



## The Selection of an Entry-Level Music Librarian: The Analytic Hierarchy Process (AHP) as a New Model

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#### ABSTRACT

This paper aims to present how to select the best entry-level music librarian by using the Analytic Hierarchy Process technique. The reason why we used this technique is due to the fact that it helps the decision makers easily calculate 'the importance weights of professional criteria' and 'the extent to which the candidates meet the professional criteria' to come to a final decision on each candidate. With this purpose, we firstly described 7 professional criteria (a1, a2, a3, ..., a7) that must be met by 3 entry-level music librarian candidates. Secondly, we decided each candidate's performance score representing the extent to which each candidate meets these criteria. For this, we used both a 9-point scale for pairwise comparisons and Saaty's eigenvector method. Thirdly, we assigned the importance weights to the required criteria. Fourthly, we performed the consistency test to measure the consistencies of our calculations with the aid of the consistency ratio (CR). Fifthly, we obtained the final performance scores of each candidate as the candidate 1= 0,464, the candidate 2= 0,296, and the candidate 3= 0,240. Finally, we selected the candidate 1 who earned the highest score (0,464) in total as the best entry-level music librarian.

**Keywords:** Music librarian, Entry-level music librarian selection, Librarian selection, AHP technique, Music.

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### I. Introduction

The term 'music', just like the German 'musik', the Norwegian 'musikk', the Polish 'muzyka', the Russian 'muzika', and the Dutch 'muziek' was derived from the classical Greek term 'mousikē', by way of the Latin 'musika' and the French 'musique' (Jacobs, 2006a; Nettl, 2001). Many researchers argue that the origin of this classical Greek term 'mousikē' comes from the nine deities or the muses called Callipo (the muse of heroic poetry), Clio (the muse of history) Erato (the muse of song, dance, and erotic poetry), Euterpe (the muse of lyric), Melpomene (the muse of tragedy), Polyhymnia (the muse of hymns), Terpsichore (the muse of choral lyric), Thalia (the muse of comedy, light poetry, and idyll), and Urania (the muse of astronomy). According to Greek mythology, these nine muses who are the daughters of Zeus and Mnemosyne (goddess of memory) are the tutelary deities of the creative arts, and preside over the arts and sciences (Jacobs, 2006b; The Hutchinson dictionary, 2008). In short, 'music' derived from the

classical Greek term 'mousikē' can be defined as a combination of sounds made by people singing or playing musical instruments (Stevenson, 2006, p. 135). In this case, a combination of sounds that does not have an aesthetic or artistic purpose comes to mean an unwanted sound or noise instead of music. An unwanted sound or a noise can be measured via sound pressure levels, and the subjective human perception of sound can be determined via the standardized frequency A-weighting curve dB(A). If noise levels are above thresholds of 50 to 55 dB(A), people who exposure to these noises may feel nervous and stressed. Besides, people in a place where the sound level is over 80 dB(A) may exhibit aggressive behavior (Short et al., 2010, p. 201). But, music is the oldest technique of stress reduction (Nicol, 2010, p. 352). For example, Prophet David tried to cure King Saul' illness by playing his harp for Saul (Aluede & Ekewenu, 2009, p. 160).

There are many benefits of music apart from being an entertainment tool. We can generally list several positive effects of music as follows:

- Listening to music elevates individuals' minds and souls (Sherman & Seldon, 1997, p. 11).
- Music may be used to treat physical and mental disorders (Bunt, 1994, p. 254; Friedman et al., 2010, p. 219).
- Music provides language and reading skills for children with learning difficulties (Hallam, 2010, pp. 271-273).
- Listening to music may have beneficial effects on intelligence (Brandler & Rammsayer, 2003, p. 124). According to Rauscher, Shaw, and Ky, listening to Mozart may make people smarter. In Rauscher, Shaw, and Ky's researches (1993, p. 611; 1995, p. 45), thirty-six college students listening to Mozart's sonata for two pianos in D major (K 488) for ten minutes earned high scores in the IQ tests. This fact is known as 'the Mozart effect' in music literature.
- Music may be used to strengthen the religious feelings. For example, Tibetan Buddhists use musical instruments like drums and bells to help to enter meditation during rituals (Will & Turow, 2011, p. 7).
- Music has both a pain-reducing effect and a mood-enhancing effect for orthopedic in-patients (Bradt, 2010, p. 154).
- Melodic Intonation Therapy is helpful in the recovery of speech. So, music provides emotional support to people suffering from aphasia (Hartley et al., 2008, pp. 236-240).
- Rhythmic auditory stimulation helps to reduce heart rate, muscle tension and blood pressure. Thus, the excessive involuntary movements of patients with Parkinson's disease can be slowed by auditory entrainment (Tomaio, 2011, p. 118).
- Music helps to revive patients in coma and to ameliorate such conditions as cerebral palsy (Ammer, 2004, p. 254).

