

# New Music Recommendation Algorithm Facilitates Audio Branding

While marketing continues to work primarily in a visual domain, holistic brand experiences and multisensory marketing techniques are becoming ever more important. Audio branding is one such technique. The European Commission-funded research and innovation project ABC\_DJ has developed an algorithmic music recommender system specifically for use in audio branding. The system's core function is to assist marketers in determining musical brand fit, i.e. whether listeners will evaluate a given piece of music as fitting the perceived attributes of a given brand, and target group preference, i.e. whether listeners belonging to a particular target group will like a given piece of music. This article describes the ABC\_DJ project's aims, outputs, commercial applications, and status as an asset for European SMEs facing the ongoing evolution of the point of sale into a point of experience.

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## Background of the ABC\_DJ Project

Audio branding is the art and science of using music and sound to enhance brand equity. Its scope of practice encompasses the creation of sound trademarks, curation of in-store playlists, sourcing of music for advertisements, and a range of other marketing tasks. The objective of the ABC\_DJ project has been to leverage information and communication technology to enhance European industry competence and competitiveness in these tasks. The project consortium included seven partners: Technische Universität Berlin, HearDis! Corporate Sound GmbH, IRCAM – Institut de Recherche et de Coordination Acoustique Musique, Fincons SPA, Lovemonk SL, Fratelli Piacenza SPA, and Integral Markt- und Meinungsforschung GmbH. From January 2016 to December 2018, this interdisciplinary team worked to design and validate tools tailored to the needs of audio branding experts and other marketers interested in working with music. The final report can be found at <http://abcdj.eu/download/1412/>.

## Determining the State of the Field

Several decades of research have shed light on the impact of background music on consumer attitudes and behaviour. Garlin and Owen (2006), for instance, found in a meta-analysis of 32 studies (selected from a pool of 157) that the presence of background music has a small positive effect on customers' enjoyment of and intent in patronising shops, while the likeability of the music has a small but clear positive effect on the intent to patronise. Kämpfe et al. (2010) took a broader view,

examining 97 studies (from a pool of 189) on the effects of background music on non-musical behaviour in general; they concluded that effects depend on context, hypothesising that "the kind of music might be decisive in whether background music influences behaviour" (Kämpfe et al. 2010, p. 440). Studies on the fit between musical and non-musical elements of the retail experience support this hypothesis (Oakes and North 2008). Consumers themselves naturally expect that the background music played in a brand store will fit the brand's image; those without prior knowledge of the brand use the music to form ideas about its characteristics (e.g., product quality and target groups), whereas those with prior knowledge of the brand often gain satisfaction from the perceived fit between the music and their expectations (Beverland et al. 2006).

Despite the importance of musical fit in consumer experience, little research to date has focused on the practices by which marketers, consumers, and brands determine musical brand fit. A central aim of ABC\_DJ was to identify these practices and, from the marketer's perspective, optimise them. The Audio Communication Group at TU Berlin interpret the determination of musical brand fit as a special case of sign-based communication (see figure 1) (Herzog et al. 2016). After identifying key brand attributes, the audio branding expert must encode them as musical signs (such as melodies, instrumentation, rhythm, and genre) that can be decoded or interpreted by listeners in consistent ways. Examples are the use of electronic instruments to signify modernity and non-Western scales to signify exoticism.

To gain insight into this musical translation process, the ABC\_DJ con-

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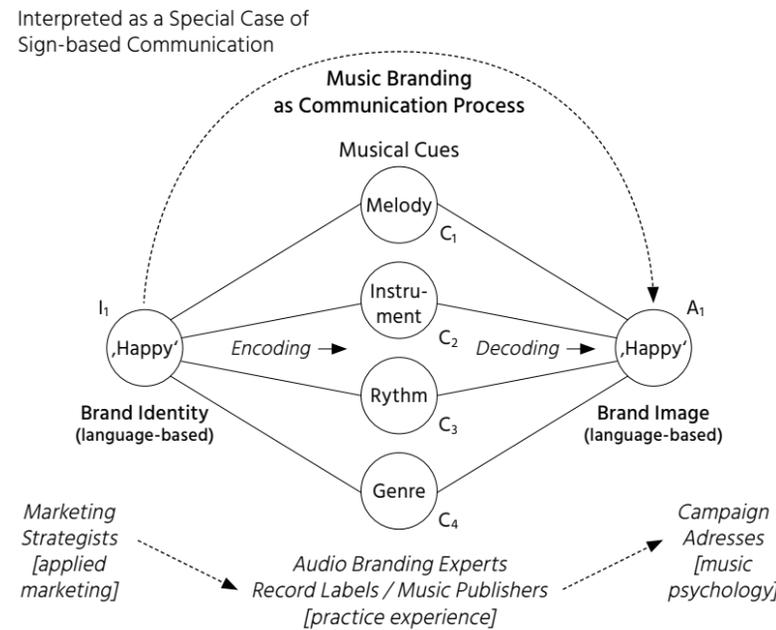
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sortium surveyed 64 audio branding experts. Of 41 respondents involved in music searching and consulting, 80% describe “translating brand values into musical qualities” as part of their scope of work. However, only 2% report doing so using an established and documented method; 27% do so using consistent but self-developed methods, while 51% do not use a consistent method at all. The survey furthermore found that of 61 respondents who engage in briefings with brands, only 37% perceive these briefings as “clear” and 51% perceive them as “well-structured”. These findings led the consortium to posit a need for consistent and documentable methods of determining musical brand fit and briefing brands on the rationale behind particular musical choices.

