Defining acoustical heritage: A qualitative approach based on expert interviews

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ABSTRACT

The interdisciplinary study of acoustics/sound and heritage occurs in different countries and cultures, but there is no uniform consensus on the terminology and definitions of the field.

This study aims to explore the definition of acoustical heritage. The study used structured interviews with experts from different cultures and different disciplines and analyzed the interview data in detail through thematic analysis. The five themes are: different terminology, subjects in acoustical heritage, possible categories of acoustical heritage, value of acoustical heritage, and challenges of acoustical heritage preservation. Based on individual definitions of acoustical heritage proposed by experts and through detailed analysis and discussion, this paper proposes a multidimensional definition of acoustical heritage.

1. Introduction

Since the 1970s, with the spread of environmental awareness, an increasing number of academic disciplines have adopted 'sound' as a subject of study [18], including the field of heritage. In various countries and linguistic environments, research is being conducted concurrently, but the content of the research ranges from an emphasis on architecture to an emphasis on traditional tribes, from a search for the past to research for the present. This paper delves into the intricate field of acoustical heritage, seeking to define it through the perspectives of experts in the field and unravel the multifaceted layers of acoustical heritage.

In recent decades, the significance of acoustical heritage as an essential component of cultural identity and memory has become increasingly recognized. For example, the unique fusion of sonic elements with tangible heritage structures has lent a distinct character to historic spaces. However, so far, sound and acoustics have usually been considered only as an element of heritage that contributes to its value, rather than being considered as a separate heritage category to be preserved, and this neglect poses a threat to the conservation of these auditory treasures. It is therefore important and even urgent to understand, define and protect acoustical heritage.

This paper sets out to achieve a set of interlinked objectives that converge to enrich the understanding of acoustical heritage:

(1) Definition through expert perspectives: By engaging in in-depth interviews with a diverse cohort of experts from the realms of architecture, archaeology, acoustics, and conservation, this study aims to capture a comprehensive spectrum of viewpoints. These expert insights will lay the foundation for a nuanced and holistic definition of acoustical heritage, reflecting its multi-dimensional nature.

(2) Definition through thematic analysis: The utilization of thematic analysis as the analytical approach will facilitate the systematic identification and interpretation of recurring themes within the collected interview data. This method offers a structured means of exploring the varied dimensions of acoustical heritage as perceived by the experts, contributing to a rich and textured depiction of the concept.

2. Literature review

When investigating the cross-disciplinarity of acoustics (including acoustic properties, music, and sound) and archaeology (including archaeological practices, heritage, and traditions), terminology is a crucial and complicated issue to consider [28]. While both the terms

'acoustic' and 'acoustical' can be used to describe phenomena related to sound, according to Hunt [11], the term 'acoustic' is more suitable for describing specific technical implications and/or features, such as *energy* and *signal*, whereas 'acoustical' can be applied to characterize terms that are more generic in nature, such as *method, engineer* and *problem.* Since *heritage* refers to tangible heritage, intangible cultural heritage, and natural heritage [29], 'acoustical' would be more appropriate to qualify the term. Therefore, from now on, we are mostly going to refer to 'acoustical', and throughout this paper, unless otherwise specified in section 3.1, the term 'acoustical heritage' refers not only to the physical acoustic characteristics of the heritage, but also, in a general sense, to the music, buildings, sites, artifacts, folklore, etc. associated with it.

2.1. Terminology of acoustical heritage research

According to Till [28], the terms 'music archaeology', 'archaeoacoustics' and 'sound archaeology' are different and 'sound archaeology' is chosen to represent his research for clear reasons. However, in most studies, the reasons for choosing particular terms to represent their research fields were not given. In addition, multiple different terms are used as synonyms in the same paper, such as 'acoustic heritage', 'sound heritage' and 'soundscape heritage' in the European Acoustic Heritage project [18]. This is because there is no common terminology, standard, or a closer definition for their employment.

Since acoustical heritage research has developed in different languages and cultures, it's worth noting that multiple English terms may correspond to only one word in a non-English language. For example, there are a number of equivalents (including music archaeology, archaeomusicology and palaeo-organology) in English to the Swedish term *musikarkeologi* [19]. Therefore, the above phenomenon is not only caused intentionally by the researcher, but may also be due to the personal choice of terminology based on the cultural context of non-native English speakers when writing in English. Since the latter hypothesis cannot be confirmed on a case-by-case basis, this study ignores this possibility and only discusses terminology in the English context. The following terms and expressions are briefly explained below as they have been identified by the literature review as the most used: music archaeology, archaeoacoustics, acoustic heritage and acoustical heritage. An overview of different interpretations of those terms is illustrated in Table 1.

2.1.1. Music archaeology

In the 1970s, the term 'music archaeology' first appeared to describe a new field in which researchers concentrated on ancient musical instruments found in the Nordic countries [19]. As the research progressed, the field of study expanded geographically, and the relationship between ancient music (including dance and ritual) and ancient societies was added to the scope of study [19,28]. In the 21st century, also motivated by an interest in the relationship between music and society, the term 'music heritage', referring to places, buildings, or practices associated with popular music, has appeared in studies discussing rock culture, place production, and social identity [7,25].

2.1.2. Archaeoacoustics

With the development of acoustic equipment, acoustic research is no longer restricted to a laboratory, but can be conducted at archaeological sites and outdoor environments [28]. This resulted in the emergence of archaeoacoustics, which is a multidisciplinary field focused on the sound of archaeological places, rather than to just music [6,15,32]. The field also includes the acoustics of musical instruments and pieces in prehistoric contexts, despite the small number of researches [22]. Till [28] agreed with the above definition, however, he argued that the term 'archaeoacoustics' had restrictions since it imposes inherent limits, requirements, and assumptions, whereas the term 'sound archaeology' is more comprehensive, complete, and rigorous. He emphasized that 'sound archaeology' covers studies framed by 'music archeology' (focus

Table 1
Definition of different terms in the literature.

