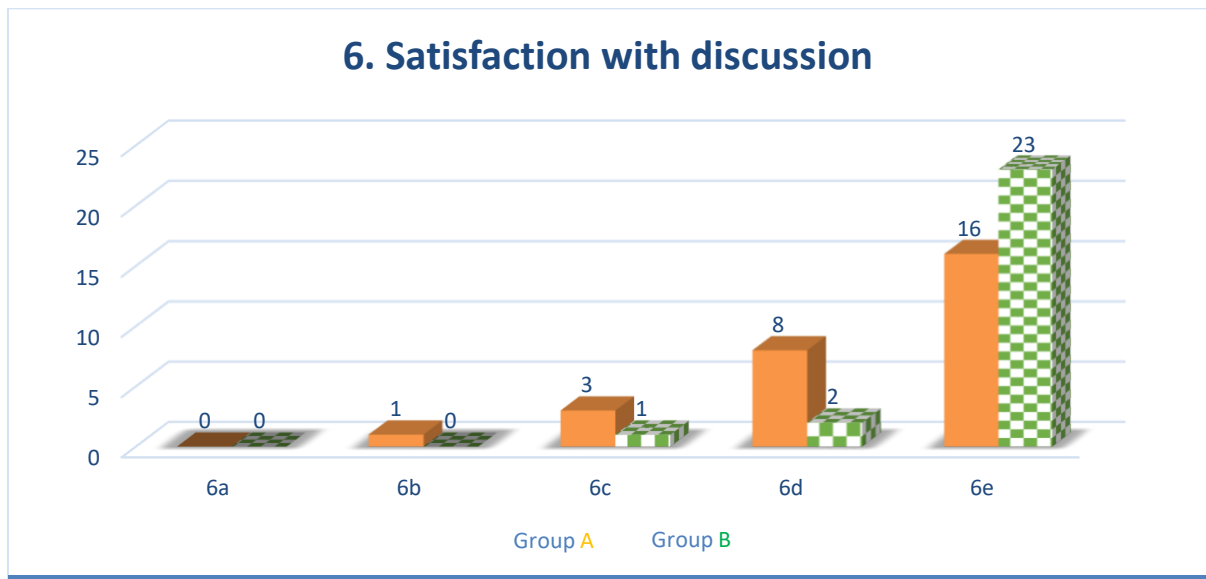
ANSWERS

ANNEX 9 PROBLEM-FOCUSED STATEMENTS

#	PROBLEM FOCUSED	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
A1	**Knowing who**	Yes	Reference to specialists. Pointing to persons of reference who can help with stakeholder mapping.
A2	**Question**	Yes	Question about knowledge shared. Inquire how/why/where from the participant on what s/he affirms about given stakeholder(s).
A3	**Organisational knowledge**	Yes	Knowledge about the organization and processes. Referring to the broader context within which stakeholders are mapped including the processes they relate to.
A4	**Problem cross-linking**	Yes	Discussing issues only indirectly related to the problem-solving task.
A5	**Problem description**	Yes	Scoping the discussion around the task given: which dossier(s) to include or not, which part(s) of the teamwork are included in the discussion or not.
A6	**Problem identification**	Yes	Defining the task to perform.
A7	**Defining the objective**	Yes	Discussing what the task means/requires the participants to do.
A8	**Solution description**	Yes	Define how to identify the stakeholder. Explain the characteristics of the stakeholders for them to be relevant to the task performed. Explain what the output should look like and positioning of stakeholders in relation to each other.
A9	**Solution identification**	Yes	About the stakeholder of the team performing the task. Naming and discussing a way to communicate with a stakeholder.
A10	**Connection with solutions**	Yes	Naming advantages of the solutions. Explaining why referring to one or more stakeholders helps the task to be performed.