### Developing the General Music Branding Inventory

After a review of the literature on brand personality (e.g., Aaker 1997; Geuens et al. 2009), brand values (e.g., Zhang/Bloemer 2008), and music psychometrics (e.g., Zentner et al. 2008; Rentfrow et al. 2012), the consortium decided to design a new psychometric inventory specifically to measure the expressive dimensions of music relevant to audio branding. The purpose

**Figure 1: Lens Model of Music Branding**



Source: Herzog / Lepa / Egermann, 2016.

here was twofold: first, to develop a consistent vocabulary for the description of musical brand fit; and second, to enable the development of recommendation algorithms able to predict musical brand fit. A workshop was convened with nine internationally recognised experts in audio branding, who were asked to create a list of ex-

pressive dimensions and populate it with everyday English-language adjectives. This resulted in a Music Branding Expert Terminology (MBET) containing 132 adjectives (e.g., sentimental, confident, modern, etc.) (Egermann et al. 2017). In order to refine the inventory, an online survey was conducted with 305 marketing professionals, who were asked to select the 66 most pertinent MBET adjectives and rate how strongly they fit the brand with which they had most recently worked. Redundant terms were eliminated at the discretion of the researchers and the remaining terms rated for relevance and discriminatory value. This process yielded a 51-item psychometric inventory named the preliminary General Music Branding Inventory (pre-GMBI), which is documented in Herzog et al. (2017).

### Management Summary

The evolution of the point of sale into a point of experience demands expertise in multisensory marketing techniques such as audio branding. The European Commission-funded ABC\_DJ project has developed an algorithmic music recommender system specifically for use in audio branding. ABC\_DJ assists marketers in matching brand attributes to the acoustic features of musical pieces and selecting the pieces preferred by particular target groups.

### Classifying Perceived Musical Expression

In order to train a recommender system capable of predicting the GMBI attributes of musical pieces, a ground truth dataset was necessary. This dataset was created using two large online listening experiments conducted in Germany, Spain, and the United Kingdom (wave 1: n ≥ 1080 per market; wave 2: n ≥ 2000 per market). The samples were nationally representative according to gender, age group (18–34, 35–51, and 52–68 years), and educational level (secondary school or less, high school or undergraduate degree, graduate degree). Respondents were presented with several ca. 30-second musical excerpts and asked to rate them using a 6-point Likert scale for all items of the GMBI, as well as for knowing and liking. Musical excerpts were selected randomly out of a pool of 549 pieces representing ten genres (e.g., Blues, Folk, and Classical) and 61 styles (e.g., Contemporary Folk and Historical Classical). During the first experiment four excerpts were presented per respondent, while during the second experiment six excerpts were presented. At the end of each survey, respondents were asked to provide sociodemographic data and indicate their listening context and musical preferences.

The first stage of data analysis was conducted by the Audio Communication Group between the two listening experiments. Exploratory factor analysis and multilevel confirmatory factor analysis were performed and then refined using Exploratory Structural Equation Modelling (Asparouhov/Muthén 2009). The result was a solution comprising four factors, tentatively named “easy-going”, “joyful”, “authentic”, and “progressive” (Herzog et al. 2017).

Based on item importance as indicated by loading size, the GMBI was reduced from 51 items to a more practical 36 items for use in the second listening experiment. Data from the second experiment was analysed using the same approach. In order to achieve language invariance and enforce orthogonality, the number of GMBI items under consideration was further reduced from 36 to 22. The four factors were then renamed in light of the established music psychology concepts of emotional arousal and emotional valence, i.e.

- arousal (easy-going: e.g., soft, relaxing, chilled),
- valence (joyful: e.g., happy, playful, bright),

- authenticity (e.g., honest, authentic, trustworthy),
- timeliness (e.g. modern, young, futuristic).

