Music360

A 360 DEGREES PERSPECTIVE ON THE VALUE OF MUSIC

Deliverable 2.4
MUSIC360 Ontology for the Value of Music – Version 2.0

Disclaimer

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1. Ontology for The Value of Music (Version 2) - General Description

The Music360 project proposes that it is possible to define a common conceptual model of the different elements that determine the real value of music for different stakeholders and venues. This conceptual model will be implemented using model-driven engineering techniques [1, 2], which consider the specification of a concrete meta-model to support ontological definitions [3]. This approach is particularly relevant to support the objectives of Music360, since most existing approaches and studies related to measuring different dimensions of music value, such as social or cultural music impact, lack supporting technology to share the obtained results [4]. Existing implementations related to sharing music usage information mainly focus on economic aspects for royalty payment [5]. However, these approaches are not fully adopted and there are still various data exchange issues that need to be solved manually [6].

The use of a model-driven engineering approach will formalise common concepts around music value and facilitate interoperability of information between the different actors in the music value chain. In addition, the proposed approach will allow researchers to leverage existing information on the economic and non-economic value of music and to share the generated knowledge with the community to improve music value assessment.

Thus, the Music360 ontology refers to a structured and comprehensive conceptual model that represents the essential elements, relationships and attributes associated with music value in both economic and non-economic terms [7]. The Music360 ontology is therefore the reference artefact for the implementation of a common repository to be achieved with the following technical facilities:

- **Data Integration.** The ontology should facilitate the integration of diverse data sources, such as sales data, streaming statistics, cultural assessments, and emotional responses, to provide a holistic view of music's value.
- **Interoperability.** Ensure that the ontology aligns with existing standards and models in the music industry, facilitating data exchange and collaboration among stakeholders.
- **Scalability and Extensibility.** Design the ontology to accommodate future changes in the music industry and evolving concepts of value, allowing for easy updates and extensions.

This takes into account various dimensions of music's value, including its cultural, social, therapeutic, ethic, behavioural, and economic aspects. From these dimensions, the cultural and social values are usually confused as the same value, for these reason we provide a detailed description of these two dimensions and their main differences.

1.1. Music Cultural Value

Refers to the significance, importance, and impact of music within a particular culture, society, or community. It encompasses the ways in which music is embedded in the cultural fabric of a group of people and how it reflects, shapes, and preserves their cultural identity, traditions, and heritage.

Key Characteristics of Music Cultural Value

- Cultural Preservation: Music often plays a crucial role in preserving and transmitting cultural traditions, stories, and rituals from one generation to another.
- Identity and Heritage: Music can serve as a symbol of cultural identity and heritage, helping individuals and communities connect with their roots and express their uniqueness.
- Shared Experience: It fosters a shared cultural experience, bringing people together in celebrations, ceremonies, and communal activities.
- Language and Narrative: Music can convey cultural narratives, history, and values through lyrics, melodies, and musical themes.
- Diversity: Different cultures have their own musical traditions, and music cultural value recognizes and celebrates this diversity.

1.2. Music Social Value

Pertains to the role of music in shaping and influencing social interactions, relationships, and dynamics within a society. It focuses on how music connects individuals, fosters communication, and contributes to social cohesion and change.

Key Characteristics of Music Social Value:

- Community Building: Music often serves as a social glue, bringing people together and promoting a sense of belonging and community.
- Emotional Expression: It provides a platform for individuals to express their emotions, which can lead to empathy and understanding among listeners.
- Social Change: Music has the potential to inspire social change and activism by addressing important social issues or conveying messages of unity and justice.
- Communication: Music transcends language barriers and can facilitate communication between individuals who may not share a common language.
- Shared Experiences: Concerts, music festivals, and other musical events create shared experiences that strengthen social bonds and memories.

It is important to point out that Music's cultural value and social value are two distinct dimensions of the value of music, each with its own unique characteristics and significance. Following, the Key Differences Between Music Cultural Value and Music Social Value are presented:

- **Scope.** Music cultural value is often deeply rooted in traditions and heritage, encompassing historical and cultural narratives, whereas music social value is more concerned with the immediate impact of music on people dynamics and connections.
- **Purpose.** Music cultural value is closely tied to the preservation of cultural identity and traditions, whereas music social value is more concerned with the emotional, social, and communicative aspects of music.

Examples of these differences are the music cultural value might involve the preservation of traditional folk songs or religious music, while music social value might manifest in the way music is used at social gatherings, protests, or therapeutic settings.

In summary, music cultural value and music social value represent two facets of the broader value that music brings to individuals and societies. Music cultural value is rooted in cultural identity and preservation, while music social value focuses on how music shapes and enriches social interactions and relationships within a given community or society. Both dimensions highlight the diverse and multifaceted impact of music on human experiences.

1.3. Core Conceptual Elements for the Music360 Ontology

The Music360 ontology is intended to provide a framework for understanding, quantifying, and analyzing music value in a comprehensive and consistent manner [8]. Figure 1 shows a high-level view of the core elements associated with the Music360 ontology, which are described below:

- **Value Dimensions.** There are two main value dimensions: the economic (or monetary) dimension, which is mainly related to financial measures of collecting and paying music royalties; and the non-economic dimension.
- **Stakeholders.** Entities such as musicians, composers, producers, consumers, and organizations that play different roles in the music value chain, which goes from the music work creation to the music use.
- **Music Creation.** It defines the concepts related to music works that include compositions, recordings, and live performances, indicating the artists involved in the creation. These artists are the right-owners that normally benefit of the music royalty distribution, however, the music rights can be also transferred to third parties.

- **Music Use.** It considers the play of the music works in different venues, adding the necessary metadata to generate richer analysis of the music effect, such as temporal and geographical information, music tempo, lyrics language, music genre, venue type, etc.
- **Rights and license management.** Represented by different relationships in Figure 1. It is closely related to the economic valuation of music use. It indicates the beneficiaries of the royalties from the use of music (right holders) and the different schemes in which the use of music can be licensed.
- **Musical Artifacts**. This includes music compositions, recordings, and performances, each with its own unique characteristics.
- **Hierarchical Structure.** The ontology should be organized hierarchically, with broader categories breaking down into more specific subcategories. For instance, under ·Musical Works" you might have "Songs," "Albums," and "Live Performances."
- **Attributes and Properties.** Define the relevant attributes and properties for each element in the ontology. For example, for "Songs," attributes might include tempo, key, lyrics, and genre, while for "Economic Value," attributes could involve revenue, sales, and licensing fees.
- **Relationships**. Specify the relationships between different elements. For instance, how are musicians related to musical artifacts? How does cultural value influence economic value?

