

Cognitive Aspects of Listening in Performance Spaces

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Sound Character

descriptive

Totality of measured values of features that are associated with the sound sample under examination

The measured values may relate to different aspects of the sound, such as, for example

- an acoustic profile
- an auditory profile

Further characteristic features may be, if available, for example

- an emotional profile
- a cognitive profile
- a semantic profile

usually assessed by experts

Sound Quality

includes judgement

sound character

reference character

Is the result of an assessment of all features and feature values of a sound sample under examination that are recognized and nameable

in the context of judging upon their **suitability** to meet all recognized and nameable features and feature values of individual expectations and/or social demands and/or pragmatic necessities

judgement

adapted from *Jekosch 2000*

Product-Sound Quality

includes judgement

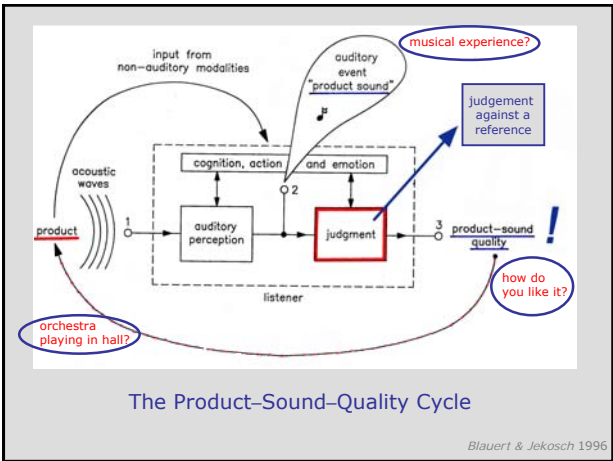
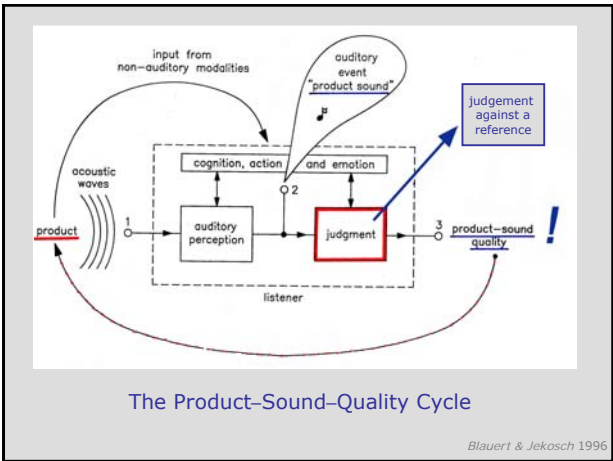
Product-sound quality is a descriptor of the **suitability*** of a sound attached to a product

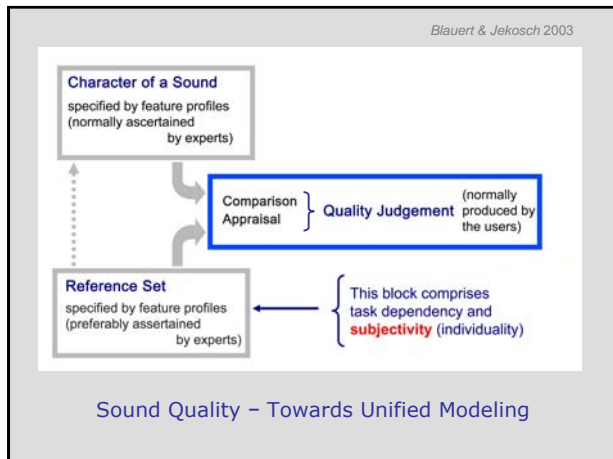
It results from a judgment upon the totality of auditory characteristics of the said sound

with the judgement being performed with reference to the set of those desired features of the product that are apparent to the users in their actual cognitive, actional and emotional situation