Definition of term or description of the research object	Terms	Reference
'Acoustic properties of mosque, both ancient and recent'	Acoustical heritage	[13]
'Acoustical environment inside historical theatres'	Acoustical heritage	[10]
'Interdisciplinary studies regarding music and other non-linguistic sounds in extinct societies; musicology based on archaeological finds irrespective of their date; the study of musical instruments and other sound tools in antiquity'	Music archaeology	[19]
'The science of sound which is designed to absorb and control a sound'	Acoustical heritage	[14]
'Any sounds that form a testimony of a sonic situation'	Acoustic heritage	[18]
'Past music and its associated memories/places/ monuments'	Music heritage	[7]
'A range of practices that are not reducible to 'the music itself' but linked to the wider social, cultural and economic processes surrounding the production and consumption of popular music histories and music heritage canons'	Music heritage	[25]
'Enhances the study of culture and context within music archaeology, moving the focus away from music and towards sound'	Archaeoacoustics	[28]
'Includes research framed by music archaeology and archaeoacoustics as well as research excluded by them'	Sound archaeology	[28]
'One aspect of archaeoacoustics; the quantifiable acoustic properties of buildings, sites and landscapes from our architectural and archaeological past'	Acoustic heritage	[21]
'The study of sound in archaeological contexts, and is inherently multi-disciplinary, covering diverse fields such as archaeology, ethnomusicology, music archaeology, acoustics, engineering, modelling and simulation'	Archaeoacoustics	[15]
'A multidisciplinary, interdisciplinary and cross-disciplinary field of research focused on the sound of historical places'	Archaeoacoustics	[32]
'An intangible part of building heritage, which unquestionably contributes to its cultural and historical value'	Acoustic heritage	[32]
'Sound recordings'	Acoustic heritage	[12]
'Encompasses a range of human auditory and soundsensing perspectives in cultural heritage contexts'		[16]
'Acoustical heritage as experienced by humans; the cross-temporality of acoustics relevant to human experience'	Aural heritage	[17]
'The study of archaeological sites through their sound and acoustic characteristics; the application of acoustics in archaeological spaces'	Archaeoacoustics	[22]

on music) and 'archaeoacoustics' (focus on acoustic properties) as well as objectives and methodologies excluded by both, such as soundscape and sound-based approach [28].

2.1.3. Acoustic heritage and acoustical heritage

In the European Acoustic Heritage project, researchers present several ways to define and describe acoustic heritage, concluding that 'acoustic heritage in Europe is any sounds that form a testimony of a sonic situation' [18]. They found it challenging to give a closed definition because, in their research, acoustic heritage is shaped within a very small geographical area and is constantly defined in the daily practices of human beings [18]. Others see acoustic heritage as referring exclusively to the quantifiable acoustic characteristics of built heritage, sites and landscapes, whether present or past, and thus part of the archaeoacoustics [21,32]. Whilst the latter definition is narrower in scope than the former, they both recognize that the acoustic heritage, as they define it, evolves over time and is closely related to the sounds heard by the

inhabitants at the time. In some papers, acoustic heritage refers specifically to historical objects, for example, in Kalibani's [12] research on the restitution of African artifacts inherited from German colonialism, the term refers only to sound recordings.

The term 'acoustical heritage' is also used in academic studies. Some researchers have used it to refer to physical acoustic properties in built heritage [13], as defined by the term 'acoustic heritage' mentioned above. However, in theatre-related research, the term incorporates additional elements, such as acoustical environment design of the historical theatres which includes the arrangement of bronze vessels around the auditoria [10,23,24]. Besides, acoustical heritage research addresses the anthropological basis of cultural heritage in terms of acoustics by delivering virtual perception and communicating the entirety of the physical spaces with sound [14], and Kolar et al. [17] define this field as 'aural heritage'.

From the above discussion, it is evident that this intersection of acoustics and heritage encompasses not only physical acoustics and acoustic methodologies, but also related sound, architecture, environment, human perception, and many other aspects. In conjunction with Hunt's [11] perspective, therefore, the term 'acoustical heritage' is more applicable to describe the subject of this research.

Terminology provides an indication of research priorities and choice of methodology [28]. Due to the lack of a clear definition, there is an intersection of their respective definitions or scopes of research. The same terms sometimes refer to different research areas, whereas the same types of research fields are defined under different terms. Although some of the items in Table 1 (summarizing in chronological order the definitions of the terms across different literatures) are based on our interpretation of the studies mentioned and do not represent a comprehensive definition of the terminology by the authors themselves, it is evident that the study of acoustical heritage, in general, is increasingly expanding to include social and cultural factors related to human activities beyond sound.

2.2. Intangible heritage or tangible heritage?

At the end of the 20th century, the view that acoustics itself was a cultural heritage began to develop [8,18]. The acknowledgement of acoustical heritage in the international framework is necessary, in order to reflect a sustainable quality of the broader cultural heritage [18] and serve as a prerequisite for its systematic preservation. Ever since UNESCO published the definition of intangible heritage, there has been a wide discussion on whether acoustical heritage is tangible or intangible. According to UNESCO [30], intangible cultural heritage is 'Practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage'.

In terms of this topic, Brezina [4] agreed that acoustical heritage was intangible heritage, while Kalibani [12] preferred the term 'immaterial heritage' because the definition of intangible heritage from UNESCO is community-based and limited. It has also been argued that acoustical heritage itself is not intangible heritage, but is part of the intangible heritage it belongs with [18,26,27], highlighting its physical acoustic characteristics. Additionally, there is the viewpoint that acoustical heritage is a concept between tangible and intangible heritage [7,21]. This perspective emphasizes the intangible aspect of acoustical heritage, and it further points out the fact that acoustical heritage cannot exist independently of tangible heritage. The primary reason for the difference between these perspectives is that each researcher begins with their own objectives, which ranges from practices linked to the social, cultural and economic processes surrounding the past music [25] to sound recordings in museums [12].

3. Methodology

Due to the research objectives and the limited previous exploration of the investigated subject, this study adopted a grounded theory approach, which is a useful qualitative methodology in interpretative research [9]. It enables researchers to maintain an open mindset towards all potentialities that arise from the data, while also allowing the thematic analysis of the interview data to drive the theory [9].

3.1. Expert interviews

In order to obtain a preliminary understanding of the subject, this study employed expert interviews method. As an exploratory tool, expert interviews prove invaluable as an approach for researchers to establish an initial direction in an area that lacks clear definition, while at the same time, allowing for more efficient collection of high-value data and shortening the data collection process, compared to quantitative surveys [3].

According to Meuser and Nagel [20], experts are not only people with professional knowledge, but these are also people who, as active participants in a problem, acquire special knowledge while performing their functions. The purpose of the expert interview is to uncover this unique domain of knowledge, which is closely related to the responsibilities attached to the position and function of the experts' field of study [20]. In this study, the experts were first selected via convenience sampling, based on desktop research of scientific publications in the field of acoustical heritage. In this process, the search was an internet-based inquiry that looked for authors who published articles between 2013 January and 2023 May, using Google Scholar as database. The search terms used were 'acoustical heritage', 'archaeoacoustic' and 'sound archeology' in the title or keywords. In the selection, both the timeliness of publications and the frequency with which the authors appeared in the search results were taken into account. Besides, the selection of the experts also considered their specificity of expertise – architects, acousticians, historians, etc.; and diversity of cultural backgrounds – Asian, European, North American and South American, thus offering a rich perspective on the interview results. In total, 9 experts from 7 countries were interviewed, and their countries, native languages, and disciplines of study are summarized in Table 2.

The expert interviews were conducted between June and August 2023 using online video tools. The duration of each interview averaged approximately 30 min. It is important to note that the majority of interviews were conducted in English, while some were conducted in Chinese or Spanish and subsequently translated into English. This study was approved as "low risk" via the BSEER Local Research Ethics Committee at University College London, and all participants provided

Table 2
Overview of experts.