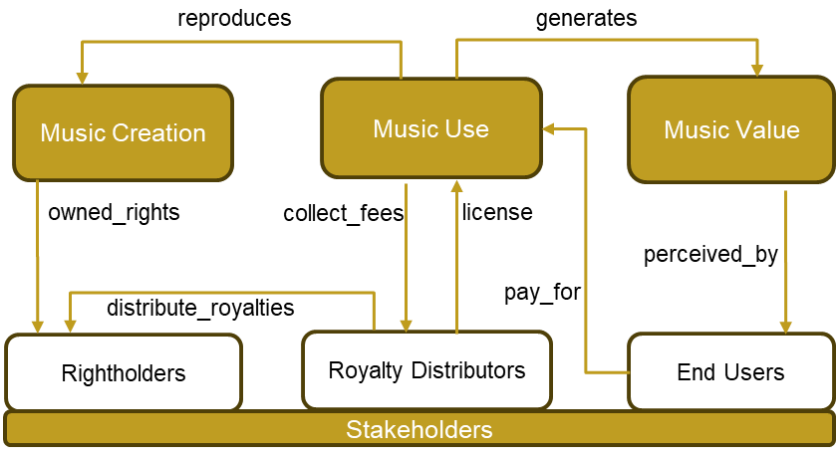

Figure 1. Core elements and relatioships of the Music360 ontology

Considering the music value dimension Music360 proposes two main classifications, Monetary and Non-Monetary values.

Monetary Value Aspect

- **Financial Metrics.** Represent the monetary value dimension using financial metrics like revenue, sales, royalties, and streaming income.

- **Market Dynamics.** Incorporate market dynamics, such as supply and demand, pricing strategies, and revenue distribution among stakeholders.

Non-Monetary Value Aspect

- **Cultural Significance.** Captures the cultural value of music by considering factors like historical importance, cultural heritage, and impact on society.
- **Therapeutic Impact.** Represents the beneficial aspects of music for health and well-being. One of the therapeutic impacts is the emotional effect of music, which is the ability of music to influence and regulate emotions by including attributes related to mood, emotional resonance, and psychological well-being.
- **Social Influence.** Account for the social value of music through aspects like community-building, identity formation, and social change driven by music.
- **Ethical Influence.** Music can convey messages of social justice, peace, love or resistance to oppression, and can become a medium for articulating and advocating ethical principles. In this way, music can promote empathy or kindness, preserve cultural traditions and moral teachings, and uphold the ethical identity of a community.
- **Behavioral Influence.** Music has a profound influence on human behavior, shaping actions, thoughts and emotions. Businesses have long understood the role of music in influencing customer behavior. Music can also improve concentration and productivity, depending on the individual and the task at hand. For some, instrumental background music can create an optimal environment for concentration, leading to better performance.
- **Temporal and Geographical Context.** Considers how the value of music can vary over time and across different regions, cultures, and communities. Music's value can change significantly depending on historical context and geographical location.

In summary, the Music360 ontology for measuring the monetary and non-monetary value of music is a structured and flexible conceptual model that encompasses the multifaceted nature of music's worth. It provides a framework for understanding, quantifying, and analysing the diverse dimensions of value associated with music in a comprehensive and coherent manner, ultimately aiding stakeholders in making informed decisions and fostering a deeper appreciation of music's significance.

In the next section the detailed definition of conceptual constructs that comprise the version 2 of the music360 ontology are presented.

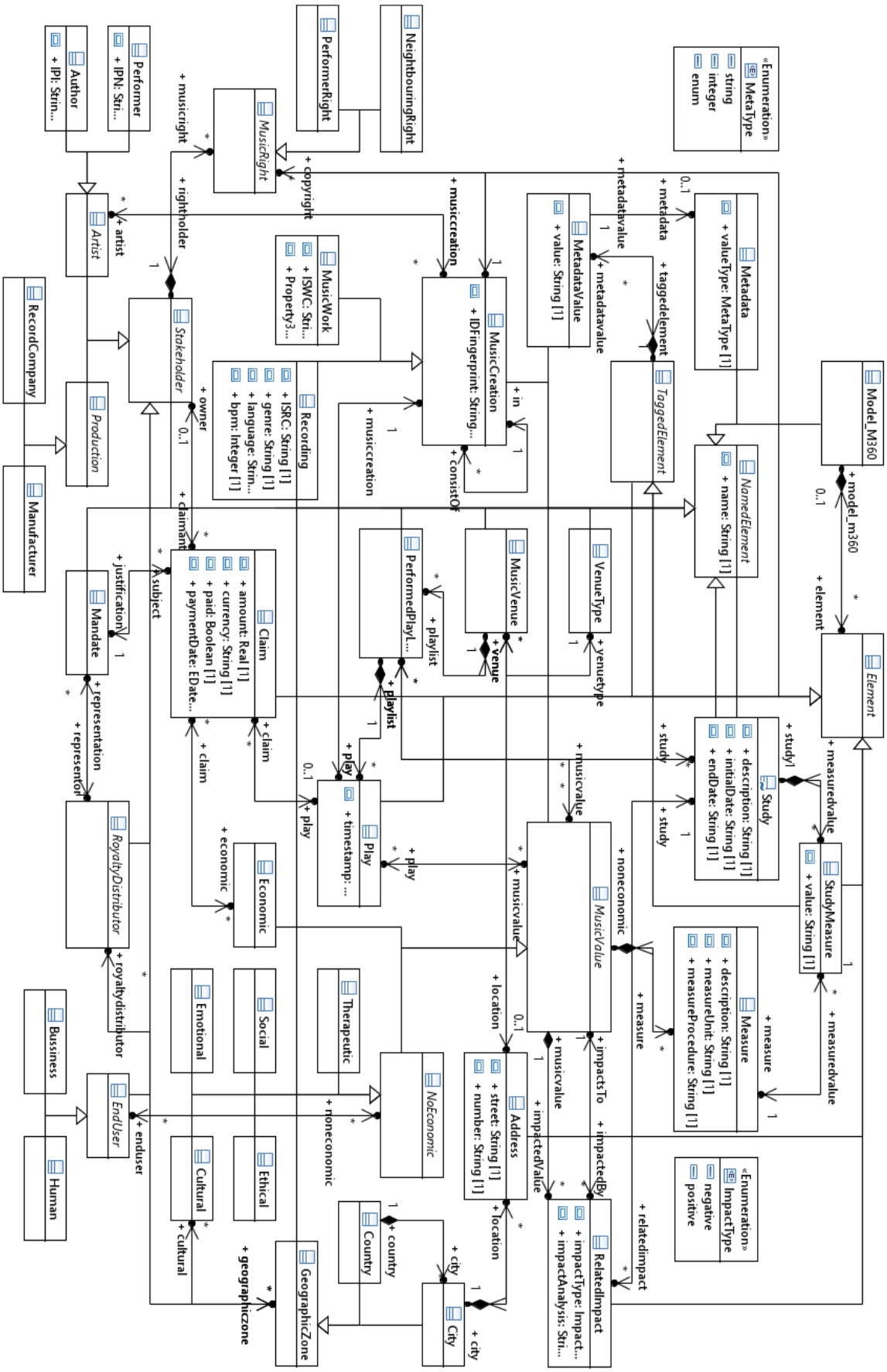

Figure 2. MOF metamodel related to the Music360 ontology (Version 2)

2. Music 360 Ontology - Version 2

The main concepts related to the Music360 ontology can be located in the following four different groups: Music Economic and Non-Economic Value, Music Creation and Use, Music Rights and Licence Management, Music Stakeholders. From these four groups, the concepts related to the Music Economic and Non-Economic Value specification are the core of the Music360 ontology for measuring the value of music. The other three groups are defined to support the data-interoperability among different stakeholders' existing platforms, specially CMOs. For the new version of the Music360 Ontology (version 2), the original metamodel have been refined and new conceptual constructs have been added for supporting the Living Labs definition and execution.