ANNEX 10 PROCEDURAL STATEMENTS

#	PROCEDURAL	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
B1	**Goal orientation**	Yes	Focusing on meeting goal.
B2	**Clarifying**	Yes	Making sure that the stakeholder quoted or discussed is relevant to the task.
B3	**Procedural suggestion**	Yes	Giving input that structures the way the task will be performed/delivered. Giving concrete guidance on how to proceed with delivering the tasks: in which order, using which means.
B4	**Procedural question**	Yes	Questions whether the procedure followed is the right one or still helpful. Express concerns or doubts or ideas in the form of questions with the goal of optimizing the procedure being followed to bring a relevant and complete list of stakeholders.
B5	**Prioritizing**	Yes	Putting emphasis on stakeholder management regarding the successful delivery of work programme. Pointing out the secondary nature of a discussion or even the low importance or impact of some stakeholders being discussed.
B6	**Time management**	Yes	Reference to time. Timekeeping, questioning whether there is enough time left, questioning whether too much time is spent on a type of stakeholder versus another one.
B7	**Tasks distribution**	Yes	Delegating tasks during the discussion. Giving roles: timekeeper, note taker, facilitator. Also for after the meeting.
B8	**Visualization (only non-verbal code)**	Yes	Using flipchart and similar tools. Using available paper: A3, post-its, visual template, write up.
B9	**Summary**	Yes	Summarising results. Reading or showing findings.
B10	**Losing the train of thought**	Yes	Giving examples not directly relevant to the goal. Long monologues. Explaining about out-of-scope aspects or holding the floor alone without output usable for group task.

ANNEX 11 SOCIO-EMOTIONAL STATEMENTS

#	SOCIO-EMOTIONAL	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
C1	Encouraging participation	Yes	Checking whether the silent or quieter participants are still engaged or have something to add and ensuring participation.
C2	Providing support	Yes	Behaviours which support group dynamics. Agreeing to suggestions, ideas, etc.
C3	Active listening	Yes	Signalling interest with words like 'Yeah, mm, yes, great'.
C4	Reasoned disagreement	Yes	Contradicting based on facts.
C5	Giving feedback	Yes	Ensuring participation. Signalling whether something is new or already known.
C6	Humour	Yes	Jokes or non-result-oriented remarks which bring laughter.
C7	Separating opinions from facts	No	Signalling interest. Marking one's own opinion as opinion not as fact.
C8	Expressing feelings	Yes	Contradicting not based on facts. Mentioning feelings like anger or joy.
C9	Offering praise	Yes	Expressing appreciation for the contribution. Mentioning positive remarks about others.
C10	Criticism/ Backbiting someone	Yes	Criticizing at a personal level. Making negative comments about others.

ANNEX 12 ACTION-ORIENTED STATEMENTS

#	ACTION ORIENTED	USED	TAILOR-MADE EXPLANATIONS FOR THIS STUDY
D1	**Expressing positivity**	No	Explicit support to change the way the participants look at stakeholder management.
D2	**Taking responsibility**	Yes	Accept taking charge. Participants volunteering to take the stakeholder map further.
D3	**Action planning**	Yes	Agreeing upon tasks to be carried out. Correlating names and actions.
D4	**No interest in change**	No	Denial of optimization opportunities. Explaining why it cannot work.
D5	**Complaining**	Yes	Emphasis on the negative status quo, pessimism, killer phrases.
D6	**Seeking someone to blame**	No	Pointing out hierarchies and competencies.
D7	**Denying responsibility**	No	Personalizing the problem.
D8	**Empty talk**	Yes	Talking without usable content.
D9	**Ending the discussion early**	Yes	Ending or trying to end the discussion early.

ANNEX 13 EXAMPLE - FOCUS GROUP TRANSCRIPT – W3

Q1) What worked well

MISSING 5 min of recordings = all about praising the visual template

- Open communication
- Included brainstorming
- Post it = framework readily available
- Common objectives
- Experts groups on topics
- The framework was available
- Knowledge could be applied immediately
- Trust
- Listen to each other
- Building consensus (yes you are right)
- Disagreement expressed due to good atmosphere
- Building common understanding

Q2) What did not work well

- The way of proceeding: per project
- If known the task before
- Different post it colours
- Take some minutes as not prepared for this topic
- Preparing the task before hand
- More effective = if done project by project or decide more generic = we got a one fit all
- Plan the use of the 30 min = more time structure
- Implicit internal agenda to each participant = no need for explicit agenda
- All participants have the same agenda = bias on validity and reproducibility = no conflicting interests