Even though there are many benefits of music, we can also meet the extraordinary effects of music in music literature through death metal songs that have the extraordinary contents like suicide, death, and violence.

Death metal and black metal are sub-genres of heavy metal that is one of the sub-genres of rock music (Berger, 2008, p. 5; Forster, 2006, p. 5). Furthermore, heavy metal beginning in the late 1960s and 1970s primarily in the United Kingdom and the United States is also increasingly gaining respect and interest in academic circles (Recours et al., 2009, p. 474; Pierry, 2013, p. 141; Shuker, 2001, p. 151). As loud music genres, the themes of death metal and black metal are generally the occult, Satanism, death, and suicide (Allet, 2010, p. 31; Philips and Cogan, 2009, p. 34; Recours et al., 2009, pp. 474-475). Moreover, the names of some heavy metal bands such as Iron Maiden (a torture device) and Black Sabbath (a different religious ceremony), and the stage costumes of some heavy metal stars such as the costumes and makeup of Kiss 5 band members open the door to various criticisms of positive effects of music. Actually, several studies have demonstrated that adolescents who prefer listening to heavy metal music may tend to use

more alcohol and illegal drugs, and may present a higher suicide risk, and antisocial behavior than their same sex peers (Hansen & Hansen, 1991, p. 335; Lacourse et al., 2001, p. 329; Miranda and Claes 2009, p. 215; Schwartz and Fouts, 2003, p. 206; Stack et al., 1994, p. 21). No matter what kind of individual or social effects music has, we should not forget that music as an art form cannot stay out of social events because of its political, sociological, and cultural nature. In this case, music libraries that preserve music's ability to criticize society always play an important role by adding music materials to their collections (Torvinen, 2009, p. 28).

As a library specializing in music, music library mainly collects music scores, sound recordings, and several materials about music and musicians. Actually, these libraries may be either an independent library or a distinct department of a library such as public libraries with large music collections (Hursh, 2004, p. 78; Mortimer, 2007, p. 149; Prytherch, 2005, p. 467).

We may generally list the types of music libraries and the various libraries with large music collections as follows:

Public libraries with large music collections: These libraries contain several printed and recorded materials for all types of music including popular music audio-video collections and provide free access to public (Marley, 2002, p. 139; Gardinier, Canino, & Rahkohen, 2010, p. 1815).

- Academic and conservatory libraries: These libraries affiliated with institutions of higher learning provide materials relevant to the institution's courses for students, researchers and lectures (Campana, 2001, p. 353; Feather & Sturges, 2003, p. 437).
- National libraries: These libraries supported by government funds acquire copies of the national bibliographic output such as books, scores, and sound recordings, and provide access to valuable heritage collections (Gottlieb, 2009, p. 11; IAML, 2007, p. 2).
- Broadcasting libraries: These libraries having a music collection provide materials for live and recorded performances.
- Music Information Centers: These centers as national organizations give access to scores, recordings, and research materials of the music of a particular country. (Feather & Sturges 2003, p. 437; Gardinier, Canino, & Rahkohen 2010, p. 1815; Gottlieb 2009, p. 22).
- Performance libraries: These libraries meet the specialized needs of performers and performing organizations. Such libraries also support several musical groups and companies such as symphony orchestras, opera and ballet companies (Gardinier, Canino, & Rahkohen, 2010, p. 3815; Girsberger, 2006, p. ix).
- Church and monastic libraries: These libraries such as the Vatican library provide access to researchers who need the early manuscript sources documented in The International Inventory of Musical Sources (RISM: Répertoire International des Sources Musicales) (Gottlieb, 2009, p. 21).
- Music publishers' hire libraries: As a part of a music

publishing company, hire libraries make available orchestral and vocal sets on hire to professional and amateur orchestras, educational establishments and broadcasters (IAML, 2007, p. 3).