Expert	Country	Native language	Main area of interest
1*	China	Chinese	Soundscape heritage in traditional settlements
2	Croatia	Croatian	Urban soundscape and spatial audio
3	Spain	Spanish	Acoustics of heritage buildings
4	USA	English	Sonic heritage (ancient and contemporary built environments)
5	Serbia	Serbian	Acoustic heritage, medieval sacred architecture, and sacred soundscapes
6	Spain	Spanish	Environmental and Architectural Acoustics, Urban soundscape
7*	Argentina	Spanish	Medieval history and sound studies
8	Indonesia	Indonesian	Urban soundscape and soundscape in heritage
9	USA	English	Relating acoustics with human perception in cultural context

*The interview was not conducted in English.

informed consent in accordance with the Declaration of Helsinki [31].

The interview questions were open-ended and were sent to interviewees before the interview. Every effort was made to retain the meaning of the original questions when translating to a different language. There were totally 11 questions, structured into five themes (Table 3). Firstly, to understand the interviewees' expert status, there are several questions focused on their background and expertise. The second section delves into the interviewees' opinion on the similarities and distinctions between 'acoustical heritage' and other related terms, while the third section looks in depth at specific features in acoustical heritage. The fourth part concentrates on the interviewees' practical involvement in acoustics-related conservation practices, which also explores possible difference in practice. Lastly, the fifth section requests interviewees to conclude with their personal definitions of acoustical heritage, providing forecast for the future development of acoustical heritage.

3.2. Data analysis

Thematic analysis within the framework of grounded theory provides a structured and systematic approach for analyzing qualitative interview data [5]. All the interviews were initially recorded and subsequently transcribed verbatim. Then, by using the qualitative analysis software Nvivo, the interview data were systematically coded in different steps – open coding, axial coding and selective coding [1].

Firstly, each interview was uploaded as a separate file, following with the open coding process when the interview data was tagged with a significant number of codes. The process is subjective [1], but also needs to avoid researcher bias as much as possible. Throughout the process, we engaged in reflective practice, continually questioning and reviewing our codes, ensuring that interpretations were grounded in the data rather than personal biases. Then, through axial coding, existing concepts were refined and classified at the same time, which formed several main themes. After that, researchers employed selective coding to examine and analyze the interrelationships among these categories. These three steps were iteratively cycled to ensure that the final result encompasses all possibilities [5]. As a result of systematically collecting and analyzing data, new theories and concepts were developed to provide an explanation of the subject.

The process of coding and theme formation was conducted manually through iteratively cycled steps, including open coding, axial coding, and selective coding. The Table 4 illustrates an example of this process in practice. As answers to the question 'Could you please give me some examples of acoustical heritage', several sentences were labelled from the interview data. After the process of categorising, two codes ('sound

Table 3
The structure of interview.

Themes	Questions
Background Information	When did you first become involved in acoustical heritage research?
	What motivated you to pursue this field of study?
Term Identification	What are the differences between these terms: 'Acoustical heritage', 'Archaeoacoustics' and 'Sound archaeology'?
	Are you aware of other possible terms?
Features of Acoustical Heritage	Could you please give me some examples of acoustical heritage?
	What are the important elements in these examples that qualify them as acoustical heritage?
	Would you be able to define different categories of acoustical heritage?
Preservation Practice	What specific data do you collect during your research on acoustical heritage?
	What are the challenges when preserving acoustical heritage?
Personal Definition	How would you define Acoustical Heritage?
	Do you think that this definition will be expanding or narrowing in the future? And why?

Table 4
Example of the coding process for Theme 2.

Example of Excerpt	Codes	Categorizing Codes	Further Categorizing Codes	Themes
'Some people are trying to recover the sound of the bells.'	Sound of bells	Sound	Sound and acoustics	Theme 2: Subjects in acoustical heritage
'The sound of a place. It is special for something, the sound not the place.'	Sound of a place			
'The acoustics created by the historical site itself.'	Acoustics from historical sites	Acoustics		
'They involve human transmission of information one way or another and creating an environment in which certain practices can take place.'	Acoustics involve information			
'We could talk about acoustic heritage only at those spaces where we can find some proof that acoustics mattered.'	Spaces where acoustics mattered			
'Silbo Gomero in the Canary Islands in Spain.'	language	Songs and language		
'Karawitan, Javanese music.'	songs			
'Acoustic vessels, they are definitely one kind of acoustic technique that was used in building.'	Acoustic vessels	Objects	Sources of sounds	
'Conserving the tapes with very old audio material.'	Old audio material			
'The song is performed by three age groups ...... according to the characteristics of their respective articulations, they produce a form of polyphonic performance in musicology.'	People perform traditional songs	People		
'We have a special celebration of Carnival in February....... people singing about the most pressing problems of	Special celebration	Events		

Table 4 (*continued*)

Example of Excerpt	Codes	Categorizing Codes	Further Categorizing Codes	Themes
today's life with humor and sarcasm.'				

of bells' and 'sound of a place') were sorted into one code 'sound'. Then, the next step was to divide these codes into categorisations based on their similarities and crosscut. For example, the relationship among 'Sound', 'Acoustics' and 'Songs and language' were similar, so they were allocated to one category labelled as 'Sound and acoustics'. After further examining the crosscut between emerged codes, themes can be determined. The analysis was independent of the interviewees' involvement. Additionally, in the discussion part, the analysis brings attention to the observed variation in interviewees' comprehension of acoustical heritage, which can be attributed to the differences in their native languages.

4. Results – thematic analysis from interviews

Through the process of analyzing the data as described above, five themes were identified, they are: different terminology, subjects in acoustical heritage, possible categories of acoustical heritage, value of acoustical heritage, and challenges of acoustical heritage preservation, with several sub-themes under each theme. In this section, the findings that pertain to each theme are explored in detail, while the discussion section delves into the links that exist between the themes.

4.1. Theme 1: different terminology

Although there are several different terms used in the field, the interview mainly asked about the differences among 3 terms: 'acoustical heritage', 'archaeoacoustics' and 'sound archaeology'. These findings are divided into 2 parts: (1) differences and similarities among terms, and (2) personal definitions of acoustical heritage.

4.1.1. Differences and similarities among terms

Firstly, on the one hand, some interviewees believed that the three terms (or two of them) had few distinctions and were similar.

'Acoustical heritage ...... and archaeoacoustics, I think, is essentially the same.' [Expert #4]
'I think they are different, but they could be used in the same container altogether because lines are very thin.' [Expert #5]

From the other hand, some interviewees considered them as very distinct terms and could not be interchangeable.

