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Stories, Songs, Steps, and Tunes: A Linked Data Ontology for Irish Traditional Music and Dance[1]

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1. Introduction

Linked data has shown great promise in cultural heritage and digital humanities applications, making cultural heritage materials accessible to wider audiences through the Semantic Web. For cultural heritage materials, accurate description of and relationships to other objects within a collection or between other collections is essential to enabling access to these materials. Because linked data provides flexibility in several key areas, including appropriate levels of detail, ability to accommodate a myriad of relationship types, and the ability to choose precise vocabulary and descriptions, it is ideal for use in representing Irish traditional music and other world music traditions (Weissenberger 2014).

Stories and narrative play a large part in orally-based transmission of Irish traditional music and dance, infusing relationships between people–and between people and music information objects–with layers of nuance and complexity. A recently commenced project, LITMUS (Linked Irish Traditional Music), focuses on the development of the first linked data ontology specifically to address the needs of Irish traditional song, instrumental music, and dance–and by extension serve as a reference point for other linked data projects involving orally-based music traditions.

This paper describes several key issues related to constructing this linked data ontology, including challenges of accurately representing complex musical relationships: musician-musician; musician-music; music-dance; variants of tunes; where the musical variation ends and the act of composition begins; and, Irish language and English language equivalents in musician, tune, and geographic place names. Once completed, the ontology will enable future opportunities for digital discovery, exploration, and facilitate meaningful research connections in a variety of humanities and social science disciplines.

[1] LITMUS, Linked Irish Traditional Music, project results (Marie Skłodowska-Curie Action grant number 750814) were generated with the assistance of EU financial support.

2. Background

Pattuelli et al. (2015) emphasize the importance of ontologies to the linked open data environment, stressing they "form the backbone of this open and distributed environment as they provide the semantic glue that weaves the data together" (2015, p. 267). Among the few music ontologies developed, such as the Music Ontology, none adequately express orally-based traditions like Irish traditional music and dance. Music traditions propagated primarily through oral transmission have additional considerations and present unique representational challenges outside current knowledge organization frameworks, the majority of which are based upon the norms of Western Classical and Western Popular music (Weissenberger, 2015a and 2015b). An ontology based upon the considerations of oral transmission will allow such items to be described and related to one another using more appropriate terms and more accurate relationships than current music ontologies allow.

Previous projects in non-Western classical music and linked data include the ongoing Linked Jazz project, as well as the large-scale Europeana Sounds project, for which the Irish Traditional Music Archive provided content. EthnoArc, a project funded by the European Commission from 2006-2008, was a multiple-partner project among folk music archival institutions in Europe that aimed to improve access to catalogs of the partner organisations through the development of tools to support metadata integration and a common access portal to aid users in locating materials. While EthnoArc was not a linked data project, it is an early initiative to link distributed ethnomusicological material within a common framework to enable access to these materials.

3. Methodology

Ontology construction has several suggested methodologies, including Uschold and King (1995); Grüninger and Fox's (1995) TOVE methodology; Fernández-López et al. (1997), deemed a "methontology;" Noy and McGuinness (2001); and, Pattuelli et al. (2015). Stuart (2016) combines the first four methodologies into a 12-stage methodology:

1. Ontology scope
2. Ontology reuse
3. Identify appropriate software
4. Knowledge acquisition
5. Identify important terms
6. Identify additional terms, attributes, and relationships
7. Specify definitions
8. Integrate with existing ontologies

9. Implementation
10. Evaluation
11. Documentation
12. Sustainability

Steps 11 and 12 of Stuart's methodology stress the importance of, not only careful consideration and construction, but ongoing growth and maintenance. It is crucial to LITMUS that documentation provide the means for ongoing linked data work with the Irish Traditional Music Archive's collections. Sustainability of the project depends upon detailed and accessible documentation of the finished ontology, both for internal use and to encourage external use and re-use of the finished ontology by other cultural heritage groups. Methodology details and challenges will also be published as the project progresses, adding to the scant but growing literature on ontology construction for music and other types of performance, along with folklore and anthropology domains.