Q3) Engagement / Motivation

- everybody engaged and motivated
- same engagement as for normal business

Q4) success factors

- preparation of meeting: framework + agenda
- bring the structure
- making explicit the goal of the meeting + agenda (decision, brainstorming)
- absence of goal create divergence
- people do not quote the room or the context actually
- clear objective and written!
- Open com
- Everybody speaks
- How to get everybody to speak
- Not common to have all participants speaking
- Even with a manager present, feeling of freedom
- Trust and respect

Q6) Compare to real meetings how do you assess the use of a visual template

- volunteering vs mandatory participation
- a lot around the table, some prepared and some not
- coming late
- different objectives
- a lot of speaking but not necessarily com
- here a lot of listening
- repeat stance 3 or 4 times
- thoughts not captured = give the feeling that I am not listened too = avoid repetition
- too much oral too little documentation: effect of white board makes a key difference
- diagram, drawing = create the same image in our minds
- the choice of the model directs the conversation
- element of interest = direct the group towards a specific level or idea by choosing the dimension of the discussion
- time is key
- choice of template directs the discussion = needs to be clear in the mind of the facilitator that how he chooses the template focuses the discussion

Q7) anything I did not ask you want to share
- the template = relaxed
- visual template = avoid having to spent time agreeing how to work together (can take time and not lead anywhere)
- no chance to complete
- discussion lost on how to go about it
- help to think more
- prompt the participants to think more
- quality and quantity would not have been possible

Q8) Take away
- useful with participants with diverging interests
- highly useful
- issue = time to prepare the visual template
- set of templates with guidance when too use = toolboxes

Q9) Open question
- right people, right experience
- junior people = useful as questioning
- junior learn not only by contributing but also listening
- learning experience
- works with heterogeneous group = junior and senior

[00:21:29] Speaker 3: That doesn't match for me.

[00:21:30] Speaker 1: But no it's the same--

[00:21:30] Speaker 3: It still does not match- [crosstalk]

[00:21:38] Speaker 1: But then we need-If I move it, I would move it up, in case I have this **[unintelligible 00:21:40]** definitely, this one.

[00:21:42] Speaker 2: It's okay, just to be consistent because- [crosstalk]

[00:21:48] Speaker 1: (NNN) and how these people are **[unintelligible 00:21:50],** yes**.**

[00:21:54] Speaker 2: Are we satisfied?

[00:21:56] Speaker 1: Sorry?

[00:21:57] Speaker 2: Are we satisfied? Do we -- are we missing anybody?

[00:21:59] Speaker 1: I think it's consistent.

[00:22:01] Speaker 3: Business area users, would I move to **[unintelligible 00:22:04]** because then we will also need them, uh, we will need them to rework- [crosstalk] I mean these are people participating in the project and these are, you know, the other ones that are not **[unintelligible 00:22:17].**

[00:22:19] Speaker 4: Well, but the (NNN) shouldn't it be left on keep satisfied, because they have high power, right? Why is the (NNN) with low power?

[00:22:27] Speaker 3: I mean, on the planning.

[00:22:31] Speaker 2: It depends whether we-we count the approval as part of the planning or-

[00:22:38] Speaker 1: Approval, of course, it's part of the planning because if they don't confirm, then there's no planning- [crosstalk]

[00:22:44] Speaker 3: If it's already been approved, I mean, it would be strange to have them turning back the planning when it has already been approved by (NNN), by the head of--

[00:22:53] Speaker 4: Then why don't they remove the (NNN)? I mean, if they have the final decision. Why do you even have- [crosstalk]

[00:23:00] Speaker 1: [unintelligible 00:23:08] It's approved by (NNN) and no one is working on it and it's approved. They secure user to user communication, it's approved by (NNN) and no one is working on it. The approval of (NNN) doesn't imply until their resources are not available **[unintelligible 00:23:21].** Your comment.

[00:23:26] Speaker 4: Yes. My comment was to move the (NNN) to keep satisfied because they have high power. That was my comment- [crosstalk]

[00:23:38] Speaker 1: It's power on the financials, but not on the planning**.**

[00:23:41] Speaker 1: [unintelligible 00:23:42] at least we need 800, uh, Monday's or 900 or 500, so that's what the- [crosstalk]

[00:23:53] Speaker 4: I got the point on the planning. On the planning. That's the key part. Yeah.