- Research libraries: These libraries administered by an organization provide music materials supporting the organization (Gardinier, Canino, & Rakhohen 2010, p. 3814).

Consequently, music librarians working all these libraries should have a good knowledge of the specific needs of the musical and research communities. In this case, the selection of an entry-level music librarian working in these libraries with large music collections is highly important.

The purpose of this paper is to demonstrate how to objectively select an entry-level music librarian by using the Analytic Hierarchy Process (AHP) technique. The reason why we used this technique is due to the fact that it helps the decision makers easily calculate 'the importance weights of professional criteria' and 'the extent to which the candidates meet the professional criteria' to come to a final decision on each candidate.

## **II. The Necessary Competencies for the Selection**

An entry-level music librarian should have some skills and competencies. David Hunter and the Music Library Association's Library School Liaison Subcommittee prepared a detailed list of the competencies for a music librarian entitled *Core Competencies and Music Librarians in 2002* (Hunter, 2002; Oates, 2004, p. 3). Furthermore, Ringwood, Stormes, Casey, Dougan, Fiske and Hedges have also prepared a draft text regarding the qualifications for music librarians (Ringwood et al., 2013). These lists may give us an idea of the competencies needed by an entry-level music librarian. By considering these lists, we may generally expect an entry-level music librarian candidate to have the following skills and competencies:

a1: Possesses a strong background in music. Music is a language consisting of sound and silences. When we want to learn a foreign language, we must learn grammar, pronunciation, vocabulary, sometimes a different alphabet. Like a foreign language, music is written with an alphabet consisting of the letters C (do), D (re), E (mi), F (fa), G (sol), A (la), and B (si) (Takesue, 2010, pp. 1-17). So,

Music librarians should have the ability to read music (Marley, 2001, p. 47).

- Music librarians providing quality service for all users should have a good knowledge of musical terminology including instrument names, voice types, musical genres, tempo markings, key signatures (Ringwood et al., 2013). Furthermore, the librarians should have a bibliographic and terminological knowledge of several foreign languages such as French, German, Italian, and Russian for music terminology (Slawsky, 2010). For example, Partitur is used for score in German (Dougan, 2013, p. 40).
- Music librarians should have a good knowledge of music literature, historical trends in music, and music-related materials such as music reference

books, different editions of scores and music biographies (Slawsky, 2010).

- A music librarian who has a master's degree in library science with a specialty in music librarianship should have an in-depth knowledge of music. So, the candidates need to acquire degrees in both music and library science (Morrow, 2004, p. 29). Otherwise, for example as an acquisitions librarian, the music librarian who does not understand the basic language of music may accidentally order an undesired music-related material (Fidler, 2002, p. 6).

a2: Knows of technical services on cataloging, classification, and indexing to ensure easy access to users' music materials. Music cataloging is special due to the nature of some music-related materials such as music scores and recordings. So, the materials should be slowly cataloged by professional music catalogers who can read musical notations (Madden, 2010, p. 342; Thompson, 1986, p. 83).

Music librarians should know of RDA 6 as a new standard for resource description and access. For example, '1 audio disc' should be used in RDA instead of '1 sound disc' in AACR2 (Anhalt & Stewart, 2012, p. 38; Henry, 2012, p. 258). Furthermore, music catalogers should enter the data into the three fields (045, 047, and 048) 7 in the MARC format designed to facilitate subject access to music materials (McBride, 2000, p. 15).

Music librarians should know of the Library of Congress Classification system (LCC) and the Dewey Decimal Classification system (DDC). In short, music librarians should know how music-related materials are located in subclasses M, ML, and MT according to LCC (McKnight, 2002, p. 45), and should know the class numbers (the 780s) for music in DDC.

