

INVESTIGATING THE SOUND DESIGN PROCESS

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ABSTRACT

This paper evaluates a novel method to elicit information about sound creative processes. This method forms part of a broader project, researching the transferring of knowledge borne from creative traditions and practices found in sound design for media production, to sonic interaction design (SID). We present the results of a pilot with two professional sound designers, one from a background in sound design for game production, and another with a background in sonic art and game development. We briefly describe the overall study procedure before focusing on a specific aspect of it, i.e., the novel method we have devised consisting of three design briefs to be tackled by sound designers. A thematic analysis of both sound designers is undertaken, where we identify eight main themes and three sub-themes. We then compare and contrast how each designer tackles the briefs to achieve their desired outcome. Finally, we evaluate the effectiveness of the method employed.

1. INTRODUCTION

The creation of new digital objects is a process driven, among other things, by increasing connectivity, and the desire for convenience and efficiency. Often there are no inherent sounds associated with digital objects and multimedia product designers are often given the challenge of developing these, including bestowing some meaningful audio feedback. This task is non-trivial and much can be learned from sound practices that have been established in media production. Research into the design and production of everyday sounds is in its infancy, with the creative contribution that sound designers bring to multimedia productions starting to be investigated, (e.g. [1–3]). Results from these studies highlight that sound designers have an extensive range of training, experience and garnered knowledge. This work contributes to this area of research by extracting information about the creative practices of professional sound designers, evaluating a method to elicit this information, and by identifying different approaches that can be pursued to identical design tasks.

This research helps connecting sonic interaction design with existing practices in sound design. Following an approach inspired by Dourish and Button’s concept of *tech-*

nomethodology [4], where ethnomethodology investigations form the basis of the design of new technology, the result of this work ultimately aims to inform the development of new techniques and tools for implementing sounds for new digital objects.

2. BACKGROUND

Research presented in [5] defines sound design as a means to convey information relating to *function* and *form*. For example, a knock on a door tells us that someone wants to come in (*function*), while the quality of the sound, i.e., whether the door is made of wood or glass, or the knock is sad or happy [6], gives us indications about the *form*. *Sonic Interaction Design* (SID) is defined in [7] as a “... *practice and inquiry into the roles that sound may play between users and artifacts, services, or environments, in applications that range from the critical functionality of an alarm, to the artistic significance of a musical creation.*”. These principles were applied in [8] to design emotional sounds for robots, and in [9] to examine the use of sounds in quiet vehicles as feedback for individuals internal and external to the vehicle, and for brand identity.

Research on how design practitioners, in sound or other areas, think and use their creativity [10] is relatively recent [4, 11–14]. An emphasis on the dynamic nature of creative design processes was highlighted by Schön and Dourish [4, 11]. Because these creative design process happen “in action”, it is necessary that their study is also undertaken “in action”. Empirical design research can be carried out “in the studio” or “in the laboratory”. The benefits of “in the studio”, using ethnographic techniques, is that practitioners can be observed in their normal, familiar workplace. This has the drawback that results are context-dependent and it is difficult to generalise results. The benefits of “in the laboratory” studies are that comparisons and generalisations are potentially possible. The drawback is that the tasks might be less typical in order to control variables. Studies that are intermediate between these two approaches attempt to maximise the benefits, but are challenging. Each technique has been shown to be able to reveal new knowledge about practitioners’ processes [15].

Previous studies into the practices of film audio post-production professionals have used ethnographic techniques [2]. Ethnographic techniques include observations of practice and semi-structured interviews [16] as a means to extract important factors such as methods, cultures, influences, techniques, daily practices, etc., of those being studied. The think-aloud protocol has been shown to be effective in revealing knowledge from a subject

carrying out a task [17–19]. When think-aloud methods are used, participants are encouraged to speak their thoughts while carrying out a task, with minimal interruption from researchers. Being able to record the participants’ thought processes as they progress through a task has the benefit that less data is forgotten or edited by afterthoughts. It has been shown that by using think-aloud techniques combined with a post-task interview provides a good overall understanding of the participants’ thought processes [20]. In [21], the sound design cognitive process of post-graduate students was studied, including where the bottlenecks occur. In [22], a pedagogical approach was examined to increase the ability of interaction design students in this field, which highlighted the importance of obtaining sound design skills. In our research, instead of focusing on students and non-professionals, we focus on professional sound designers who are directly working over a range of different media. Studying professional sound designers, i.e., attempting to capture their *reflection-in-action* [11], may provide richer information with respect to creative approach and originality.

3. OVERALL STUDY PROCEDURE: A SHORT DESCRIPTION

We have developed a procedure for an intermediary study combining the “in the studio” and “in the laboratory” elements [15]. It is based on ethnographic techniques, (capturing the sound designers’ actions through audio and video, written observations, informal and semi-structured interviews, conversations and general notes) as well as think-aloud methods [17–19]. The procedure includes a number of carefully crafted sound design briefs to be common to all participants enabling comparison of different approaches.