4. Ontology Construction Challenges

The Linked Irish Traditional Music (LITMUS) project faces numerous challenges related to steps 5 and 6 of Stuart's (2016) methodology, namely relationships and terminology made more difficult due to the imprecise and informal nature of oral transmission. Storytelling and narrative are embedded in relationships between musicians, the music, dancers, and how these are all situated within and across time and place.

Additionally, musicians and other cultural practitioners do not necessarily agree upon shared aspects of their culture, making Pattuelli's description of linked data ontologies as "represent[ing] agreed domain semantics," (2011, p. 314) more of a challenge in the context of Irish traditional music and dance. Many of the examples given within the following sections denote more than one single issue; the jig song and tune Páidín Ó Raifeartaigh / Paddy O'Rafferty illustrates several challenges at once: cross-lingual issues between Irish and English language names, variants or variations of a tune, tunes that are both sung and played without words using instruments, and challenges of applying the term "musical work" to describe tunes and relationships within Irish traditional music.

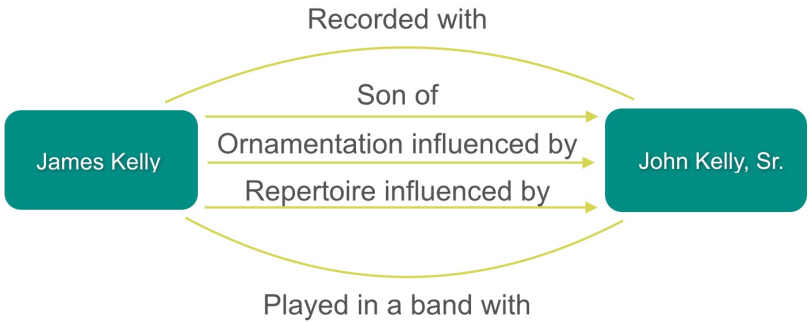
4.1 Musician-Musician Relationships

Linked Data requires precise relationships to be established (through use of RDF triples), and allows the assigning of more than one relationship between people. Common musical relationships include "teacher of," "played with," and "influenced by," some of which are in use already by Linked Jazz to denote musician-musician relationships. Some challenges in expressing musician-musician relationships are that there is not always a clear

primary relationship, or it may difficult to express a particular a musician-musician relationship.

The following illustrates some relationship expressions between James Kelly, a renowned fiddle player originally of Dublin but now in Miami, Florida, and his father John Kelly Sr., a member of Seán Ó Riada's legendary group Ceoltóirí Chualann and a renowned fiddle and concertina player originally from Clare. These account for some, but not all, of the possible relationships between the two musicians.

Figure 1. A few possible relationship expressions between James Kelly and John Kelly, Sr.



In terms of two-way relationships, James and John both "played in a band" and "recorded with" one another, as members of the group Ceoltóirí Laighean. James has three relationships expressed in relation to his father John, namely that he is John's son, and both his ornamentation and repertoire has been influenced by his father. These are also attributed to in-person narratives expressed by James directly to the researcher, an example of oral transmission and its direct relevance to the construction of the LITMUS ontology.

Many basic relationships such as "played with" and "performed with" or "influenced by" could be included in addition to the example relationships suggested for James and John Kelly. The example does not attempt to account for the philosophical influences from father to son that James has expressed numerous times to the researcher between 2004-2005 within a teaching context. Personal narrative and the process of oral transmission again plays a part in the documenting of relationships–as this example demonstrates. The example also questions whether we might fully learn of, or have adequate means to express, these human relationships in shortened form.

There are also practical considerations involving unique identifiers to disambiguate names of musicians in Irish traditional music. Too few musicians are included within the Virtual International Authority File (VIAF) to be a comprehensive option for Irish traditional

music and dance. While some prominent musicians are included, many musicians and dancers are not. For example, VIAF has well-known piper Willie Clancy but not the equally-regarded John Kelly, Sr., nor his children including John Kelly Jr. and James Kelly. Inaccuracies in VIAF data also present a problem: Micho Russell, a well-known whistle player, is included in VIAF but his death date is not noted although he died in 1991.