Music librarian should be able to select appropriate subject headings and call numbers to provide the users with the best access to the materials. As subject headings can show diversity in language and form, the librarians should be careful. For example, a music librarian using the Library of Congress Subject Headings (LCSH) must assign a book about concerto to concerto as a subject heading, while the librarian must assign the scores and recordings of concertos to concertos. For most musical forms, if the term is in the plural, the librarians should assign the music itself to the term. If the term is in the singular, the librarians should assign the books about that subject as a musical form to the term (Gardinier et al., 2010, p. 3821; Hemmasi and Young, 2000, p. 135).

a3: Conducts reference and readers' advisory interviews to help all their users. Music librarians should be able to understand users and their information needs and expectations (Peyvand Robati & Singh, 2013, p. 119). Generally, we can list user groups coming to music libraries to meet their needs and expectations as follows:

- Casual users: This user group who does not have a musical training enjoys listening to music and discovering new music (Orio, 2006, pp. 29-30).
- Expert users: This user group is professional library users who want to meet music-related information needs (Bello & Kent, 2012, p. 18; Berndt Morris, 2012, p. 36; Hart & Muncy, 2009, p. 80). These users are composers, professional and amateur

musicians, music scholars, music theorists, musicologists, students receiving music education and teachers giving music education.

Music librarians should conduct reference and readers' advisory interviews to help all these users with the selection of music-related materials and services, according to their needs. For many library users, finding some music materials such as music scores and sound recordings is more difficult than finding music-related books in library catalogues because of the complexities of music materials in multiple formats and languages. For example, a piece of music may have titles in more than one language, and it can have multiple manifestations such as scores for different instruments (Dougan, 2013, p. 40; King, 2005, p. 2). In this case, a librarian who has little musical training may have difficulty in helping to find songs and scores (King, 2004, p. 111). As a result, music librarians should understand and respond to the interests and the needs of their users who come to music libraries.

a4: Builds and maintains a collection of music resources. Music librarians who want to provide optimal access to all music resources should understand the acquisition and collection development processes. For this, the librarians should have a general knowledge of a wide variety of materials in music libraries. Generally, we can list music materials that should be added to library collection as follows:

- Music manuscripts, musical texts in a printed or digital format, and scholarly editions of works written by different composers (or the German, Denkmäler) (Fling, 2006, p. 288; Gentili-Tedeschi & Riva, 2004, pp. 401-402).
- Sound and video recordings such as Mp3 sound files, CD/DVD, LPs and video recordings (Dougan, 2012, p. 559; Luttmann, 2004, p. 11; Hope, 2009, p. 2; Madden, 2010, p. 334).
- Music-related books, specialized reference tools and indexes, journals, microfilms, and several materials made available electronically such as music-related e-books, digitalized images (Archer-Capuzzo, 2013, p. 11; Dougan, 2010, p. 705; Fazekas & Philpott, 2005, p. 128; Gardinier et al., 2010, p. 3817; Walker, 2003, p. 820).
- Music scores (Dougan, 2013, p. 40; Ferguson Publishing, 2007, pp. 56-57; Lai & Chan, 2010, p. 63; Newcomer et al., 2013, p. 524; Walker, 2003, p. 820).

As a result, the librarians should provide all materials listed above to best serve the needs of all users, and should possess up-to-date information about music materials in all formats.

a5: Possesses the ability to administer and manage library budget, library staff, and library's planning process. Music librarians should be able to plan and manage the services in an efficient and effective way. For this, the librarians need to possess the following administrative and management skills:

- Understands the library's mission, goals, and policies.
- Analyzes the costs of library services, and then plans and controls the library budget.
- Selects and supervises library staff for the library,

and encourages continuing education for staff.

- Is proficient in short-term and long-term planning, and policy development to represent service to user.

a6: Possesses up-to-date technology skills and follows new technologies to best meet the needs of users. We may expect a music librarian to have the following competencies:

- Manages access to electronic resources (Heimer, 2003, p. 35)
- Follows trends regarding digital libraries and digital information services (Choi & Rasmussen, 2009, p. 462)
- Follows publishing trends related to digital music resources
- Possesses the knowledge of the creation and maintenance of the library web site
- Demonstrates familiarity with the library automation systems, basic operating systems such as UNIX, Lunix, Windows, MacOS, common software programs such as office applications and several programs used for building and distributing digital library collections such as Dspace, and Greensone (Choi & Rasmussen, 2009, p. 462; Satpathy & Maharana, 2011).
- Understands and uses RSS, wiki, blog and social networking sites.

a7: Communicates effectively with all users, administrators and other library staff. Music librarians who have communication skills should build good work relationships with users, administrators and other library staff (Al Ansari & Al Khadher, 2011, p. 244; Gerolimos & Konsta, 2008, p. 694). For this, the librarians should act in accordance with the principles of professional ethics and work standards. Furthermore, they should respect copyright, and defend intellectual freedom and freedom of information.