Figure 2 shows the metamodel defined for the Music360 Ontology Version 2. The OMG MOF Standard[2] has been used for the representation of this metamodel. The Eclipse Modelling Tools[3] have been used for the specification of the conceptual model and implementation of model editors that support the Music360 metamodel instances.

2.1. Music Economic and Non-Economic Value

In the new version of the Music360 ontology, the non-economic values are classified into five main value types: Social, Cultural, Ethical, Emotional, and Therapeutic Value.

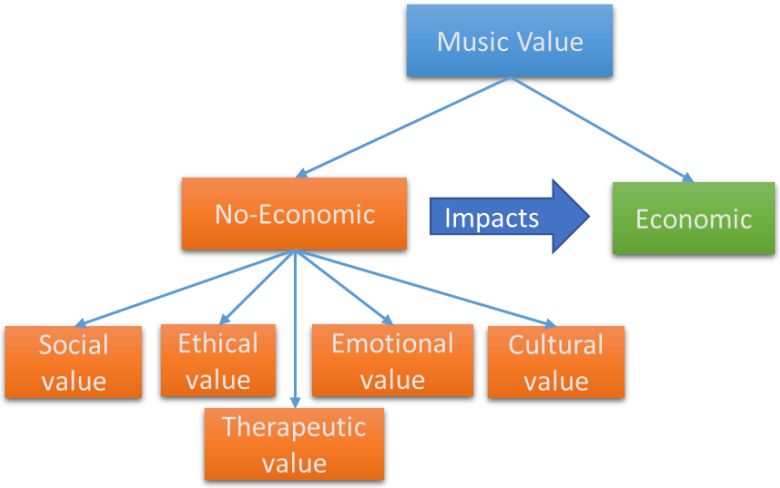

Figure 3. Music360 Economic and Non-Economic Values Relationship

Moreover, these music values can have positive or negative impact each other. For instance, non-economic values can have an impact on the economic music value (see Figure 3). It is precisely the capturing and measurement of music values, trying to

2 OMG (2016). Object Management Group Meta Object Facility (MOF) Core Specification Version 2.5.1. Retrieved from https://www.omg.org/spec/MOF

3 Eclipse modeling tools. https://www.eclipse.org/downloads/packages/release/2021-06/r/eclipse-modeling-toolsl.

determine in a quantitative manner the impact that can have over the economic value of music, one of the main objectives of the Music360 platform.

The main constructs (Meta-Classes) related to Economic and Non-Economic Music are described below.

2.1.1. Metaclass Music Value (Specialization of NamedElement)

The Metaclass Music Value represent any kind of value (monetary and non-monetary) related to a music play or to a music playlist used in a venue. This is an abstract metaclass that is specialized in the NoEconomic and Economic Metaclasses.

Properties:

- **name.** Inherited from superclass NamedElement.

Relationships:

- **play** [0..*]. Indicates the music plays that are related to the corresponding music value.
- **Study** [0..*]. Indicates the studies where the related music value is involved.
- **performedlist** [0..*]. Indicates the play lists related to different venues that are related to the corresponding music value.
- **impactedValue** [0..*]. Indicate other values that are impacted positively or negatively by a music value. The impact kind is specified by means of the enumeration ImpactType.
- **impactedBy** [0..*]. Indicates the music values that impact the corresponding music value.
- **measure** [0..*] (composite). Indicate the measures related to a music value evaluation.

2.1.2. Metaclass RelatedImpact (Specialization of Element).

The Metaclass RelatedImpact represent how a specific music value can have a positive or negative effect over other music value. This impact allows to indicate the effect observed from the analysis of music values in different studies. This is a concrete metaclass.

Properties:

- **impactType.** Valued from Enumeration ImpactType. Indicates the positive or negative effect that a music value can have over other music value.
- **impactAnalysis.** Describe the analysis that support the impact effect indicated from a specific study.

Relationships:

- **impactsTo** [1..1]. Indicates the music value that is positively or negatively affected by the other music value being analysed.
- **musicValue** [1..1] (composite). Indicates the analysed music value that has a positive or negative effect on another music value.
- **study** [1..1]. Indicates the study related to the impact analysis.

2.1.3. Metaclass Metadata (Specialization of NamedElement).

The Metaclass Metadata represent the type of metavalues that can be used to characterize and classify different tagged elements in the Music360 repository. This is a concrete metaclass.

Properties:

- **name.** Inherited from NamedElement.
- **valueType.** Indicates the type of value associate to the corresponding metadata, this can be string, integer or enum. (defined in the enumeration MetaType)

Relationships:

- **metadatavalue.** Indicates the values associated to a specific metadata.

2.1.4. Metaclass TaggedElement (Specialization of Element).

The Metaclass Metadata represent an element that can have tagged values to represent specific metadata. This is an abstract metaclass that can be specialized to Study, PerformedPlaylist, Play, and Recording.

Properties: --

Relationships:

- **Metadatavalue** [0..*] Indicates the values owned by the corresponding tagged element associated to a specific metadata.

2.1.5. Metaclass MetadataValue (Specialization of Element).

The Metaclass Metadata represent an the values for a specific metadate that are owned by a tagged element. This is a concrete metaclass.

Properties: --

Relationships:

Metadata [0..1]**.** Indicates the values owned by the corresponding tagged

taggedelement [1..1]. Indicates the metadata values owned by the corresponding tagged element.

2.1.6. Metaclass NoEconomic (Specialization of MusicValue).

The Metaclass NoEconomic represent any no-economic music value (non-monetary) related to a Recording. This is an abstract metaclass that is specialized into the Social, Cultural, Ethic, Emotional, and Therapeutic Metaclasses.

Properties:

- **name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Indicates the end users (people or businesses) impacted by the corresponding non-economic value.

2.1.7. Metaclass Social (Specialization of NoEconomic).

The Metaclass Social represents any social value related to a play or a playlist. This is a concrete metaclass.

Properties:

- **Name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Inherited from NoEconomic.

2.1.8. Metaclass Emotional (Specialization of NoEconomic).

The Metaclass Emotional represents any emotional value related to a play or a playlist. This a concrete metaclass.

Properties:

- **Name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Inherited from NoEconomic.

2.1.9. Metaclass Ethical (Specialization of NoEconomic).

The Metaclass Ethical represents any ethical value related to a play or a playlist. This is a concrete metaclass.

Properties:

- **Name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Inherited from NoEconomic.