'To me, they're very different terms.' [Expert #2]
'I believe that these terms are not interchangeable. Any sense of that interchangeability indicates a lack of precision, or a lack of domain knowledge or familiarity of the specific uses of terms in specific fields and disciplines. ......All these domains are very interesting and important.' [Expert #9]

Secondly, when talking about differences, some experts gave an abstract explanation, arguing that the difference between the terms was in the approaches, sources of sound, or context.

'The main difference is how they approach sound, depending on the focus on the problem of sound is the difference.' [Expert #3]
'The difference that can be established between these terms is related to the type of sources in which one works and the type of evidence that is extracted.' [Expert #7]
'The difference between acoustical heritage, archaeoacoustics and sound archaeology is in the context.' [Expert #8]

Consequently, there is an entailment relationship among terms, with 'acoustical heritage' usually having the broadest scope in these opinions.

'Archaeoacoustics and sound archaeology ...... are very much embedded into archaeology. They are part of the whole heritage framework. They are only a small fraction of what the acoustical heritage could be.' [Expert #2]
'Acoustical heritage wider than archaeoacoustics because it involves human perception and conservation.' [Expert #8]

However, relatively speaking, some experts found it possible to give clear and nuanced definitions and distinctions.

'Acoustical heritage would be the acoustics of heritage sites, objects, and materials, whereas archaeoacoustics to me signifies using acoustical science within archaeological research. Sound archaeology could indicate a wider range of approaches to studying sonic matters in archaeology that wouldn't necessarily involve acoustics.' [Expert #9]
'Acoustical heritage has to do with the acoustics of a heritage site, whether that's architecture in nature or landscape in nature. So basically, the acoustics of the constructed environment from the past. Archaeoacoustics, I think, is essentially the same, except that it concentrates on sites that are accepted archaeological sites. Sound archaeology is different from archaeoacoustics in that people look at the architecture and the practices, but they also look at objects, so musical objects and sounding objects.' [Expert #4]

Comparing all the comments, there is a dispute among experts as to whether acoustical heritage necessarily includes acoustics and human perception.

'Acoustical heritage only looks at the acoustics and not necessarily the people perceiving it.' [Expert #4]

'Archaeoacoustics is a field of research ......uses the methodology of acoustics and when you talk about acoustical heritage, it doesn't necessarily need to involve acoustics. I mean it could be also only like ethnographical research.' [Expert #5]

In the interviews, respondents also mentioned a number of other terms, such as

'Auditory heritage', 'Sonic Heritage', 'Historical soundscapes', 'Etnoacoustics', and *'Archaeology of sound'*, which are either similarly phrased terms or terms having differences mentioned above.

Thirdly, although the sample was limited, it was found that native speakers of the same language tend to give similar insights into terms. Besides, native English speakers gave more nuanced insights on terminology, while others were relatively more inclined to give generalized views. One possible reason is that these distinct English terms do not have significant translation variations in other languages such as Spanish and Chinese. In these languages, acoustical heritage is typically described with a single term or phrase.

'In Spanish, we use a lot patrimonio sonoro. And here we tend to use that in the broad sense of the work. It is related with soundscape, historical places where acoustic is important or anything.' [Expert #3]

4.1.2. Personal definitions of acoustical heritage

At the end of the interviews, each interviewee offered a personal definition, based on personal research and understandings. These definitions and expressions are not identical, but their emphasis have traits in common, as reported in Table 5.

4.2. Theme 2: Subjects in acoustical heritage

In the interviews, interviewees were asked to suggest examples of acoustical heritage, and it was found that they referred to very different cases, which encompassed a wide variety of subjects. The subject here refers to the items that can be considered acoustical heritage, answering the question 'What is acoustical heritage specifically?' The main

Table 5
Key concepts used by the experts in their definitions of acoustical heritage.

Emphasis	Similar key words in definitions
Emphasis on environment	'acoustic environment', 'sound environment', 'environment', 'particular place', 'sites'
Emphasis on acoustics/ sounds	'acoustics', 'sounds', 'auditory component', 'human voice'
Emphasis on activities	'activities', 'cultural activity', 'practiced'
Emphasis on sound experience of people	'ways of listening', 'how people experience sound', 'intervening cultural group', 'culturally contextualized auditory perspective'
Emphasis on reconstruction	'reconstruct', 'recreate', 'reproduce'

categories can be summarized as follows: (1) sound and acoustics; (2) sources of sounds; and (3) places where heritage exists. In addition, the cases include subjects that cannot be termed acoustical heritage *per se*, but are still included in the study; they are categorized as (4) sound-related context.

4.2.1. Sound and acoustics

Firstly, sound or acoustics itself is a very important subject of conservation. In acoustical heritage, it is not an element that is dependent on the heritage, but an important part that determines whether the heritage exists or not. On the one hand, it can be a kind of sound that exists now and can be heard directly.

'Some people are trying to recover the sound of the bells' [Expert #6]
'The sound of a place. It is special for something, the sound, not the place.' [Expert #6]
'Sounds play an essential role, so you cannot describe that place or that event without talking about sound or acoustics or things like that.' [Expert #3]

Sound also includes songs, or special forms of language.

'Silbo Gomero in the Canary Islands in Spain.' [Expert #6]
'Karawitan, Javanese music.' [Expert #8]

On the other hand, from a physical point of view, it can be acoustics or acoustic traits, such as purposeful acoustic design in the buildings, which makes the sound different in a given environment.

'We could talk about acoustic heritage only at those spaces where we can find some proof that acoustics mattered.' [Expert #5]
'The acoustics created by the historical site itself.' [Expert #3]
'They involve human transmission of information one way or another and creating an environment in which certain practices can take place.' [Expert #4]

In practical research, the two are sometimes discussed simultaneously. Sound needs to be quantified by acoustic parameters, and acoustic characteristics are more intuitive through audio recordings.

'The main data I work with are impulse responses because I mainly focus on research linked to heritage, places and sites. ...... I'm also trying to gather some sound recordings about there, the ambient sounds we have on site.' [Expert #3]
'I am often collecting a combination of soundscape recordings. And I am trying to also capture the acoustics, ...and oftentimes that's an impulse response that I then use to analyze (space) physically and acoustically.' [Expert #4]

4.2.2. Sources of sounds

For sound, it requires a medium for its production, which is also important. The subjects can be divided into objects, people, and events. Objects include those that can produce sound and those that have acoustic characteristics. A special example is the historical recordings, which is a historical document itself, enabling reproduction of a previous sound.

'Musical instruments. Bells.' [Expert #6]
'Acoustic vessels, they are definitely one kind of acoustic technique that was used in building.' [Expert #5]
'Conserving the tapes with very old audio material.' [Expert #2]
'Those artefacts sound producing instruments such as the 3000-year-old conch shell horns, or Pututus, from Chavín de Huántar we study, we document the acoustics of the instrument and understand how it works.' [Expert #9]

For acoustical heritage such as song and language, humans are the main source, which makes it an important topic of conservation.