Actually, the numbers of the criteria needed by a music librarian may change depending on the needed position. For example, if the decision makers want to hire a library director, they must increase the numbers of the criteria regarding administrative and management skills. In this case, we may expect all music library director candidates to meet the following criteria (Gutsche & Hough, 2014, pp. 29-33):

z1: Understands the basic principles and procedures of project management.

z2: Establishes effective strategies for performance management.

z3: Leads and empowers the librarians to deliver an effective and high-quality library service.

z4: Prepares for and responds to crisis and unanticipated events.

z5: Uses leadership skills to provide vision and guidance to library staff.

z6: Provides opportunities for connecting with other organizations that serve music users and builds strategic partnerships.

In short, we should not forget that the numbers of the competencies and the skills listed in this section may increase or decrease according to the requirements of the job position and the number of the library workers. If a library has only one librarian responsible for providing all

services, the librarian candidates may be expected to meet all criteria listed in this section.

Eventually, after the decision makers determined all the criteria that the candidates must meet, they should determine both ‘the importance weights of each professional criterion that are not equal to each other’ and ‘the extent to which the candidates satisfy these criteria’. For this, the decision makers may use the Analytic Hierarchy Process (AHP) technique.

**III. The AHP Technique for the Selection**

The AHP technique can easily quantify ‘the importance weights of different criteria’ and ‘the extent to which the librarian candidates satisfy these criteria’. For this, the decision makers using the AHP technique can change linguistic values such as low, strong, and very strong used in spoken language into a numerical value between 1 and 9.

The AHP developed in 1970s by Thomas L. Saaty is a multi-criteria decision technique which combines qualitative and quantitative factors in the decision-making model (Geng & Hu, 2013, p. 80; Montazar & Behbahani, 2007, p. 157; Patel, 2001). So, the decision makers will have the following advantages by using the AHP technique:

- In decision-making processes, sometimes decision makers only can process a restricted amount of information (Water & Vries, 2006, p. 413). Thus, the AHP allows the decision makers to reflect their subjective feelings and psychologies to the decision-making model (Geng, 2004; Saaty, 2005, p. 346; Saaty & Sodenkamp, 2010, p. 92; Yilmaz, 2010). According to Zammori (2010, p. 1001), until the introduction of the AHP, there were no effective means to combine feelings and rationale in a formal mathematical way.
- The decision makers can use various pieces of information obtained from different sources to select the best music librarian through the AHP technique. These pieces of information may be verbal information and the decision makers can use all verbal information at the same time to come to a final decision on all music librarian candidates. For this, the AHP allows the decision makers to incorporate tangible and intangible information (Okada et al., 2008, p. 200; Yilmaz, 2006; 2014).

**IV. The Selection Algorithm**

The decision makers can use the following algorithm to select the best entry-level music librarian meeting the criteria through the AHP technique:

Step 1: Structure the problem as a hierarchy: The decision makers should decompose the system into various hierarchical levels. The top level of the hierarchy is the primary objective (or Final Goal in Figure 1). The second level of the hierarchy represents the criteria, and the last level represents the alternatives (Chandran et al., 2005, p. 2235). Figure 1 shows the hierarchy structure (Munier, 2004, p. 23).

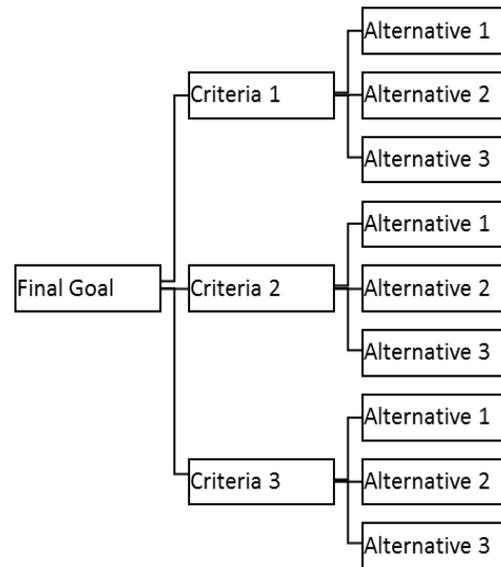


Fig. 1. A classic hierarchy structure.