Commercial music alternatives like MusicBrainz may not prove as useful for the numerous non-commercial materials found in archives like the Irish Traditional Music Archive, and their list of relationships between artists is not comprehensive enough to adequately describe relationships for the purposes of the LITMUS project. For the Linked Jazz project, it was necessary for researchers to initially develop a directory of jazz musician names in order to facilitate future linked data work (full details of this process are described within Patuelli 2012). Faced with a similar problem, LITMUS will work toward the development of a similar directory of Irish traditional musicians and dancers, and provide necessary contributions of musicians' and dancers' names and information within current authority files.

4.2 Musician-Music Relationships

Within Irish traditional music, there is also a need to account for a fuller range of activities and relationships than "composer," "arranger," "performer" and others derived from assumptions based in Western Classical Music. Such relationships are already found in commercially-based ontologies such as the Music Ontology and relationships provided by MusicBrainz. In addition, loose relationships such as "associated with" or "strongly associated with" a particular tune, ornamentation, or style will be helpful, as musicians often use this language when describing a musician's relationship to a tune.

In particular cases, going a step further from being "[strongly] associated with" a particular tune, musicians are associated with extended variation or personalised versions of tunes. These relationships need to be accounted for within the ontology, but not necessarily as acts of composition or arranging (addressed in more detail within section 4.4). A few examples of this include the personalised versions of common session tunes The Mason's Apron and The Morning Dew by two prominent musicians, whistle player Micho Russell and box (accordion) player Joe Cooley, respectively. These tune versions usually include the musician's name within the title to make for a distinct setting, for instance, "Joe Cooley's Morning Dew" or a musician would say "I'm going to play Micho Russell's version of The Mason's Apron." Yet another example is piper Willie Clancy, whose personalised versions of

The Yellow Wattle and MacAllistrum's March are all played in their own right, but with acknowledgement of origin and relationship to the other versions of the tunes.

These personalised versions or variants go beyond a few areas of melodic difference, and instead alter the structure (number of parts or repetition of parts) of the tunes, making them distinct. Within the ontology, these relationships should be differentiated from acts of composition or arranging, as these are seen as different acts; additionally, this need to associate the musician with the tune but not divorce the personalised version from the other version problematizes the notion of an authoritative version of a musical work. Equivalent relationships are more suited to this type of "work" relationship.

4.3 Music-Dance Relationships

LITMUS faces additional challenges in accurately representing Irish dance types, along with their relationships to traditional music. The American Folklore Society's Ethnographic Thesaurus, developed with the Library of Congress, attempts to provide enough specificity in dance practise without being too prescriptive (personal communication). There are a few issues that may prevent full use of the AFS Ethnographic Thesaurus (AFSET) within LITMUS.

One example is the AFSET entry for "céilidh dance" the preferred spelling given for the more modern (and more commonly seen) Irish spelling of "céili dance," which is instead listed as a variant. The AFSET provides the definition for the "céilidh dance" type as "Set dances, sometimes done in a circle," which implies a false equivalence with Irish set dancing, which refers to two separate dance practises, one solo and one group-based. While the intentions of the AFSET may have been to denote dance types that involve sets, or couples of dancers, in the context of Irish traditional dance, the term "set dance" implies two specific dance types that are distinct from the type known as "céili dance." The first "set dance" refers to a solo step-dance practise where specific dance steps are choreographed to tunes with irregular numbers of beats. A few examples of set dance tunes with corresponding set steps are St. Patrick's Day, Job of Journeywork, and The Blackbird. The second "set dance" refers to the social/group dance practise involving sets of couples who dance a series of figures. Examples of these set dances include the Caledonian set and the Kerry set.

Another potential issue with using the AFSET with LITMUS is in its hierarchical choices, and the conflict between what AFSET views as broader, narrower, and related terms with how practitioners actually conceptualise Irish dance. While various dance forms, like jig and reel, are included, the narrower terms of "jig" include only "Irish jig," "Scottish jig," and "slip jig." Dancers would not necessarily place "slip jig" as a narrower term to "jig," as they

are distinct dances on par with reels and hornpipes. AFSET was not developed to be too narrow in terminology, however there are already problems with the inclusion of these narrow terms at the expense of others. For the 9/8 metred slip jigs to be included, it is noticeable that "single jig" is not also included as a jig subtype, nor is the 9/8 sub-type of the slip jig "hop jig" included. A part of LITMUS will include adding to existing vocabularies to better reflect Irish dance styles, approaches, types, and social practices.