[00:23:57] Speaker 2: I mean this a bit how you rate it **[unintelligible 00:23:58]** It is included in this or -- because it says **[unintelligible 00:24:05]** to support a successful delivery. In order to have a successful delivery, I would also see it more there, no? Because when they- when you come with your plan and they say, "No," this could also happen, right?

[00:24:20] Speaker 3: I mean, when you already have the planning approved by all the intermediate steps **[unintelligible 00:24:22]**

 [00:24:25] Speaker 2: I'm just exaggerating but it could happen now that--

[00:24:29] Speaker 3: Yeah, you can't reach that point without any planning. So, if we don't have you in the plan, they are not in a position either to approve or to **[unintelligible 00:24:34]**

[00:24:37] Speaker 2: Yes, yes. That's what I'm saying. Is the approval here included or not?

[00:24:44] Speaker 4: I mean, are they interested in your planning or do they have the power-

[00:24:48] Speaker 3: Who?

[00:24:48] Speaker 4: -The (NNN). Are they interested in-

[00:24:52] Speaker 3: (NNN)

[00:24:51] Speaker 2: (NNN).

[00:24:54] Speaker 4: Yes,(NNN). Are they interested in your planning or do they have the power to influence your planning?

[00:25:00] Speaker 1: They are interested to know if their resources are available and committed to the project. So, they committed financial resources. For them, (NNN), when I talked to them, the only important thinking have all their resources been committed or not. Actually, we have a project where the resources were not committed. We move on. We have a good example like the visitor center. Ant they, there were no, there were no resources from the **[unintelligible 00:25:23].** The (NNN) was complaining, "Why did you then ask for a project when the resources was not committed by the area?"

[00:25:30] Speaker 4: So, can the (NNN) do something about the resources part?

[00:25:32] Speaker 1: Probably not.

[00:25:34] Speaker 4: Can they enforce like the head of divisions to provide resources, to commit more resources?

[00:25:41] Speaker 1: I've seen Windows, you remember Office, out of support. Windows, uh, XP, out of support and they were complaining, you need to **[unintelligible 00:25:51],** but they were not responsive.

[00:25:52] Speaker 4: Ah-ha but they're not actually doing something to provide you the resources?

[00:25:54] Speaker 1: No. No. They even remind you that you need to do but they don't influence- [crosstalk]

[00:25:59] Speaker 2: In theory, they've approved the resources but when they are not given then--

[00:26:01] Speaker 4: Mm-hmm.

[00:26:03] Speaker 1: The local, I mean the local manager has a high power to influence their resources where they are working. A very high power.

[00:26:12] Speaker 4: Okay.

ANNEX 15 EXAMPLE OF FIELD NOTES – TEAM W3

START 14:04 – END 14:30

a) use post-its for stakeholders
b) list on A4 paper
c) move at some point to complement list on A4 to post-it
d) play between talk – write – pin – adjust
e) speed up process because they want more time for arranging and spotting, colleagues physically contributing to changing the post-it from one place to another
f) focus, effective and efficient
g) action oriented
h) building consensus with the body
i) look at each other when diverging or building opinion
j) looking at template when implementing
k) the role of seeing the other participants is key
l) a lot of pointing with arms and fingers and use of body language to accompany their views
m) join forces towards end of period to do a quality review of the info pinned on the templates
n) having documented conversation allow to iterate efficiently and revisit agreements
o) notion of passive facilitation by finger pointing = seems to save words and speed up revision of agreement
p) 14:20 = looking at template – looking at each other
q) reviewing the post-it allows for refining + completion
r) bring the conversation much further
s) from info to knowledge grows as time passes. Other teams = info mapping, this team+ round of knowledge + more and more sophisticated pieces of knowledge
t) knowledge here is defined as political awareness = stakeholder management = operational arm of political sensitivity
u) sit again and take distance = did that several times
v) 3 active persons were pinning = one all way through, second 2/3, 3rd one (lady) at a specific point
w) cross-checking = if this here, then this cannot work = visualization allows the group to check consistency of their output
x) real discussion going on = 14:27 = role of PSC = impact on planning or financials: allow for real discussion and opposing views. PSC = discussion on role to define stake

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