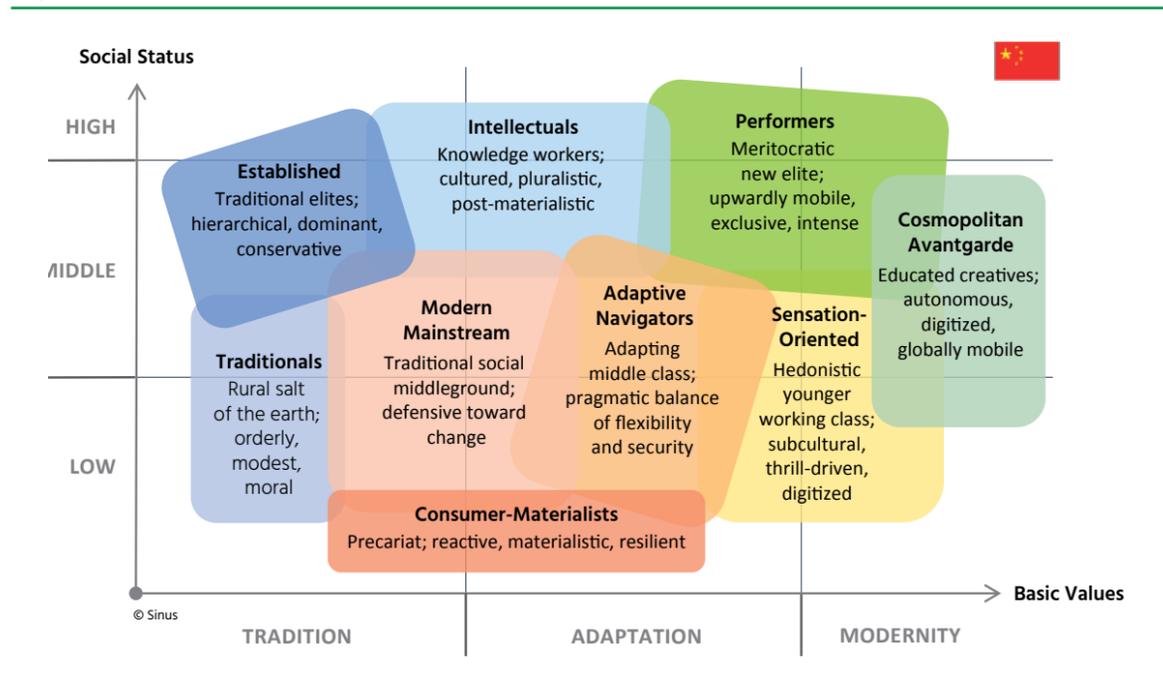
### Predicting Perceived Musical Expression

Completing the recommender system required matching the ground truth dataset on listener perceptions with a dataset on acoustic and musical features. Accordingly, project partner IRCAM analysed the 549 pieces of music used in the listening experiments using music information retrieval tools (e.g., Peeters et al. 2011). The pieces were tagged for “hard” and “soft” features. “Hard” tags were derived from signal

ABC\_DJ develops innovative music recommendation software to predict brand-fit music



Fotos: Unternehmen xxxxxxxxxxxxxxxxxxxxxxx

**Figure 2: The Sinus-Meta-Milieus in Established Markets**

Source: xxxxxx xxxxxxxx.

analysis of rhythm, key and tonality, structural, and melodic features. “Soft” tags such as musical genre, style, and timbre were applied based on expert classification. Machine learning made automatic tagging possible with 45–93% accuracy. Final analysis yielded 516 predictor variables per musical excerpt. The next step was to map the correlations between these 516 “hard” and “soft” musical features on the one hand and six dependent variables (D1. arousal, D2. valence, D3. authenticity, D4. timeliness, D5. knowing, and D6. liking) on the other hand. The Audio Communications Group experimented with a range of machine learning models. Stepwise regression models proved most effective for D1 and D4, while conditional random forest regression models proved most effective for D2, D3, D5, and D6. The final pre-

diction module can predict perceived musical expression as described by these four dimensions with an overall accuracy of ca. 80%.

### Milieu-specific Music Preferences

During the analysis of the first listening experiment data it was determined that while GMBI attributions could be predicted with high accuracy based on acoustic features alone, liking could not. It was hypothesised that liking was a matter of individual and sociocultural orientation. In order to measure sociocultural preferences in all three target countries, the Sinus Meta Milieus were integrated into the second listening experiment. Sinus Milieus are a segmentation model widely used in the German-speaking world that identifies

groups of like-minded people based on values and lifestyles (Flaig/Barth 2018). Sinus Meta Milieus are international target groups based on the Sinus Milieu approach that describe groups of people across national borders who display similarities in the way they live and think (see figure 2) (Schäuble et al. 2018).