4.4 Versions, Variations, and Compositions

With tune versions, variations, and compositions, the ontological challenge is determining where the variation or version ends and the act of composition begins. Sometimes we know tunes are composed entirely by one person, for example Seán Ryan's jig composition The Nightingale (anecdotally said to have been named by someone else, as Seán didn't always name his compositions himself).

Table 1: Possible combinations involving tune composers and names/titles

Composer	Tune Names	Example(s)
Known Individual Composer	Tune Names	Porthole of the Kelp (Bobby Casey); Greenfields of Glentown (Tommy Peoples); Bonkers in Yonkers (Joanie Madden)
Known Individual Composer	No Tune Names	Paddy Fahey's tunes
No Individual Composer or Composition Accidental	N/A	Amhran an Tae /Song of the Tea became the Cúil Aodha jig

We may also know multiple tunes are attributed to one composer, yet are named identically. Paddy Fahey composed numerous tunes but did not name them, thus they are all known by musicians as "Paddy Fahey's." Holohan (1995) posed a numbering system for Paddy's tunes within her thesis focused on his compositions, also including interviews with Paddy Fahey himself. Fiddle player Lucy Farr, recorded in 1992 playing many of Paddy's tunes, plays "Jig No. 10" according to Holohan's (1995) numbering system and then is heard at the end of her performance saying "…Paddy never christened any of his tunes…" meaning he never gave them names. Holohan's (1995) numbering system may provide the answer to differentiating between compositions of Paddy Fahey within a linked data environment.

The next example is one of a song arrangement leading to an accidental composition of a dance tune, a jig now known as the Cúil Aodha jig after the geographic location associated with the song whose arrangement spawned the tune. The source of this story is Ceoltóirí Laighean (the musical group mentioned earlier in the context of John Kelly Sr. and James Kelly) member Peter Phelan. Ceoltóirí Laighean recorded an arrangement of Amhran an Tae (Song of the Tea) in 1979, which is sung in the same metre as jigs are played. The melody of the song's chorus became the second part of the tune now known as the Cúil Aodha jig, with the melodic material inserted between chorus and verse (composed by band members) becoming the first part of the Cúil Aodha jig. The Cúil Aodha example is not a typical example of tune composition, making it a special case in the context of the LITMUS ontology. The question of how might we express this story in shortened relationship form and attribute it accurately might lie an alternative to "composer of," such as "origin attributed to" or "derived from." The latter option might not be the most specific, as it could be more appropriately applied to the next examples.

4.4.1 Tune Derivation and Variants

Tunes "derived from" one another are another challenge for ontological representation. These include tunes manifest in several forms, such as an unmetered slow air and within metred dance tune types like a hornpipe or as a set dance. The Blackbird is well-cited example of tune derivation, with one melody manifest as a slow air, a hornpipe, and a set dance (also technically a hornpipe, but with an irregular number of beats in the second part). Another example is the harp piece composed by 17th century harper Thomas Connellan called Molly McAlpin, with two hornpipes, Poll Ha'Penny and Moll Ha'Penny derived from the melody. The slow air or harp piece from which other tunes are "derived from" could also be "related to" them. The derivative tunes themselves could be "related to," a "variant of," or "related by derivation to" one another.

Tune variants can also be melodically semi-related to one another, but are linked together by their association with a common jig song, such as the numerous versions of the jig/jig song Páidín Ó Raifeartaigh / Paddy O'Rafferty. There are approximately three distinct melodic variants, but similar enough that they might be deemed "facets" of the same tune/jig song. One version of the tune can be associated with particular players, such as Willie Clancy and the three-part version in D Major. Other versions have only two parts and are in different keys or modes. Linking the versions together and with their respective players may require versions to be assigned a unique identifier. The Paddy O'Rafferty tunes are a perfect illustration of the difficulty with the notion of a "musical work" and applying this concept to

structured data models. In the case of Paddy O'Rafferty, it is not enough to create one "work" and denote various "expressions" of the work, as they are equal facets of the thing musicians understand as Paddy O'Rafferty's.