2.1.10. Metaclass Therapeutic (Specialization of NoEconomic).

The Metaclass Therapeutic represents any therapeutic value related to a play or a playlist. This a concrete metaclass.

Properties:

- **Name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Inherited from NoEconomic.

2.1.11. Metaclass Cultural (Specialization of NoEconomic).

The Metaclass Cultural represents any cultural value related to a play or a playlist. This is a concrete metaclass.

Properties:

- **Name.** Inherited from NamedElement.

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **Study** [0..*]; **measure** [0..*]. Inherited from Music Value.
- **enduser** [0..*]. Inherited from NoEconomic.
- **geographiczone** [0..*]. Indicates the geographical locations that can be related to a cultural value.

2.1.12. Metaclass Economic (Specialization of MusicValue).

The Metaclass Economic represent the economic or monetary value related to a music creation. This economic value is directly related to the licensing process related to the use of music. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement

Relationships:

- **play** [0..*]; **venueplayist** [0..*]; **impactedValue** [0..*]; **impactedBy** [0..*]; **valueproperties** [0..*]; **musicvenue** [1..1]. Inherited from metaclass Music Value.
- **claim** [0..*]. Indicate the claims associated to one or more economic values.

2.1.13. Metaclass Measure (Specialization of NamedElement).

The Metaclass Measure represents the measures that can be used to evaluate a music value. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement
- **description**. Provides the details about the measure defined.
- **measureUnit**. Indicates the measure unit for the measure defined.
- **measureProcedure**. Indicates the measure procedure for the measure defined.

Relationships:

- **musicvalue** [0..1]. Indicates the music value that owns the corresponding measure.
- **measuredvalue** [0..*]. Indicates the specific value that a measure gets for a specific study.
-

2.1.14. Metaclass Study (Specialization of NamedElement).

The metaclass Study represents the studies oriented to analyse the music value in different context, considering the effect of the playlist reproduced in specific venues. This the instances of this class are used to represent the living labs performed in Music360 project. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement
- **description**. Provides the details about the measure defined.

Relationships:

- **metadataValue** [0..*]. Inherited from TagedValue. Indicates further metadata that complements the specification of the study.

- **playlist** [0..*]. Indicates the play lists involved in the corresponding studies, also indicating the venues involved to the playlist reproduction.
- **measuredvalue** [0..*]. Indicates the specific values that are identified and measured from a specific study.

2.1.15. Metaclass StudyMeasure (Specialization of NamedElement).

The metaclass StudyMeasure represents the values measured from the execution of different studies, such as Music360 Living Labs.

Properties:

- **value**. Indicates the value obtained from the measure evaluation.

Relationships:

- **metadataValue** [0..*]. Inherited from TagedValue Indicates further metadata that complements the information about the measure evaluation for a specific study.
- **Study** [1..1]. Indicates the study related to the measure evaluation.
- **measure** [1..1]. Indicates the specific measure evaluated.

2.1.16. Metaclass GeographicZone (Specialization of NamedElelment).

The metaclass GeographicZone represents the geographical locations that can be associated to a cultural value and/or to a royalty distributor in terms of different cities or countries involved. This is a concrete metaclass.

Properties: **name**. Inherited from superclass NamedElement

Relationships:

- **royaltydistributor** [0..*]. Indicates the royalty distributors related to a specific geographic zone.
- **cultural** [0..*]. Indicates the cultural music values that are related to a specific geographic zone.

2.2. Music Creation and Use

The music conceptual model includes a set of conceptual constructs (metaclasses) related to the characterization of music creations and their use in specific music venues.

2.2.1. Metaclass MusicCreation (Specialization of NamedElelment).

The metaclass MusicCreation represents the main musical artefacts that can be played in music venues. These musical artefacts can be musical works that can be performed by musical artists (for example, in live music events), or musical recordings that can be played using digital or analogue media. This is an abstract metaclass that specialises in the metaclasses Recording and MusicWork.

Properties:

- **name**. Inherited from superclass NamedElement
- **IDFingerprint.** Identification code implemented in the context of the MUSIC360 platform to provide a unique identification the different music creations.

Relationships:

- **playlist** [0..*]. Indicates the playlist related to specific venues where the corresponding music creation is involved.
- **play** [0..*]. Indicates the moment and place where the music creation is played.
- **artist** [0..*]. Indicates the artists involved in the music creation.
- **copyright** [0..*]. Indicates the copyrights related to a music creation.
- **consistOf** [0..*]. Permits to define a music creation as a composition of different music creations, for example, a re-mix with different songs.

2.2.2. Metaclass MusicWork (Specialization of MusicCreation).

The metaclass MusicWork represents the abstract idea of a composition, including its melody, harmony, and structure. A music work can also be a composition of different music works. This is a concrete metaclass.

Properties:

- **name.** Inherited from superclass NamedElement.
- **IDFingerprint.** Inherited from superclass MusicCreation.
- **ISWC**. International Standard Musical Work Code. Unique identifier for music works.

Relationships:

- **playlist** [0..*]**; use** [0..*]; **artist** [0..*]; **copyright** [0..*]; **consistOf** [0..*]. Inherited from superclass MusicCreation.

2.2.3. Metaclass Recording (Specialization of MusicCreation).

The metaclass Recording represents a specific performance made by one or more artists. This is a concrete metaclass.

Properties:

- **name.** Inherited from superclass NamedElement.
- **IDFingerprint.** Inherited from superclass MusicCreation.
- **ISRC**. International Standard Recording Code. Unique identifier for music records.
- **genre.** Indicates the genre associated to a recording.
- **language.** Indicates the language associated to a recording.
- **bpm.** Indicates the tempo for a recording in beats-per-minute.

Relationships:

- **playlist** [0..*]**; use** [0..*]; **artist** [0..*]; **copyright** [0..*] Inherited from superclass MusicCreation.
- **metadataValue** [0..*]. Inherited from TagedValue. Indicates further metadata that complements the specification of the recording.

2.2.4. Metaclass Play (Specialization of Element).

The metaclass Play represents the moment when a music creation is played by indicating the related music venue and the different music values (monetary and non-monetary) that can be associated to the execution of music creation involved in the play. This is a concrete metaclass.

Properties:

- **timestamp**. Indicates the temporal moment when a music creation is played.

Relationships:

- **metadataValue** [0..*]. Inherited from TagedValue. Indicates further metadata that complements the specification of the play.
- **musicvenue** [1..1]. Indicates the music venue where a play is performed.
- **musiccreation** [1..1]. Indicates the music artifact (recording or music work) played in a specific venue.
- **musicvalue** [0..*]. Indicates the music values (monetary and/or non-monetary) related to a music creation play.

2.2.5. Metaclass MusicVenue (Specialization of NamedElement).

The metaclass MusicVenue represent the specific context where a music creation is played. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **venuetype** [1..1]. Indicates the venue type related to a music venue.
- **use** [0..*]. Indicates the music creations effectively played in a music venue.
- **playlist** [0..*]. Indicates the playlists defined for a music venue.
- **location** [1..1]. Indicates the place where a music venue is performed.