'The song is performed by three age groups ...... according to the characteristics of their respective articulations, they produce a form of polyphonic performance in musicology.' [Expert #1]

In addition, sounds can also originate from special events, such as festivals, celebrations and ceremonies.

'We have a special celebration of Carnival in February....... people singing about the most pressing problems of today's life with humor and sarcasm.' [Expert #3]

4.2.3. Places where heritage exists

There is also acoustical heritage that has a strong connection to a given location. It is the particular site that gives rise to this type of heritage. Places can be divided into two types: buildings and outdoor environments. Buildings refer to architecture built for acoustic purposes and used for sound-related activities. Churches and theatres are the most frequently mentioned because they were designed to be used for lectures and music and are rich in acoustic design. It Is worth noting that 'buildings' here does not mean closed indoor environments, but also open-air buildings.

'The Drum Tower is famous for the large drums placed on top of it, so it is a sound-producing body in the whole Dong community.' [Expert #1]
'...... with Cathedral, you have, first, the building, which creates special acoustics which is part of the character of this building. ...... in these spaces, you have special musical spaces and special speeches that are part of the acoustical heritage as well.'[Expert #3]
'The theatre at Epidaurus.' [Expert #4]

Outdoor environments include archaeological sites, and cities, which can also be referred to acoustical heritage.

'If you take for example for city of Venice ...... There're no cars in Venice. The sound sources that were present 400 years ago are very much the same as today.' [Expert #2]
'Andean archaeological sites, the UNESCO World Heritage Site of Chavín de Huántar, Perú; Inca archaeological sites, for example, I worked in Huánuco Pampa, which is also in the north central mountains of Peru.' [Expert #9]

4.2.4. Sound-related context

Sound-related context includes performances like dance and literature of sound. Literature of sound can be both oral and written. If the sound itself, such as in a song, conveys information, then the lyrics are a significant element as well because they provide information of the heritage.

'There's also the dance, because when you dance you need an accompaniment.' [Expert #1]
'This heritage may also be about oral literature, as some of our literary works are, and it may be expressed in this manner. Lyrics is in the transmission of history or memory.' [Expert #1]
'Written historical sources.' [Expert #7]
'There are examples in classical archaeology where we have documents about architectural acoustics being discussed by philosophers, and so that's a domain of acoustical heritage as well.' [Expert #9]

In practical research, lyrics and historical literature are important references, because they reflect the cultural value of the heritage and the previous perception of sound.

'It's also important to collect information about any historical reference to how sound was looked in the past in historical documents.' [Expert #3]
'I would work on the historical texts that were mentioning sound in some way, regarding that particular church.' [Expert #5]

As a case can contain multiple different subjects, Table 6 details which subjects were included in the examples provided by the interviewees. The categorization is based on personal description of examples.

4.3. Theme 3: possible categories of acoustical heritage

The categorization of acoustical heritage depends on its definition, and therefore some people find it difficult to give a classification at the moment.

'It really depends on how you define acoustical heritage.' [Expert #4]
'...... identify different elements to be analyzed in relation to acoustical heritage rather than categories.' [Expert #7]

Based on individual research needs, experts suggested a number of possible categories applicable to the content of their research, which can be divided into (1) based on location, (2) based on sound, and (3) tangible or intangible.

4.3.1. Based on location
Many mentioned the possibility of categorizing acoustical heritage by the places in which it is located or the state in which the sound occurs. The categories are as follows.

a. Daily life practices, events, or historical places.

'Focus on the nature of the event, is this a particular sound event? ...... or conversely is it a heritage place or historical place with an elevated acoustic feature like cathedrals.' [Expert #3]
'The participation in daily life or extraordinary events.' [Expert #7]

b. Indoor spaces or outdoor spaces.

'You can talk about indoor spaces and indoor acoustics. ...... then you can talk about outdoor spaces like those sites, or shelters.' [Expert #5]
'Where the sounds were produced, in opened or closed spaces.' [Expert #7]

c. Objects, buildings, landscape, combination of natural and artificial environment.

'The spatial environment in which the heritage is located, including the buildings and the natural and artificial environment in which the heritage is located, such as villages.' [Expert #1]
'The type of heritage it is, whether it's building, landscape, combination, object.' [Expert #4]

4.3.2. Based on sound
It is also possible to categorize acoustical heritage according to their source and type of sound. The two specific types are as follows.

a. Natural sound, human sound, or technological sound.

'The types of sounds. If those sounds are natural, human, technological.' [Expert #7]
'The sound made by people and the sound made by nature.' [Expert #1]

b. Real(present) sound or simulated(past) sound.

'When you are dealing with acoustical heritage, using real impulse responses, real recordings, real testimonies, or you are simulating these things. This is one category, so it is sound event real or simulated?' [Expert #3]
'The purpose of the research of acoustical heritage. For example, is it plan to explore past cultural events, it is acoustical heritage which is part of the past. Or we are analyzing something that is happening at this moment to kind of achieve these for the future.' [Expert #3]
'...... real or imaginary spaces.' [Expert #7]

4.3.3. Tangible or intangible
Due to the specificity of acoustical heritage, many people mention the issue of tangible and intangible. Some experts find it possible to define the heritage as 'intangible' or categorize the heritage into 'tangible' and 'intangible'.

'Two categories, tangible and intangible. Tangible: places and sites which include urban soundscape, and intangible: practices, behaviors, lifestyles.' [Expert #6]
'The heritage is intangible.' [Expert #8]

However, it has also been argued that acoustical heritage is a kind of heritage that lies between the tangible and the intangible.

'There is a question of whether we are talking about tangible or intangible heritage and acoustical heritage can be associated to both.' [Expert #2]

Table 6
Subjects in acoustical heritage.

Examples	Sound and acoustics		Sources of sound			Places		Sound-related context	
	Sound	Acoustic	Object	People	Event	Building	Outdoor environment	Performance	Literature
Dong Song	✓			✓		✓		✓	✓
Cathedrals/ Churches		✓				✓			✓
Church bells	✓		✓						✓
Acoustic vessels		✓	✓			✓			
Epidaurus theatre		✓				✓			
City of Venice	✓						✓		✓
Silbo Gomero	✓			✓			✓		
Musical instruments	✓		✓						
Historical audio tapes	✓		✓						
Carnival	✓				✓			✓	✓
Alhambra	✓			✓		✓			
Karawitan	✓		✓	✓				✓	✓
Chavín de Huántar		✓	✓			✓	✓		

'That's line between tangible and intangible heritage of architecture.' [Expert #5]

It was also mentioned that the relationship between intangible heritage and acoustical heritage is very complex, as intangible heritage is not understood in the same way by people in different fields, and therefore the relationship between them requires further research and cannot be easily defined at present.