*) in German: **Eignung**

after *Blauert & Jekosch 1996*





The Perceptionist's Point of View

The "world" and everything in it is our "brainchild", that is, appears and exists in the course of biological brain functions, thus forming a relationship in the form of bijective mapping

Conceptual Aspects of "Quality of the Acoustics"

- Classical Psychoacoustics
- Perceptual Psychology
- Physics
- Communication Sciences

(I) Classical Psychoacoustics

(II) Perceptual Psychology
(III) Physics
(IV) Communication Sciences

Exemplary Issues

perceptual features (properties), such as: loudness, roughness, sharpness, pitch, timbre, spaciousness

Suitable Measuring Methods

indirect scaling: thresholds, difference limens, points of subjective equality

direct scaling: category scaling, ratio scaling, e.g., direct magnitude estimation

(II) Perceptual Psychology

(I) Classical Psychoacoustics
(III) Physics
(IV) Communication Sciences

Exemplary Issues

identification and localization of sounds in a mixture, speech intelligibility, audio perspective incl. distance cues, scenic arrangement, tonal balance, aural transparency

Suitable Measuring Methods

discretistic: semantic differential, multi-dimensional scaling

syncretistic: scaling of preference, suitability, and/or appropriateness, benchmarking against target sounds

Examples of *Gestalt* Rules

<i>Proximity</i>	elements are close together
<i>Similarity</i>	elements appear to be alike
<i>Common fate</i>	elements move according to a pattern, e.g., a wave
<i>Good continuation</i>	elements are aligned in the same direction
<i>Closure</i>	elements are connected to each other although they form an incomplete structure
<i>Simplicity</i>	elements are "simple"
<i>Habit</i>	elements form familiar and regular shapes
<i>Persistence</i>	element grouping recurs over time such as initially grouped

(III) Physics

(I) Classical Psychoacoustics
(II) Perceptual Psychology
(IV) Communication Sciences

Exemplary Issues

sound-pressure level, impulse response, transmissions function, reverberation time, sound-source position, lateral-energy fraction, interaural cross correlation

Suitable Measuring Methods

instrumental measurement with physical equipment for the measurement of elasto-dynamic vibrations and waves, incl. appropriate signal processing

(I) Classical Psychoacoustics
(II) Perceptual Psychology
(III) Physics
(IV) Communication Sciences

Exemplary Issues

product-sound quality, comprehensibility,
usability, content quality, immersion
assignment of meaning, dialogue quality

Suitable Measuring Methods

cognitive / psychological tests, particularly in
realistic use cases, e.g., the product in use,
the audience in concerts, etc., questionnaires,
dialogue tests, comprehension test,
usability tests, market surveys

Some Keywords to Consider

Typicalness
Functional Adequacy
Listening Tradition
Aesthetic Form

Classical Concert Halls

Hardware, persistent (bricks, stones and wood)

Since > 200 years

Rectangular "shoe-box" form (Basilica)

Sound sources: acoustic musical instruments
human voice

Program: baroque,
classical and romantic music

Modern Concert Halls

Hardware, persistent (concrete)

Since > 100 years

Fan-shaped and arena-shaped plans

Sound sources: acoustic musical instruments
human voice

Program: as with classical halls,
plus modern music

Analogous Electro-Acoustic Installations

Hardware, slowly variable

Since ≈ 50 years

Acoustic modification of classical and modern halls

Sound sources: amplified musical instruments
amplified human voice

Program: amplified, electroacoustically
modified music, and
music generated by
analogous electronic devices

Digital Electro-Acoustic Installations

Software, instantly variable

Since a few years

Acoustic modification of classical and modern halls,
auditory virtual environments

Sound sources: amplified musical instruments
amplified human voice
sampled and electronically
generated sounds

Program: amplified, electro-acoustically
modified music, all kinds of
electronic music

Ancient Theater (Greek/Roman) !