2.2.6. Metaclass Address (Specialization of Element).

The metaclass Adress represents the specific location of a music venue by indicating the street and number in a specific city. This is a concrete metaclass.

Properties:

- **street**. Indicates the street where a music venue is located.
- **number**. Indicates the number of the street to precise the music venue location.

Relationships:

- **venue** [0..*]. Indicates the venue located in a specific address.
- **city** [1..1]. Indicates the city where the corresponding address belongs.

2.2.7. Metaclass VenueType (Specialization of NamedElement).

The metaclass VenueType Indicates the kind of music venues defined in the music360 platform. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **venue** [0..*]. Indicates the different venues related to a corresponding venue type.

2.2.8. Metaclass PerformedPlayList (Specialization of NamedElement).

The metaclass PerformedPlayList describes the different playlists related to a music venue. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **metadataValue** [0..*]. Inherited from TagedValue. Indicates further metadata that complements the specification of the playlist.
- **musicvenue** [1..1] (composite). Indicates the different venues where the corresponding playlist is used.

- **musicvalue** [0..*]. Indicates the music values (monetary and/or non-monetary) related to a venue playlist.
- **play** [0..*]. Indicates the music creations played in a playlist.

2.3. Music Rights and Licence Management

The music conceptual model includes a set of conceptual constructs (metaclasses) related to the generic characterization of the licence management and stakeholders rights over the music creations. These conceptual constructs are described below. The new version of the ontology improves the assignment of music rights, considering the different stakeholder can have music rights over a same music creation. Moreover, it is considered that the music rights can be owned by different stakeholders, not only performers or authors, for instance, a record company.

2.3.1. Metaclass Mandate (Specialization of NamedElement).

The metaclass Mandate indicates the agreement that an interested party signs with a CMO for the collection of the corresponding royalties related to the claims of the music creations played. This a concrete metaclass.

Properties:

- **shareAmount**. Amount of money that must be collected by a royalty distributor for the use of a music creation.

Relationships:

- **representor** [1..1]. Indicates the royalty distributor that is responsible for collecting shares associates to a mandate.
- **subject** [0..*]**.** Indicates de claims of music creations related to the corresponding mandate.

2.3.2. Metaclass Claim (Specialization of Element).

The metaclass Claim indicates the royalties paid a music creation played. This a concrete metaclass.

Properties:

- **amount**. Amount of money that must be collected for a music creation play
- **currency**. Currency related to the payment for the music creation play
- **paid**. Status of the payment related to the claim. TRUE = Claim Paid; FALSE = Claim not paid.
- **paymentDate**. Indicates the date when the payment related to the claim has been performed.

Relationships:

- **play** [0..1]. Indicates the music creation play related to the corresponding claim.
- **justification** [1..1]**.** Indicates the mandates that enables to the Royalty Distributor to request the corresponding claim.
- **owner** [0..1]. Indicates the beneficiary related to the corresponding claim.
- **economic** [0..1]**.** Indicates the economic values related to the claim.

2.3.3. Metaclass MusicRight (Specialization of Element).

The Metaclass MusicRight the music creation rights owned by a stakeholder. Thus, different stakeholder with different profiles can have rights over a same music creation This is an abstract metaclass that is specialized in NeightbouringRight and PerformerRight.

Properties: --

Relationships:

- **musicreation** [1..1]. Indicates the music creation (music work or recording) related to the corresponding music right.
- **rightholder** [1..1] (composite). Indicates the right holder that owns the corresponding copyright.

2.4. Music Stakeholders

The Music360 conceptual model include a set of metaclasses that provide a general characterization of the stakeholders related to the Music360 ecosystem. These stakeholders can be instantiated into particular actors according to the different music use and the related economic and non-economic values.

2.4.1. Metaclass Stakeholder (Specialization of NamedElement).

The metaclass Stakeholder provides the generic characterization of the stakeholders involved in the Music360 platform. This is an abstract metaclass specialized in the metaclasses Artist, Production, RoyaltyDistributor, and EndUser.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **musicright** [0..*]. Indicates the music rights that are held by a stakeholder in relation to one or more music creations.

- **claimant** [0..*]. Indicates the claims that must be paid to the corresponding stakeholder.

2.4.2. Metaclass Artist (Specialization of Stakeholder).

The metaclass Artist represents the roles and attributes that can be associated with individuals or groups contributing to the music creation. For instance, an artist can be a performer, which encompasses various roles such as instrumentalists and vocalists. Musicians are responsible for performing music compositions, either through playing musical instruments, singing, or a combination of both. Other example is the author, which is an artist who creates musical works, such as songs, symphonies, or soundtracks. This is an abstract metaclass specialized in the Performer and Author.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **musiccreation** [0...*]. Indicates the music creations where the corresponding artist participates.

2.4.3. Metaclass Performer (Specialization of Artist).

The Performer metaclass represents the artists involved in the performance of a musical creation, such as instrumentalists and vocalists.

Properties:

- **name**. Inherited from superclass NamedElement.
- **IPN**. International Performer Number. is a unique identifier for performers: singers or musicians.

Relationships:

- **claimant** [0...*]; **musicright** [0..*]. Inherited from Stakeholder.
- **musiccreation** [0..*]. Inherited from Artist

2.4.4. Metaclass Author (Specialization of Artist).

The Author metaclass represents the artists involved in the composition of a musical creation, such authors of songs, symphonies, or soundtracks.

Properties:

- **name**. Inherited from superclass NamedElement.

- **IPI**. An Interested Party Information (IPI) number is a unique, international identification number.

Relationships:

- **claimant** [0...]; **musicright** [0..*]. Inherited from Stakeholder.
- **musiccreation** [0..*]. Inherited from Artist

2.4.5. Metaclass Production (Specialization of Stakeholder).

The metaclass Production represents the stakeholder involved in making creative and technical decisions during the music creation process and production of a musical composition. This is an abstract metaclass specialized in Record Company and Manufacturer.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **claimant** [0...]; **musicright** [0..*]. Inherited from Stakeholder.

2.4.6. Metaclass Manufacturer (Specialization of Stakeholder).

The metaclass Manufacturer represents the stakeholders involved in making the music works available through digital or analogic supports and/or providing the necessary musical resources for the correct music performance. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **claimant** [0...]; **musicright** [0..*]. Inherited from Stakeholder.

2.4.7. Metaclass RecordCompany (Specialization of Production).

The metaclass RecordCompany represents the organization (also known as a record label) that specializes in the production, distribution, and promotion of music recordings. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **claimant** [0...]; **musicright** [0..*]. Inherited from Stakeholder.

2.4.8. Metaclass RoyaltyDistributor (Specialization of Stakeholder).

The metaclass RoyaltyDistributor represents the organizations or entities that are responsible for collecting and distributing royalties and payments to music rights holders. CMOs are a king of royalty distributors. This is a concrete metaclass

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **claimant** [0...]; **musicright** [0..*]. Inherited from Stakeholder.