The complete intermediary procedure spans up to 4 days, including the following stages:

- Day 1: Initial contact and establishment of rapport (prior to Day 2)
- Day 2: Observing moment-by-moment ([4]) practice (Duration: 4-8 hours)
- **Day 3: Observing how sound designers approach given briefs** (Duration: about 3-4 hours)
 - **Brief 1: Abstract brief**
 - **Brief 2: Listener in focus**
 - **Brief 3: Case Study - The sound of air pollution**
- Day 4: Final observations and follow-up conversation

Initially (Day 1), we recruit participants and build rapport learning about their role, and describing our research and common interests. The second stage (Day 2), involves observing the sound designer in their studio, discovering their *moment-by-moment* [4] responses and reactions to their daily tasks while situated within their normal working environment. This also helps putting the sound designers at ease when communicating verbally aspects of their work, something particularly important in Day 3.

The focus of this paper is on the activities of Day 3, which is designed to facilitate *reflection-in-action* [11] through a series of sound design briefs, developed to uniquely challenge the sound designer. The benefit of a common set of briefs being used for different sound designers is that it provides an explicit way to identify unique approaches which lead to novel solutions as well as highlights common practices. Once the briefs have concluded, researchers are able to seek clarification, if required, from the participant, without breaking their thinking flow (an identified think-aloud technique [23]). Participants are also able to offer feedback to the researchers at this stage. The final stage (Day 4) consists of a semi-structured interview to obtain precise background information about the participant, the sound design preferences and how they perceive their role within media production workflow.

4. DESIGN BRIEFS

The *Design Thinking* framework [13, 24], which includes five stages (empathise, define, ideate, prototype and test) of “thought expansion” and “contraction” partially influenced the way the briefs were constructed. On Day 3, the briefs are revealed to participants, one after the other. This is to be able to capture initial thoughts as they develop from the initial reading of the brief. A list of *what-if* questions are available to be used at the researchers’ discretion to stimulate further design. The initial brief, *Abstract Brief*, has two aims. The first is to present sound designers with an open task that challenges habits and conventions that may have developed in their work. The participants’ typical practice in their studio is observed in Day 2, in contrast, during Day 3, we aim to give them something slightly unusual so that their thought process might become more explicit and reflective. Secondly, the *Abstract Brief* is an opportunity for participants to experience speaking out loud their thoughts in the presence of the researchers. The follow up *what-if* questions can be asked by the researchers once participants have explored their thoughts on potential sound designs, in order to challenge their perspective on the brief and facilitate brainstorming [24].

The participant is presented with four coloured shapes, a green triangle, blue circle, red square and orange hexagon and asked to choose one. They are then informed that this is the character they need to create sound for. The character is described as walking happily down the road. On completion of this, participants are informed that the character has arrived at the end of the road and that they are waiting for their friends, who are nowhere to be seen so the character is now sad. Researchers are interested in observing whether shape characteristics and narrative elements are used by the sound designer to make decisions about the sound. Additionally, researchers are interested to observe to what extent the designer focuses on the character or the overall scene.

The second brief, *Listener in focus*, is designed to encourage the designer to explicitly consider the listener of the sounds being created. In Design Thinking terms, this brief should facilitate researchers to investigate to what extent the sound designers “empathise” with their “end

users”. This is facilitated by asking the designers to consider first on one specific group of listeners, and then, once they have exhausted their ideas on the initial task, on a very different group of listeners, who may (or may not) be judged to have contrasting values from the first group.

Participants are asked to consider how they would create the sound of a thinking, active, talking brain that will be listened to by a group of engineers in order for them to understand it. On completion of this, designers are informed that the brain is now to be listened to by a group of people who are vegans. Obviously, engineers and people who are vegans are neither mutually exclusive groups or have any reason to prefer different sounds. And indeed, sound designers can decide that their sound is appropriate for both groups for exactly these reasons. However, sound designers could also decide to adapt their design for an audience depending on what characteristic of that audience has been highlighted to them and, if they do, we are interested to see on what basis they make their changes.

Brief three, *Case study - The sound of air pollution*, is based on a specific, concrete scenario, where a coat has an embedded air pollution sensor. This brief purposely presents media production sound designers with what could be defined as a sonic interaction design task. In this brief, the air pollution sensor produces a sonic output which informs the wearer about the quality of air at their location. A route map of a journey in a city is given, with four specific points where the air quality goes from very poor to excellent. Participants are invited to sketch the sounds at the four points. On completion, *what-if* questions may be asked. On this occasion, researchers aim to observe how participants tackle a brief that is presented more concretely (e.g., with a real air pollution map), and how they think about changes on their design when presented with an unexpected variation.