Hardware, persistent (rock and wood)

Ancient use for > 1000 years
Modern use for > 90 years

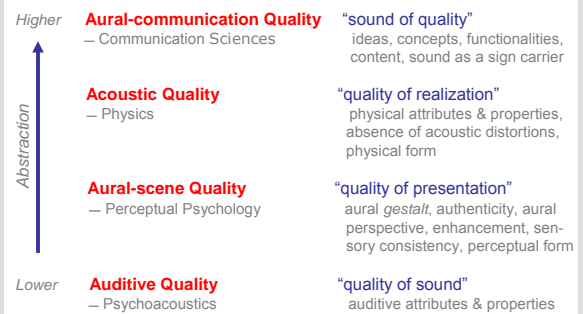
Semicircular amphitheater

Sound sources: human voice
acoustic musical instruments

Program: tragedy, comedy
and multipurpose use

Modern use: multipurpose use

Layers of Sound Quality



Blauert & Jekosch 2007, modified

Conceptual Aspect	Exemplary Issues	Suitable Measuring Methods
Auditive Quality <i>Classical Psychoacoustics</i>	Perceptual properties such as loudness, roughness, sharpness, pitch, timbre, spaciousness	<i>Indirect scaling:</i> thresholds, difference limens, points of subjective equality <i>Direct scaling:</i> category scaling, ratio scaling, direct magnitude estimation
Aural-scene Quality <i>Perceptual Psychology</i>	Identification and localization of sounds in a mixture, speech intelligibility, audio perspective incl. distance cues, scenic arrangement, tonal balance, aural transparency	<i>Discretic:</i> semantic differential, multi-dimensional scaling <i>Syncretic:</i> scaling of preference, suitability, and/or appropriateness, benchmarking against target sounds
Acoustic Quality <i>Physics</i>	Sound-pressure level, impulse response, transmissions function, reverberation time, sound-source position, lateral-energy fraction, inter-aural cross correlation	Instrumental measurements with physical equipment for the measurement of elasto-dynamic vibrations and waves, including appropriate signal processing
Aural-communication Quality <i>Communication Sciences</i>	Product-sound quality, comprehensibility, usability, content quality, immersion, assignment of meaning, dialogue quality	Psychological (cognitive) tests, particularly in realistic use cases, e.g., the product in use, the audience in concert, etc., questionnaires, dialogue tests, comprehension test, usability tests, market surveys

Synopsis of Conceptual Aspects of Sound Quality

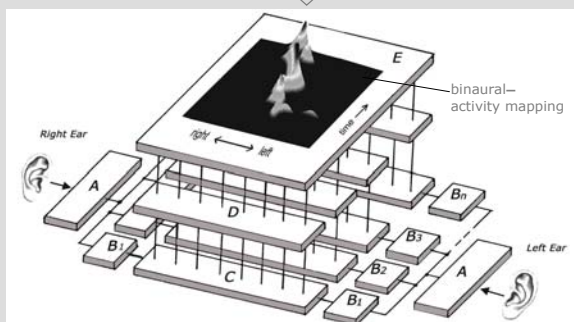
Blauert & Jekosch 2011

Instrumental Sound-Quality Judgement via a Model of Interactive Listening

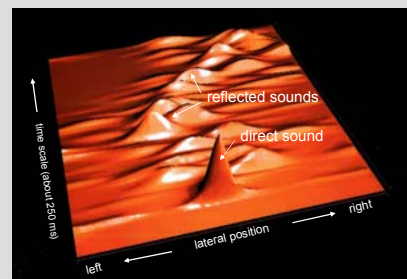
Incorporating
Cognition
Feedback Loops
Cross-modal Input

the AABBA project

recognition, interpretation and judgement



Schematic Plot of a Typical Binaural Model



Binaural-Activity Map of the Impulse Response of a Concert Hall

rendered by the model of binaural signal processing of Lindemann & Gaik 1986, 1990
plotted by Okabe 1997