2.4.9. Metaclass EndUser (Specialization of Stakeholder).

The metaclass EndUser represents to individuals or entities that consume or interact with music in various ways. These end users can include music listeners, consumers, and other entities that engage with music, such as businesses using music for commercial purposes, or medical centres that use music for therapeutic purposes. This is an abstract metaclass specialized in the metaclasses Business and Human.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **ownedbenefits** [0...*]. Inherited from superclass Stakeholder.

2.4.10. Metaclass Business (Specialization of EndUser).

The metaclass Business represents commercial entities or organizations that use music for various purposes in the course of their operations. These businesses may include retail stores, restaurants, advertising agencies, event organizers, and any other entity that utilizes music for professional, commercial, or promotional activities. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **ownedbenefits** [0...*]. Inherited from superclass Stakeholder.

2.4.11. Metaclass Human (Specialization of EndUser).

The metaclass Human represents individuals who interact with music-related services, platforms, and content. These users are music enthusiasts, consumers, and music professionals who engage with music in various ways, such as listening to music, creating playlists, managing their music collections, and exploring music-related content. This is a concrete metaclass.

Properties:

- **name**. Inherited from superclass NamedElement.

Relationships:

- **ownedbenefits** [0...*]. Inherited from superclass Stakeholder.

3. Music 360 Ontology and Living Labs Alignment

One of the key updates in the second version of the music360 ontology is the improved representation of concepts related to the impact of music, as captured in various research studies conducted within the Living Labs. This update addresses two main challenges associated with the data generated in these Living Labs: the level of granularity of the data and the representation of qualitative and unstructured data.

Firstly, the ontology now allows for a more detailed and nuanced representation of the data, accommodating different levels of granularity. This means that both high-level summaries and fine-grained details can be accurately captured and analysed.

Secondly, the new version includes improved mechanisms for representing qualitative data. This is crucial for capturing the rich, descriptive insights that often emerge from Living Lab studies, which are not easily quantified but are essential for understanding the full impact of music on individuals and communities.

Overall, these updates make the music ontology a more powerful tool for researchers, enabling them to better capture, analyse and interpret the complex ways in which music impacts. Below we discuss the rationale and key design aspects considered to address these two elements.

Music Granularity Levels

The Music360 living labs have exposed the complexity about capturing the music impact in different context. Originally, it was expected a simple connection between music creations and the effect that this creation may have over individuals, groups, or organizations such as retail stores or bars. For instance, the effect that the Mariah Carey Christmas song has over the festivity feelings of people. At this respect, one of the living labs performed in Finland analyses the effect of music in relation to the

intention to buy of people in a large retail store. However, to capture the effect of a specific music creation is much difficult in real settings, since the attention of most the people involved is not paid into background music itself, and, hence, they can have an opinion about the kind of music played or the music mood, but not about the specific song. Similar situation happens in the living labs executed about the "Moros y Cristianos" local party in Valencia. Despite in this local celebration, there exist a specific kind of music played, the attention of the people was paid to the celebration activities not to identify a specific song.

Music Dimensions and Granularity levels.

The version 2 of Music360 ontology captures the impact of music considering different dimension to equalize the granularity levels involved in Living Labs, according to the configuration of the real setting involved. These dimensions can vary from the playlist that group a set of specific music creation involved in the setting analysed, the relevance of music as main attention subject (foreground music) or as complementary artifact different venues (background music), or the period of time were the study or study executions are performed, etc. Despite Music360 project is aimed at evaluating background music, we included other dimension to support the linkage with different kind of studies and facilitate the knowledge interchange.

The conceptual model defined for Music360 project (WP1 Deliverable) defines a value matrix with a set of dimensions that determinate the value of music in different settings (See Figure 4). For supporting these different analysis dimensions and granularity levels, the Music360 Ontology (version 2) relates the music values to the play of specific music creations as well as to performed playlist. Also, it includes the concept of Study to aggregate the information from different plays or playlist with the evaluation and measurement o specific monetary and non-monetary impacts. Moreover, since the nature of the study requires flexibility to incorporate different analysis dimensions, the concept of tagged element is included to indicate those conceptual construct that can be extended with specific metadata to enrich their analysis and classification. This metadata is particularly relevant for the management of qualitative data coming from the living labs and studies performed.

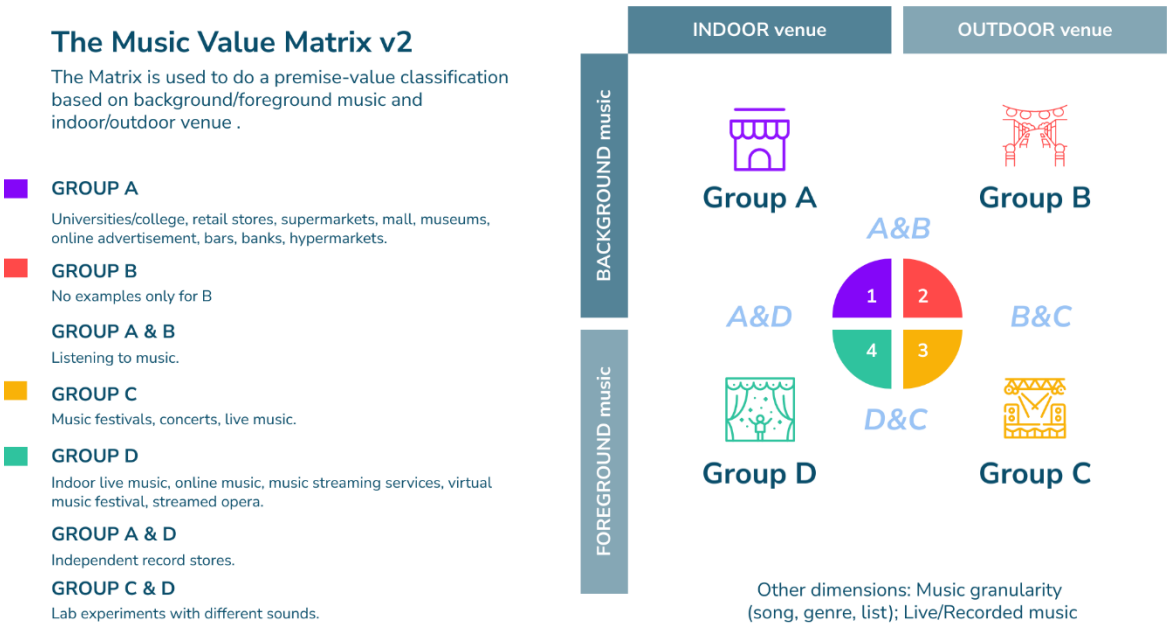

Figure 4. Music360 Conceptual Model - Value Matrix V2

Music360 Living Labs and Qualitative Data

The Living Labs provide qualitative information that is difficult to standardise into a common set of measures. Most of the studies complement the quantitative information with technical analysis reports, which are presented in a textual manner without any specific structure. It is therefore necessary to provide in the ontology the conceptual construct and relationships to link this qualitative and unstructured data with the music information already provided by CMOs and venues on music reproductions and royalty payments.