The Sinus Meta Milieu composition of a survey sample can be determined via a 38-item inventory containing questions on values and lifestyle. This inventory was incorporated into the second listening experiment, and machine learning models were trained using the data for 9 Sinus Meta Milieus and 29 sociodemographic groups. Accordingly, the final ABC\_DJ prediction module comprises 234 distinct models: one per dependent variable per target group (plus the base population).

Analysis of the second listening experiment data demonstrated that Sinus Meta Milieus identify the musical genres and styles most popular among like-minded social segments, displaying mostly better differentiating power than criteria such as age, gender, education, or nationality. Certain genre preferences are highly milieu-dependent: the genre Blues, for example, is strongly liked by 27% of respondents overall across the three countries, with Germany at 23%, Spain at 26%, and Great Britain at 31%. By comparison, the differences between the milieus have a spread of 28 percentage points: an average of 17% of the Traditionals and 18% of the Consumer-Materialists across all three countries like Blues, as compared to 32% of the Intellectuals and 45% of the Cosmopolitan Avantgarde.

On the more detailed level of style, it is possible to identify styles which are strongly liked by only one of the nine Meta Milieus. For example, EDM (Electronic Dance Music) is a unique preference in the milieu of the Adaptive Navigators, whereas Hip-Hop has a specific relevance among the Sensation-Oriented, or Flamenco for Performers.

### Immediate Applications

The ABC\_DJ system’s planned immediate application is in-store music management. Other near-term applications include online music library and catalogue indexing, sale as a software application (SaaS), and “predictive audio branding” based on custom target group research.

• The ABC\_DJ system will improve both the practices and outcomes of in-store music provision. Regarding practices, it will streamline consulta-

tion between audio branding experts and clients. Qualitative expert interviews conducted during the ABC\_DJ testing process revealed that misunderstandings frequently arise during audio branding consultations (an egregious example being a client without musical experience saying a song is “too fast” but meaning it is too loud). ABC\_DJ obviates such misunderstandings by providing a shared vocabulary of branding adjectives (the GMBI) that can be linked to audio examples and used to define playlists. After identifying the GMBI terms that best describe the client brand, a provider could use the system to search tracks tagged with these terms, to assemble tagged tracks into playlists matched to particular times

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of day, and to visualise the relationships between musical and semantic parameters. The GMBI need not replace the intuitive methods currently preferred by most audio branding experts. Rather, as suggested by members of the Audio Branding Society industry group at its 2018 meeting, it could serve as an open-source means of verifying the quality of methods across the sector.

• Regarding outcomes, ABC\_DJ will help ensure brand- and target-group-appropriate playlists by modelling the taste and judgment of target customers. In layman’s terms, it constructs a virtual listener representative of each potential target group. By inputting the client brand’s target groups in addition to descriptive GMBI terms, the ABC\_DJ user can predict how those target groups will experience particular songs. Once provided by ABC\_DJ with data on musical brand fit and likeability as perceived by the general population and specific target groups, the audio branding expert must artfully balance these factors with their own aesthetic sensibility and feeling for the market to create a winning playlist.

### Main Propositions

1. Many marketers do not work with music in a systematic way as they lack adequate conceptual and technical tools.
2. The General Music Branding Inventory (GMBI) provides a consistent vocabulary for the description of musical brand fit using four factors – arousal, valence, authenticity, and timeliness.
3. The ABC\_DJ system assists marketers in selecting music that fits the perceived attributes of brands.
4. The prediction of musical preference must take listeners’ sociocultural orientations (milieus) into account.

## Future Vision

Early in the discourse on experiential consumption, measurement was identified as a challenge (Hirschman/Holbrook 1982). Technical advances have largely mitigated this, with mobile and static devices now able to measure affective states and intersubjective dynamics through psychophysiological and other indicators. The next challenge in multisensory marketing is how to act on such data from a brand management perspective. In audio branding, data-driven management might appear as an in-store music system capable of tracking correlations between the audio features of songs, customer profiles (e.g., social milieus), and behavioural data measured at the point of sale. Such a sys-

tem could in theory make real-time musical decisions that measurably affect sales, footfall, or other brand metrics. The ABC\_DJ project has established the conceptual and technical groundwork for this data-driven

future of audio branding. It has moreover done so in a manner that will improve the competitiveness of European SMEs working at the intersection of the information and experience economies. 

## Lessons Learned

1. Think of brands as multisensory experience opportunities, considering visual and auditory components of brand identity.
2. Support consistent and positive brand experiences by selecting appropriate acoustic features.
3. Develop a clear feeling of your main target groups and select music that balances brand fit with likeability.
4. Use the music selection process as an ideation tool for systemising brand values and target groups.

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