A related problem to tune derivations and tune variants are tunes that share a name but are distinct, un-related melodic entities. Examples of this are the two jigs both known as The Gold Ring and the two reels both known as Toss the Feathers; both are played under these titles and musicians simply specify the key/mode or provide a few notes of the beginning of the tune to differentiate between the two. Within a linked data ontology, these will also need to be assigned a unique identifier to avoid confusion.

Table 2: Possible combinations involving tune melodies and tune names/titles

Tune Melodies	Tune Names	Example(s)
Derivative melodies	Different Names	Molly McAlpin (harp piece); Moll Ha'Penny and Poll Ha'Penny (hornpipes)
Derivative melodies	Same Names	The Blackbird / An Lon Dubh (slow air); set dance; hornpipe
Distinct Tunes	Same Names	Toss the Feathers (2 reels); The Gold Ring (2 jigs)
Related Tunes	Same Names	Páidín Ó Raifeartaigh / Paddy O'Rafferty

4.5 Irish and English Language Equivalents

Irish traditional music and dance have Irish language and English language equivalents in personal, musical, and geographic place names. Musicians who appear on albums or in other references with Irish and/or English versions of their name need to be disambiguated. Tunes with titles in Irish such as An Buachaill Dreoite (sometimes translated as The Ailing Boy) and Caisleáin An Óir (The Golden Castle) are also known in English translation, with both used. The jig song Cailleach an Airgid is sometimes titled instead by the first phrase of the chorus, 'Sí do mhaimeo í, and also known in English translation as the jig The Hag With the Money. Geographic place names are also known in both languages, such as Inis, An Clár anglicised as Ennis, Co. Clare and Cúil Aodha anglicised as Coolea.

When referencing geographic places, personal names, and other terminology in English and Irish, several resources can be re-used within the context of the eventual linked

data framework constructed using the LITMUS ontology. Linked Logainm.ie is a linked data resource for Irish-English geographic place names, and the newer Meitheal.logainm.ie consists of community-contributed local place names. In addition, dúchas.ie contains the Irish Surname Index, which provides Irish-English equivalents for surnames. Several related projects to logainm.ie and dúchas.ie include ainm.ie (biographies), téarma.ie (National Terminology Database for Irish), and gaois.ie (legal terminology but also a dictionary of Irish idioms).

5. Conclusion

A linked data ontology for Irish traditional music and dance, like the tradition itself, is an ongoing process rather than strictly an end goal. Personal narrative and storytelling is essential to understanding Irish music and dance traditions, with rich contextual information more likely found through in-person conversations and oral histories rather than explicitly printed within musical collections or other formal publications. Some exceptions are to be found; musicians may publish informal and auto-biographical accounts of their musical life (Peoples 2015). Some publications such as The Companion to Irish Traditional Music, 2nd edition (Vallely 2011) attempt to document a large trove of information, including personal and geographic information, as well as musical concepts related to Irish traditional music and dance. And, there is an increasing amount of ethnographic research found in theses and dissertations devoted to topics in Irish traditional music and dance.

It is also important to consider the perspective from which each source is written and the potential biases which might be present. Music and dance traditions which rely upon oral transmission are living traditions with many participants continually adding to, modifying, and re-defining what it means to practise what they do. Accurately reflecting the intentions and expressions of communities engaged in Irish traditional music and dance is the challenge set for LITMUS.

The eventual linked data ontology will be the first one of its kind, designed to represent a music tradition propagated primarily through oral transmission, and will provide more robust means to represent other orally-based music traditions. As the LITMUS project is cross-disciplinary, it will begin to make Irish traditional music and dance materials widely accessible, helping to advance research within fields such as music librarianship; digital cultural heritage; digital humanities; linked data and computing in libraries, archives, and museums (LODLAM); ethnomusicology; folklore; and, anthropology.

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