In addition to the levels of granularity mentioned above, qualitative data has the complexity of not providing common measurement mechanisms for comparing results across studies. For example, a living lab may relate the mood of the songs to the happiness or satisfaction of the people around a playlist. However, it is very difficult for different studies to play exactly the same playlist, and more importantly, satisfaction levels do not just depend on the music played, as in real life there are other factors that influence people's behaviour and feelings that cannot be completely isolated. For example, the purchase intention of people in the Finland Living Lab related to a large retailer is not only dependent on the music played, it can also be influenced by promotions or product offers that happened during the same period of time as the Living Lab was conducted. Thus, the additional metadata captured during the Living Lab execution takes on special relevance, as the analysis of the results can be refined or even adjusted according to specific characteristics that happened during the Living Lab execution.

In the version 2 of Music360 ontology the conceptual constructs that can be extended with specific metadata are the following: Study, Performed Playlist, Play, and Recording. All these constructs are represented as metaclasses that extend the concept of Tagged Element in the reference Music360 ontology.

Supporting Music360 Platform

The first implementation of the Music360 platform considers the data model shown in Figure 4, based on the reference ontology. This data model has been implemented using the PostgressSQL database and is the repository support for the different demonstrations carried out, where the information from the Portuguese, Finnish and Dutch venues have been integrated. The architecture and implementation details are presented in D2.5 in relation to the development of WP2.

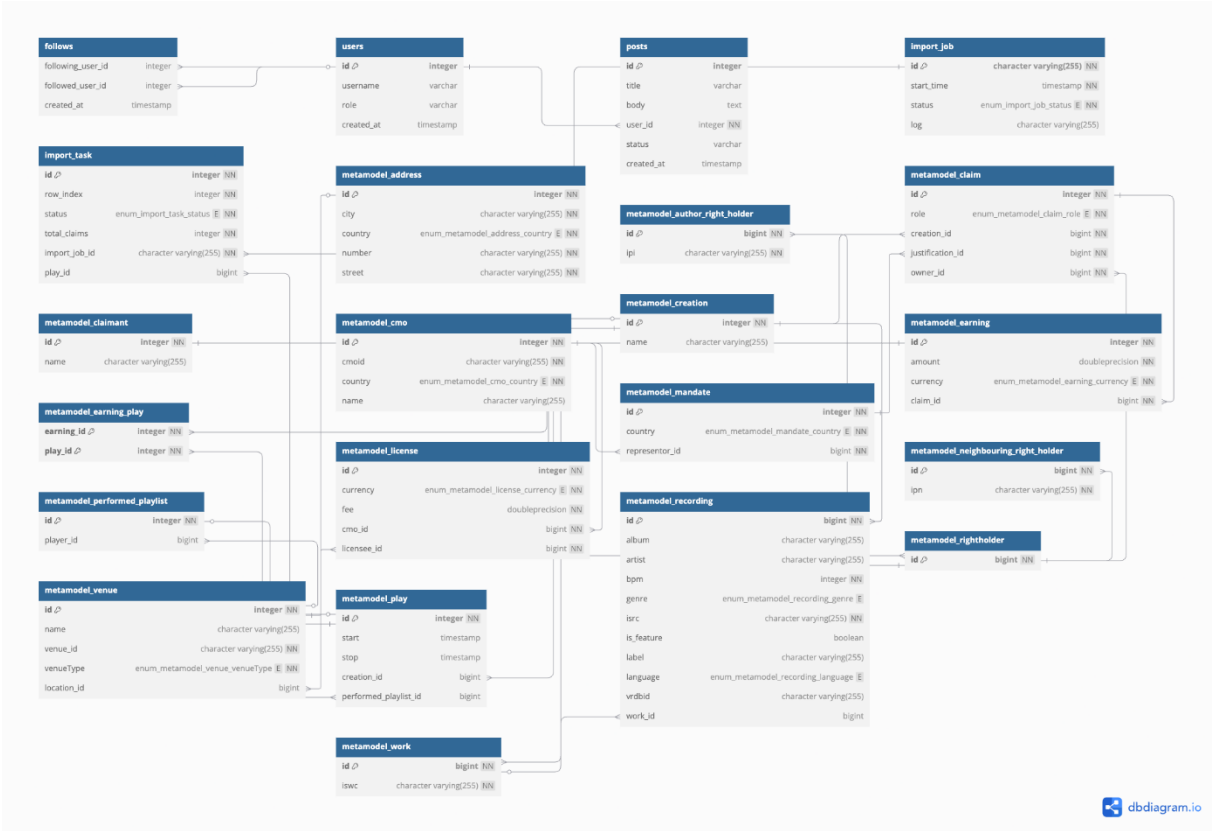

Figure 4. Implemented data model for the Music360 platform

Overall, the implementation of the music360 platform, supported by the proposed moode-driven approach have enabled interoperability among different stakeholders, providing standardized data management across the music value chain. Thus, facilitating data collection, and evidence based decisions for stakeholders, among other benefits.

These results are possible by means of the interdisciplinary collaboration of computer science, marketing, and social science research teams, together with the support of various CMOs and companies related to the creation and use of music. In this way,

music organizations and creators would have accurate information about the distribution of royalties and the use of music, policymakers would have details about the real value of music, and researchers would be able to generate new studies and share knowledge about the impact of music in different areas.

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Appendix: Application of the ontology for Living Labs

Based on the Music360 ontology, we derived the data model used for the living labs. In addition to the ontology, the data model is based on a series of workshops with the Dutch Collective Management Organizations (CMOs), namely SENA and BUMA (see Figure 4).