Step 2: Build a pairwise comparison: After the hierarchy is constructed, the decision makers should determine the importance weights of each element of the hierarchy. For this, the decision makers make pairwise comparisons by means of a matrix  $A$  (Forrester & Hutson 2014, p. 138; Notsu et al., 2013, p. 1012). We can see the pairwise comparison matrix (A) in Figure 2.

$$A = \begin{bmatrix} 1 & \dots & a_{1n} \\ \vdots & a_{ij} & \vdots \\ a_{n1} & \dots & 1 \end{bmatrix}$$

Fig. 2. The pairwise comparison matrix (A).

The decision makers can determine the relative importance of each element (i and j) through the decision matrix. For this, we use a 9-point scale to measure the degree of importance between criteria or alternatives (Jalao et al., 2014, p. 192). The 9-point scale can be seen in Table 1.

TABLE I  
THE FUNDAMENTAL SCALE FOR PAIRWISE COMPARISONS (LÓPEZ DROGUETT AND MOSLEH, 2014, P. 261; SANDERSON AND GRUEN, 2006, P. 261; SHARMA, 2010, P. 35)

Value	Relative importance
1	$a_1$ and $a_2$ are equally important
3	$a_1$ is weakly more important than $a_2$
5	$a_1$ is strongly more important than $a_2$
7	$a_1$ is very strongly more important than $a_2$
9	$a_1$ is absolutely more important than $a_2$
2,4,6, and 8	Intermediate values (or, for compromise between the above values)

But, pairwise comparisons must satisfy the following two rules (Saaty, 2005, p. 351):

Rule 1: If  $a_{ij}=a$ , then  $a_{ji}=1/a$ ,  $a>0$ . For example, let us compare the criterion 1 ( $a_1$ : Possesses a strong background in music) with the criterion 6 ( $a_6$ : Possesses up-to-date technology skills and follows new technologies to best meet the needs of users). If the criterion 1 ( $a_1$ ) is strongly more important than the criterion 6 ( $a_6$ ), we must

assign the criterion 1 (a1) to 5 (See Table 1). In this case, the relative importance of the criterion 6 (a6) against the criterion 1 (a1) must be 1/5 according to rule 1.

Rule 2: If  $a_i$  is judged to be of equal relative intensity to  $a_j$ , then  $a_{ij}=1, a_{ji}=1$ ; in particular,  $a_{ii}=1$  for all  $i$ . For example, if the decision makers decide that the criterion 2 (a2) and the criterion 3 (a3) are equally important, then they must assign the criterion 2 (a2) and the criterion 3 (a3) to 1.

Step 3: Compute the relative weights of the pairwise comparison matrix: The standard way to calculate the weights of the pairwise comparison matrix is Saaty's eigenvector method (Hurley, 2001, p. 186). Formula 1 for eigenvector method can be used (Srdjevic, 2005, p. 1901).

$$W_i = \frac{1}{n} \sum_{j=1}^n \left[ \frac{a_{ij}}{\sum_{j=1}^n a_{ij}} \right] \quad (1)$$

( $i, j = 1, 2, 3, \dots, n$ ;  $w_i$ : vector;  $a_{ij}$ : is the entry of row  $i$  and column  $j$  in the comparison matrix.

After we calculated the relative weights of each element, we can go to the next step.

Step 4: Assess the consistency of the comparison matrix: The decision makers should perform the consistency test to measure the consistency of judgment matrix. If the value of the consistency ratio (CR) is less than 0,10 (or  $CR < 0,10$ ), then the consistency of judgment matrix is acceptable (Jiazhong & Min, 2013, p. 104). CR can be calculated by means of the following formula (Huang et al., 2014, p. 265):

$$CR = \frac{CI}{RI} \quad (2)$$

The value of the consistency index (CI) in the formula 2 can be calculated by means of the following formula (Pedrycz & Song, 2014, p. 94; Wu & Chen, 2013, p. 4):

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

( $\lambda_{max}$  is the eigenvalue, and  $n$  is the matrix size). Furthermore, the random index (RI) in the formula 2 is a constant value, and the values of RI can be seen in Table 2.