'What does the Venn diagram of intangible heritage and acoustics, ... it really depends on what field you're coming from.' [Expert #4]
'The intersection between acoustical heritage and intangible cultural heritage will continue to be defined.' [Expert #9]

Table 7 illustrates the correspondence between the examples and categories mentioned earlier except the last category because there are a lot of controversies. The symbol 'X' indicates that the heritage cannot be categorized according to that criterion, which includes two possibilities. One possibility is that the heritage contains multiple varieties simultaneously, for example, under the first categorization criterion, 'Dong Song' contains both daily life practices and historical places. Another possibility is that the heritage cannot be categorized into any of these types, such as 'Church bells', which are not necessarily connected with daily life practices, events or historical places. It seems fair to assume that there is no single categorization that adequately addresses each and every one of the cases.

4.4. Theme 4: values in acoustical heritage

As mentioned in several personal definition of acoustical heritage, the heritage possesses unique qualities that should be protected for future generations. The value of the acoustical heritage is demonstrated in many aspects, including (1) value of sound and acoustics, (2) social value, and (3) cultural value.

4.4.1. Value of sound and acoustics

Firstly, as discussed in 4.1.1, sound and acoustics themselves are important and valuable to the 'acoustical heritage' concept.

'Without sound, we can't form the concept of acoustic heritage.' [Expert #1]
'Like all the physical acoustic aspects of that remained more or less as they were. It's not only talk about not being changed. It is also about very high value.' [Expert #2]

As sound and acoustics are part of our lives, their value is reflected in

their relevance to human life.

'They contribute to citizens' quality of life because they contribute to citizens' wellness, and people feel better in a way.' [Expert #6]
'Sound is important in particular ways for human health, for our ability to communicate with each other, even though we use electronic technologies so much, they're still in accordance with acoustics.' [Expert #9]

It is not easy for sound and acoustics to remain unchanged because they are particularly vulnerable to changes throughout the course of time and surroundings, and conversely, unchanged sounds reflect unchanged environments, which is explained in 4.5.3.

4.4.2. Social value

The social value of acoustical heritage is reflected in the fact that it is closely related with people's lives.

'The Dong song, including the drums of the drum tower, it has social properties. ...... when this drum is beaten, it can distinguish which family name it is.' [Expert #1]
'What's important is that there is a persistent record of human uses of the spaces.' [Expert #9]

In this context, we should acknowledge the significance of individuals, both in terms of those who create the sound and those who experience it.

'We probably tend to overlook the fact that this thing was naturally formed by a specific group of people in the course of their activities.' [Expert #1]
'We must consider the importance of the body of the person who produces a sound or listens to it.' [Expert #7]

Social values are also reflected in research and experiments where researchers record subjective data from individuals in the environment, which reflects the impact of heritage on society today.

'Subjective data in terms of visual and sound preferences.' [Expert #2]
'I used a live tour with guests, and they filled out a survey and I interviewed them informally afterwards and collected their notes.' [Expert #4]
'It's a diverse kind of approaches: site observational visits, site constituency interviews, ...' [Expert #9]

4.4.3. Cultural value

The cultural value of acoustical heritage lies in its heritage context. On the one hand, it refers to the cultural significance of activities and

Table 7
Categories of acoustical heritage.

Examples	Daily life practices/ Events/Historical places	Indoor spaces/ Outdoor spaces	Objects/Buildings/Landscape/Combination of natural and artificial environment	Natural sound/Human sound/ Technological sound	Real sound/ Simulated sound
Dong Song	X	X	X	Human sound	Real sound
Cathedrals/ Churches	Historical places	Indoor spaces	Buildings	X	X
Church bells	X	X	Objects	Technological sound	Real sound
Acoustic vessels	X	Indoor spaces	Objects	X	X
Epidaurus theatre	Historical places	Outdoor spaces	Buildings	X	Simulated sound
City of Venice	X	Outdoor spaces	Combination of natural and artificial environment	X	Real sound
Silbo Gomero	Daily life practices	X	X	Human sound	Real sound
Musical instruments	X	X	Objects	Technological sound	X
Historical audio tapes	X	X	Objects	Technological sound	X
Carnival	Events	X	X	Human sound	Real sound
Alhambra	Historical places	Outdoor spaces	X	X	Real sound
Karawitan	X	X	X	Human sound	Real sound
Chavín de Huántar	Historical places	Outdoor spaces	X	Technological sound	Simulated sound

places related with the heritage.

> *'For example, rituals, festivals and ...... oral literature ...... have its cultural attributes.'* [Expert #1]

While on the other hand, it bridges the gap between the past and the present, meaning that people today can experience an interpretation of life and experience of ancient people.

> *'The use of that space, or the evolution of that space, or the devolution of that space and the deterioration, and how that's interpreted.'* [Expert #4]
>
> *'The sounds of the bells ...... speak of a complex sonic language that was shared by the communities of the past, and those same meanings can be found in written historical sources. This heritage was kept part of the cultural significance.'* [Expert #7]
>
> *'The recognition of cultural phenomena that have a persistent and even changing of course, changing over time, but a persistence in a particular place or within a particular group of community people or within a particular community.'* [Expert #9]

4.5. Theme 5: challenges of acoustical heritage preservation

Due to the specificity and uniqueness of the acoustical heritage, there are a number of challenges when confronted with the conservation of this heritage. Challenges can be divided into four categories: (1) lack of consensus, (2) lack of public awareness, (3) difficulties in preserving sound, and (4) limitations of recordings. In addition, the potential future direction of development is discussed as (5) future development, as it implies the deficiencies that currently exist.

4.5.1. Lack of consensus

Acoustical heritage encompasses a number of disciplines, each with its own tendencies and focuses.

> *'Different disciplines may have different perceptions of acoustical heritage.'* [Expert #1]
>
> *'Archaeologists focus on how sound interacts with the ritual practices in those places; ......architects who are trying to see how cathedral building affects the sounds that is being produced inside the building; ...... someone working in soundscape, for example, they approached the historical soundscape from other festivities, maybe how people would experience those events.'* [Expert #3]
>
> *'I think acoustical scientists, audio engineers, architects, soundscape scientists, environmental scientists, we all have a job to do to communicate the importance of what we believe in and care about across disciplines and across fields but also to general audiences.'* [Expert #9]

A lack of consensus exists due to the large number of involved disciplines. There is a lack of harmonization of definitions, methodologies, evaluation, and assessments, which may cause problems for disciplines to cooperate.

> *'There is a lack of a unified understanding of the overall concept of conservation of acoustical heritage that intersects these things in a general framework.'* [Expert #1]
>
> *'There is no system of evaluating acoustical heritage that would say, this soundscape is also very high value.'* [Expert #2]
>
> *'There is not a methodology established adapted to the different requirements of historical cases.'* [Expert #3]

4.5.2. Lack of public awareness

As acoustical heritage is still a relatively new field, it has not received much attention or focus from the community. Sound has been presented as an element in existing heritage documents but has not received sufficient attention as a separate category.