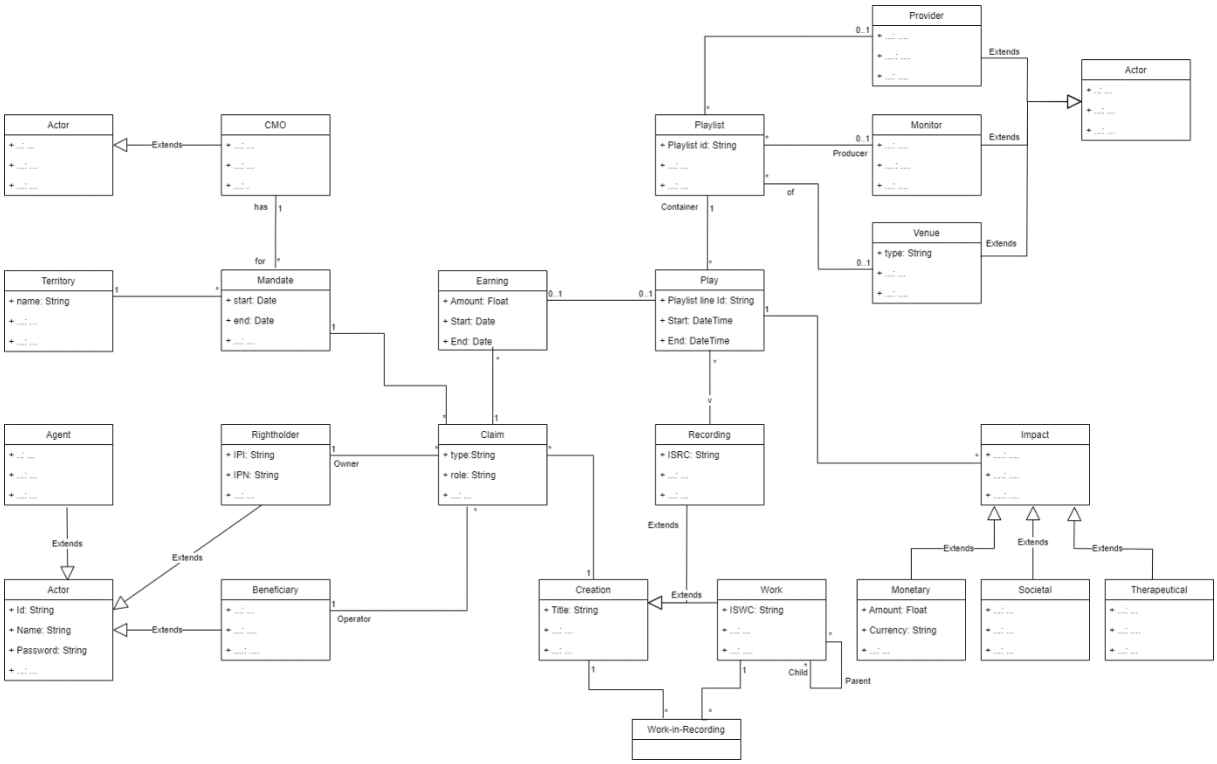

Figure 4. Base data model for the living labs

Actor

Explanation: An actor is an identifiable natural person or legal entity such as an organisation, enterprise, foundation, etc.

Identification: There is no world-wide identification of actors. There are different identification methods for specific kinds of actors. Where appropriate, we will use the scheme for that actor.

Properties: Actors can have many properties, such as their name.

Rightholder

Explanation: A rightholder is any actor who has a claim on creation.

Example: Artist, composer, producer and publisher are all rightholders.

Identification: Rightholders are, depending on their nature, identified differently. Rightholders of neighbouring rights are identified by their International Performer Number (IPN), whereas authors are identified by the Interested Party Information (IPI). A rightholder can have both an IPI and IPN; then such a rightholder is for example both

artist and composer. Note that the current metadata of the music industry does not relate the IPI and IPN.

Relations:

- A rightholder can be represented by an agent

Agent

Explanation: An agent is someone, who represents the interests of a rightholder. Typically, famous rightholders do not directly manage their neighbouring- and author rights, but use an agent to do so.

Identification: The identification used by the CMO, plus the identification of that CMO.

CMO

Explanation: A Collective Management Organization (CMO) is an organization that collectively, so on behalf of many right holders, obtains a compensation from right users (restaurants, shops, etc.), and pays the collected fees, minus an administrative fee, to the rightholders.

Benificary

Explanation: A beneficiary is an actor who obtains money that is paid as a result of a neighbouring- or author right.

Identification: The identification used by the CMO, plus the identification of that CMO.

Claim

Explanation: A rightholder has a claim on a work (either a recording or a work).

Properties:

- Type: either a neighbouring or author claim
- Role: the claiming role a rightholder has in relation to the creation (e.g. main artist, studio musician, producer, lyrics author, etc.). CMOs have an exhaustive list of the possible roles.

Identification: A claim is identified by the combination of the rightholder, creation, and role.

Relations:

- A claim has a creation to which the claim applies.
- A claim may have a beneficiary. Default, the right owner is the beneficiary (e.g. the party who receives the payment associated with the claim), but this may be delegated (sold) to a beneficiary.

Creation

Explanation: A creation is either a work or a recording.

Recording

Explanation: A recording is the master, often a digital file, that carries music played by musicians, e.g. in studio but also during a live performance. Recordings are associated with neighbouring rights.

Identification: A recording is identified by the International Standard Recording Code (ISRC). In this project we assume that the ISRC code uniquely identifies a recording.

Work

Explanation: A work is an intellectual creation, in our context often lyrics, scores, and compositions. Works are associated with author rights.

Identification: A work is identified by the International Standard Work Code (ISWC). In this project we assume that the ISWC code uniquely identifies a work.

Relations:

- A work may consist of other works.

Work-in-recording

Explanation: A recording often is based on a work. However, more than one work may be involved, for example in case of a medley. Obviously, a work can have many recordings

Identification: A work-in-recording is identified by the combination of the recording and the work.

Relations:

- A work-in-recording has one recording.
- A work-in-recording has one work.

Mandate

Explanation: A mandate expresses that a CMO is allowed, for a specific claim, to collect fees, and to pay the rightholder.

Properties:

- Start date: When does the mandate start.
- End date: When does the mandate ends.

Relations:

- A mandate is for a CMO.

- A mandate is for territory. Note that a territory can multiple mandates. Often, CMO is the only party who has a mandate for a specific territory, but in case of competition, multiple mandates for the same territory are possible.
- A mandate is for multiple claims.

Identification: A mandate is identified by the combination of the start- and end date, the CMO, and the territory.

Territory

Explanation: A territory is a geographical area.

Example: NL, FI, PT, SP, IE, B, EMEA, USA,…

Earning

Explanation: An earning is a financial result for a claim, which is paid to a rightholder or beneficiary. The earning allows very course grained earnings, e.g. for one year, and for very fine grained earnings, e.g. a play of one recording.

Properties:

- Amount, which reflects the amount of money to be paid.
- Start, the moment the earning periods starts.
- End, the moment the earning periods ends.

Relations:

- An earning is for a claim.
- An earning is based on a mandate.

Identification: An earning is identified by the start- and end data, and on the claim.

Play

Explanation: A play represents that (part of) a recording is played a music user, e.g. a radio station, a restaurant, or a shop.

Properties:

- A play has a start date and time.
- A play has an end date and time.

Relations:

- A play can be associated with an earning. Note that in many cases, a play can not be directly related to a play. Based on an algorithm, collected money by the CMOs are distributed over claims, e.g. based on the playlists of radio stations, market research, etc. In some cases, where venues are monitored using finger printing technology it is possible to relate the play to an earning.

Identification:

- A play is identified by a playlist line id.

Playlist

Explanation: A playlist is a collection of plays.

Relations:

- A playlist consists of plays.

Identification:

- A playlist is identified by a playlist id.

Provider

Explanation: A playlist is delivered by a provider.

Relations:

- A playlist may be delivered by a provider, such as a background music provider, a radio station. In case someone plays from a local CD/MP3, there is no playlist provider.

Monitor

Explanation: A monitor is the party who listens to music played (e.g. on the radio, or by a shop), and identifies the recording played.

Relations:

- A monitor produces playlists.
- A monitor monitors a music user (e.g. by means of a music finger printing device).

Music user

Explanation: A music user is an entity which makes music public, and as result of that, has to pay for neighbouring and author rights.