The main purpose of this pilot study was to evaluate whether the design briefs stimulated creative thinking, i.e., new and valuable ideas [10], and elicited rich information about the initial stages of the sound design process. It did not aim to analyse in detail the sound design sketches produced, or to compare different sound designers’ solutions. By examining and contrasting two professional sound designers we aimed to evaluate our method for elicit information about the initial stages of the sound design process and to what differences and similarities in creative approach the method is able to highlight.

5. RESULTS

Two participants were recruited to evaluate the briefs, one with a background in sound design for game production (participant A) and the other with a background in sonic arts as well as games (participant B). Participant A was the first to complete the briefs and give feedback to the researchers, followed by participant B. Video and audio recordings were captured along with observations and general notes. A thematic analysis of the think-aloud process (using NVivo¹) was carried out by both researchers

¹ www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

to ensure robustness [25]. A total of 8 themes and 3 sub-themes, focusing of the articulations of the creative process (for example, whether the designer sketched sounds, or used personal experiences in design ideas) were identified. We initially utilised a “bottom-up” approach, i.e., themes are derived from the data itself rather than a “top-down” approach where themes are defined a-priori by the researchers [25]. We then compared our themes with those, for general design processes, devised by [26] adapted from [27] and validated in [15]. Our final themes (see Table 1) adopt some themes from [26] as well as add some themes that emerged from this specific pilot.

5.1 Brief 1 - Abstract

Both participants started this first brief by seeking clarification, obtaining an understanding of the scope of their control over the design process. Both participants described a scene before focusing on the sound of the character, but participant A described this in much more detail. Once the participants established their initial ideas both started reflecting on their choices. Reflection became a regular feature as they completed the task. Subsequently, the thought processes of participants structured in slightly different ways. Participant A alternated between the themes of association and scene ideation, whereas participant B alternated between ideation and vocal sketching their ideas.

Participant A discussed their personal background and drew on a lot of associations throughout the task, but the theme of personal background only appeared towards the end of the process for participant B and they only occasionally drew on associations. Participant B considered the listener at the beginning of the task and again around the middle whilst this was not considered by participant A at all during this brief. Participant B started vocal sketches of potential sounds from the beginning, which was not the case for participant A who developed much more of a scene and story around his character. Participant B contemplated the context of how the shape will be perceived more, linking the sounds to animations and movements.

5.2 Brief 2 - Listener in Focus

Table 2 details the themes identified when the target listener group was changed for both participants. It can be seen that there is some similarity at the start, with themes of ideation, reflection and listener consideration appearing. There are less similarities in the sound designers’ processes by the middle of their design. Participant B produces their first sketch, whereas participant A continues to express listener consideration. Only at the end of this process participant A begins sketching sounds for their design. Both participants make decisions about their designs at the end of their processes, with participant B considering the listener again at the end.

5.3 Brief 3 - Case Study

The contrasting styles of the sound designers becomes more evident in brief 3 (Table 3). Here, Participant A seeks clarification at the very beginning of their process

Theme	Sub-theme	Description
Clarification		Where the participant is seeking clarification about the brief
Constraining [26]		Where the participant considers practical issues surrounding the sound design, e.g. if the sound should be heard through headphones or speakers
Listener Consideration		Where the participant acknowledges and / or considers the listener
Personal Background		Where the participant identifies something specific from their own personal background and experience to use in their design
Association		Where the participant associates the sound they are thinking about to something else, for example a concept
Solving [26]	Scene Ideation	Where the participant describes an audiovisual scene within which the object they have been asked to describe could be situated
	Ideation	Where the participant is generating ideas about how to tackle the specific sound at the centre of the brief
	Sketching	Where the participant very roughly creates a sound (for example in Pro Tools, with vocal sketching or with a sounding object) to explore and illustrate their ideas, as described in [28]
Decision making [26]		Where the participant defines a specific way they would approach the brief
Reflection [26]		Where the participant speak out loud the internal discussions they have with themselves about their ideas as described in [29]

Table 1. Themes

Start		Middle		End	
Participant A	Participant B	Participant A	Participant B	Participant A	Participant B
Clarification	Ideation	Ideation	Ideation	Sketching	Association
Reflection	Association	Reflection	Sketching	Reflection	Ideation
Ideation	Ideation	Decision Making	Reflection	Sketching	Decision Making
Listener Consideration	Reflection	Listener Consideration	Association	Ideation	Reflection
Ideation	Listener Consideration	Ideation	Reflection	Decision Making	Listener Consideration

Table 2. Themes developed at the start, during the mid-section and at the end as each participant progressed through Brief 2 - once the listener group had changed.

before making a decision on how they would approach the brief, developing a scene, and drawing on their background. Participant B, in contrast, starts by reflecting on the process, an initial idea and then introduces constraints based on what they believed the listener would be interested to hear. The theme of listener consideration becomes present in the middle of participant A's design process. It is not until the end that participant A introduces sketching. They concluded with a period of ideation and reflection. This is in contrast with participant B who had a period of scene ideation and reflection towards the end of their design process.