> *'The mentions of heritage in documentation related to planning and conservation coming from cultural heritage and natural heritage both. Sound gets mentioned there, but that's quite unsystematic.'* [Expert #2]
>
> *'Professionals working in heritage, management and conservation, they need to be become aware of the potential of sound and the idea of holistic environment besides the physical artefact.'* [Expert #2]

In addition to this, in terms of protection practices, the lack of institutional and sectoral attention in this area can easily lead to problems such as lack of funding.

> *'The greatest challenge would be to get the institutions to become aware and to get some budget for analyzing acoustic heritage and protect it, conserve it.'* [Expert #5]
>
> *'Challenge for me is always having the permission to record.'* [Expert #6]
>
> *'It's still a challenge for an archaeological research project or cultural heritage organization to support acoustical research and preservation.'* [Expert #9]

4.5.3. Difficulties in preserving sound

Sound is a dynamic element and protecting it is inherently difficult. It can easily change with the environment. Any possible renovation can make preserving the acoustical heritage even more challenging.

> *'The main challenge is that sound is ephemeral, so it just happens and goes, and you can record it, but you can never really experience it exactly as it was anymore.'* [Expert #2]
>
> *'If you change material on the large surface, it could significantly affect the acoustics of interior space.'* [Expert #5]

Furthermore, it can easily change over time, and it is difficult for people to find clues. So the more ancient the heritage, the greater the difficulty.

> *'It's easy for Middle Ages. It's more difficult for prehistoric sites to prove that acoustics did matter.'* [Expert #5]
>
> *'Another challenge is the reconstructive aspects. ...... we don't have any direct evidence other than the material remains of things. So, what we have to do is make hypotheses. ...... we use analogies with present day experience.'* [Expert #9]

4.5.4. Limitations of recordings

Recording is an important part of heritage conservation. However, there is a degree of intrinsic interference with the recording of heritage which is relevant to human activities.

> *'Sometimes when you start recording, people behave in a different way.'* [Expert #6].

In addition, simply making audio recordings does not provide a complete and comprehensive record of the entire heritage. The connection between heritage and people is essential, but such value is difficult to capture or preserve by digital recording.

> *'Such a sound can become just data if it is taken out of the environment where it first happened and if some of the sounds are no longer being sent by the people who made them in the first place, it is just a physical property.'* [Expert #1]
>
> *'If it is an in-situ preservation, the challenge of a through recording is to preserve the social and cultural significance of sound or acoustic that mentioned.'* [Expert #7]
>
> *'Acoustical heritage is on sound, but sound is provided from activity, activity and sound cannot be separate, so the biggest challenge is preserved to activities that contain identity, meaning, originality.'* [Expert #8]

4.5.5. Future development

Since there is still a lack of consensus on the definition of acoustical

heritage, experts have suggested that one possible direction is to adopt a systematic approach that encompasses a comprehensive spectrum of analyses, ranging from the subtle nuances to the grand narratives.

> *'I also think we are going to see some sub categories or sub fields to account for these different approaches we are having at the moment because ...... it is so interdisciplinary.'* [Expert #3]
> *'We must approach acoustical heritage in a systematic way, expanding a range of analysis from minor to major.'* [Expert #7]

Another possible direction is for the narrative of the definition to become more specific and precise so that people clearly understand what it refers to.

> *'While being more specific, they could be also more inclusive.'* [Expert #2]
> *'The definition will be more specific because acoustical heritage emphasises meaning, identity and character of the sound.'* [Expert #8]

In addition, as the conservation of acoustic heritage is still at an exploratory stage, the concept of its conservation may develop more maturely in the future.

> *'It comes to the system of evaluating sounds as culture and heritage, nor elements of that contribute to heritage soundscape.'* [Expert #2]

> *'I think we get tangled up in the idea that the way acoustics were in their original condition is something that we must preserve.'* [Expert #4]

5. Discussion

This part serves as the bridge between the empirical findings presented in the previous sections and the broader implications they hold within the context of acoustical heritage, and its future development. In this section, in order to provide a synthesized understanding of (1) definition of acoustical heritage and (2) conservation and sustainability of acoustical heritage, an integrated discussion distills the insights gained from the thematic analysis. The relationship between the topics and themes are shown in Fig. 1.

Firstly, according to the results of Theme 1, for 'acoustical heritage' and other terms, part of the interviewees thought that the terms were similar and could be used at the same time, while others believed that there was a difference in the scope, the source of the sound, and the methodology, etc., but there is no dominant view of what the difference is. In other words, the distinction among terms is blurred, and there is no consensus on what the difference is. However, most of the people who were interviewed did not speak English as their first language, and several interviews were not even conducted in English. As a result, the
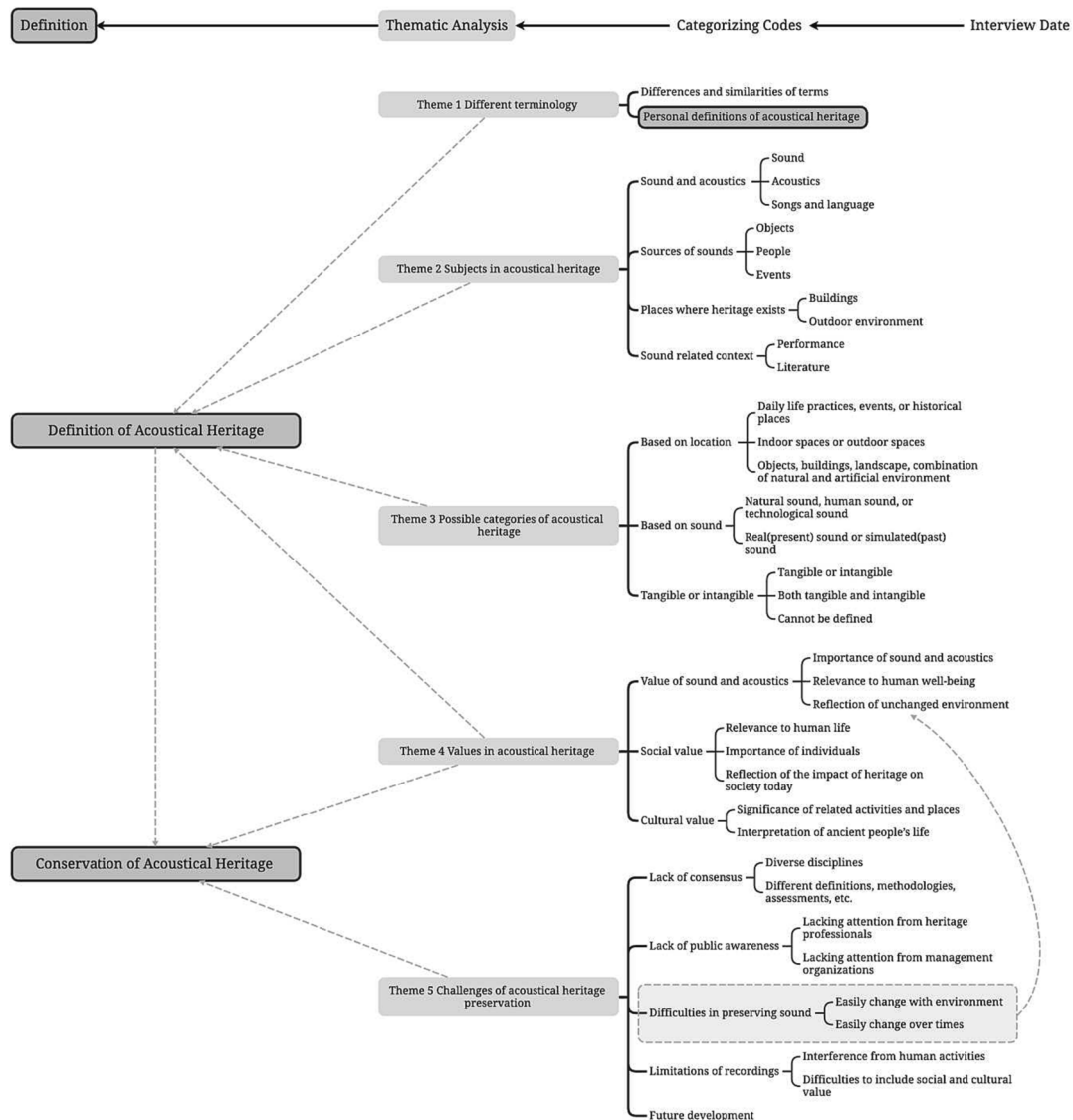