5.4 Structure of brief's session

An analysis of the number of occurrences each person speaks during the briefs are shown in Tables 4 and 5. These tables highlight the differences between the two instances of the study in respect of the number of times researchers speak compared to the sound designer. We can see in Table 4 that participant A spoke for 73.59% of the time. Table 5 shows that participant B spoke for 88.80% of the

time. Comparing the number of times each person spoke we can see that the values for Table 5 are all less than half than those given in Table 4. From this we can say that participant A spoke frequently (128 occurrences) with each occurrence averaged 0.57% of their total progression towards completing the design briefs. Participant B spoke for less than half of the occurrences of participant A, but each occurrence averaged 1.68% of their total progression towards completing the design briefs.

The interjections from researchers throughout the briefs are indicated in Table 6. From this, it can be seen that researchers spoke for less than half the number of occurrence during the study of participant B compared to the study with participant A. Comments that can be construed as negative by the researchers (*Flow breaker, Leading participant, Re-enforcing participant, Unnecessary feedback*) can be seen to have greatly reduced from the study with participant A to that of participant B.

Start		Middle		End	
Participant A	Participant B	Participant A	Participant B	Participant A	Participant B
Clarification	Reflection	Reflection	Ideation	Sketching	Scene Ideation
Decision Making	Ideation	Listener Consideration	Reflection	Decision Making	Reflection
Scene Ideation	Constraining	Ideation	Sketching	Ideation	Scene Ideation
Personal Background	Listener Consideration	Association	Ideation	Reflection	Scene Ideation
Scene Ideation	Constraining	Reflection	Decision Making	Ideation	Ideation

Table 3. Themes developed at the start, during the mid-section and at the end as each participant progressed through Brief 3.

Speaker	Frequency of occurrence	% of comments	Ave % per comments
Participant A	128	73.59	0.57%
Researcher X	116	20.17	0.17 %
Researcher Y	64	6.24	0.10 %

Table 4. Breakdown of number of occurrences per speaker during the briefs - Participant A

Speaker	Frequency of occurrence	% of comments	Ave % per comments
Participant B	53	88.87	1.68%
Researcher X	57	7.98	0.14%
Researcher Y	24	3.15	0.13%

Table 5. Breakdown of number of occurrences per speaker during the briefs - Participant B

6. DISCUSSION

Results show that the series of briefs presented to the two participants have allowed us to derive a number of themes. The themes appear to be comprehensive in capturing participants design processes and were sufficient to segment results for both participants. The method and design of the briefs appear to be effective in eliciting rich design processes from both participants, allowing us to examine their design approaches and compare them. Examining the participants different approaches, we can see the participant B often considered the listener early in their design process and made more use of vocal sketching to express their thoughts. It is believed that this is most likely due to their previous experience working directly with clients to establish priorities. In contrast, participant A was more used to working as part of a design team, and generally had less direct contact with clients. Participant A's approach included a number of associations and personal background compared to participant B, but participant B included significantly more reflection throughout their design processes (26.67% compared to 5.18% for participant A). During reflection the designer has a conversation with

Description of author remarks	Participant	
	A	B
Flow breaker	1	0
Leading participant	11	2
Reinforcing participant	4	0
Unnecessary feedback	20	3
Vocal encouragements	27	12

Table 6. Number of occurrences of remarks made by researchers during briefs

themselves, debating the pros and cons of their designs, therefore do not require input from the researchers. This is possibly why participant B makes more uninterrupted progress through his designs (Table 5).

The first brief (Abstract), appears successful in giving both participants experience in the think-aloud method and giving them an understanding of the scope of their control. This appears to take participant A further from their comfort zone than participant B. Brief 2, (Listener in focus), enabled our participants to question how and if they would change the design based on a different description of the target audience. Both participants made changes. The final brief (a case study) magnified their different approaches and goals, with participant A developing specific sounds, while participant B focused more on imagining a system for the creation of sounds. However, in the end, both participants focused on designing a personalised sound experience.

7. CONCLUSIONS

Overall, the method was successful in facilitating an investigation of the sound design process in two participants with different backgrounds and experience. The method enabled researchers to identify a number of themes and segment the session, enabling an examination of commonalities and divergences in approaches. The backgrounds and personalities of participants, as well as how the sessions were conducted, have been discussed in this paper allowing the researchers to identify areas of improvement for future implementations.

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