Fig. 1. Relationship between topics and themes.

experts' comprehension of English terms may have been based on terms in their first language. As mentioned in 4.1.1, a single term is often used in Spanish to describe any relevant research, whereas in Chinese there is no *'particularly clear academic term'* [Expert #1] to describe this field. This premise reinforces the likelihood that interviewees perceive different terms to be close synonyms of each other. Furthermore, it has also been argued that the term 'acoustical heritage' is *'borrowed from other disciplines'* [Expert #4], thus, for what it refers to, it is more important to ground from practice rather than take the word too literately. As a result of integrating the previous analyses, the definition of acoustical heritage in this paper is drawn from the findings of the interviews and will endeavor to include any possible cases.

Secondly, as mentioned in Theme 1, there are two main controversies over acoustical heritage, which is (1) whether it must include acoustics and (2) whether it needs to include human perceptions.

Some of the cases, as shown in Table 3, include physical acoustic characteristics or designs, while others include simply sound or suggest that sound is the more essential subject of that heritage. According to 4.2.1, in practical research, sound and acoustics are frequently integrated with one another, which help research and contribute to preservation as well. Therefore, considering both sound and acoustics have high value, acoustical heritage may include acoustics or/and sound, and there is a high probability that acoustic methods are employed in the research.

Another question could also be seen as whether to discuss only acoustics or/and sound in heritage. According to Theme 2, many cases are directly related to people, who are the primary producers of sound. Some cases are not directly related to human, such as churches with special acoustic design, but humans are just as important because they are the listeners and the experiencers of this sound environment, and one of the purposes of acoustic space creation is to give listeners unique experience compared to normal places.

In addition, social value that is mentioned in Theme 4 also emphasizes the connection between humans and acoustical heritage. Thus, although there are a few cases that are difficult to prove their relationship to humans, such as historical audio tapes, it is undeniable that for the majority of acoustical heritage, the study of human perception is a significant component of the process. One rather special case is the historical audio tapes, which is not directly related to either acoustics or human perception. It is more of an acoustic archive as a heritage. And it is difficult to define whether it is real sound or simulated sound as well.

Thirdly, as can be seen from the findings of Theme 3, there is no single categorization that comprehensively covers all examples. This is due to two reasons as follows: (1) The case has too many contents that it is challenging to place them into a single category. One example of this is 'Dong Song', which includes not just songs but also architecture, activities, and so on. (2) The case has too little content, such as most acoustical heritage produced by objects, and none of the categories that are related to the location take them into account. Therefore, referred to Araújo et al. [2] and combined with findings of Theme 2 and 4, it will be more effective to categorize acoustical heritage in a multidimensional way, including three dimensions that are completely separate from one another. They are: (1) acoustical dimension (acoustic feature, or acoustic design), (2) sound dimension (object sound, natural sound, or human sound), and (3) environment dimension (buildings, landscape, or combination of buildings and landscape). Each case can be generally placed in at least one of these dimensions.

In conclusion, taking into account all above analyses, the following definition of acoustical heritage is proposed. 'Acoustical heritage' is the cultural heritage that encompasses three dimensions:

a. It includes acoustics or/and sounds that are worthy of preservation and reconstruction,
b. It possesses historical value, either in itself or in its environment,
c. It contains elements of socio-cultural value such as the environments, people, and activities.

6. Conclusion

This paper brings forward key aspects important for defining acoustical heritage, leading towards its conservation. The main conclusions of this study are:

(1) The expert interviews revealed that, although opinions varied, there were five main aspects of acoustical heritage that were emphasized in the experts' definitions: environment, acoustics/sounds, activities, sound experience of people, and reconstruction, reflecting the multidimensional nature of acoustical heritage.

(2) Through thematic analysis of the expert interviews, five themes were identified, which are: different terminology, subjects in acoustical heritage, possible categories of acoustical heritage, value of acoustical heritage, and challenges of acoustical heritage preservation. In conjunction with the first four themes, this paper proposes a definition of acoustical heritage, which is *'Acoustical heritage is the cultural heritage that encompasses the following dimensions: a. it includes acoustics or/and sounds that are worthy of preservation and reconstruction; b. it possesses historical value, either in itself or in its environment; c. it contains elements of socio-cultural value such as the environments, people, and activities.'*.

However, it is essential to acknowledge the limitations inherent to this study. Certain interviews were conducted in English despite it was not the first language for either the interviewer or interviewee. Consequently, it is possible that some linguistic nuances are not reflected in the interview or translation process. The definition of acoustical heritage, while comprehensive in our opinion, may not fully encompass the entirety of acoustical heritage's intricacies because of the limited numbers of interviews. None of the interviewees is a policy maker; rather, they are either researchers or practitioners, which means that their perspectives may have certain restrictions. Moreover, while the possibility of the acoustical heritage to include natural heritage was mentioned peripherally by the interviewees, the thematic analysis led away from that field and positioned the narrative firmly within the cultural heritage discourse. This, however, doesn't exclude a possibility for future work to include the viewpoints of natural heritage.

This study positions acoustical heritage at the intersection of sound/acoustics, culture, and history, which encourages a broader exploration of acoustical heritage including further research, deeper interdisciplinary understanding, and harmonization of perspectives across cultures. As more and more researchers, practitioners and policy makers join the field, the study of acoustical heritage will become more comprehensive and mature.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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