TABLE II  
THE VALUES OF RANDOM INDEX (RI) 9 (SAATY, 2008, P. 129)

Order (n)	1	2	3	4	5	6	7
RI	0	0	0,52	0,89	1,11	1,25	1,35

We can see that the values of RI in Table 2 vary depending on the numbers of elements compared (or,  $n$ ).

Step 5: Aggregate the relative weights (or the priorities): In this last step, the decision makers should multiply the weights of the criteria by the weights of the candidates and then should add these values to each other to obtain the overall scores of each candidate.

## V. The Selection of an Entry-Level Music Librarian: An Illustrative Example

In this illustrative example, we will demonstrate how to select the best entry-level music librarian providing all aspects of library services from 3 candidates ( $c_1, c_2$ , and  $c_3$ ). The first stage of the selection process involves structuring the problem as a hierarchy. The hierarchical structure concerning the selection of an entry-level music librarian can be seen in Figure 3.

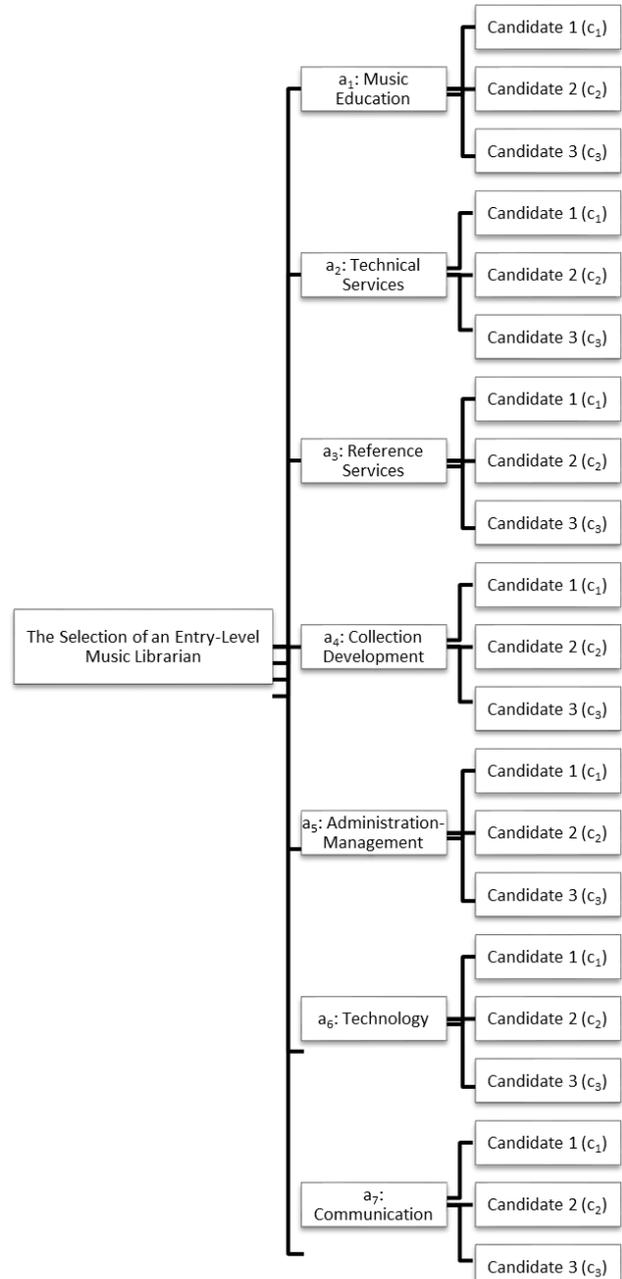


Fig. 3. The hierarchical structure concerning the selection of an entry-level music librarian.

To select the best music librarian from 3 entry-level music librarian candidates ( $c_1, c_2$ , and  $c_3$ ), we used 7 criteria consisting of (a1) music education, (a2) technical services, (a3) reference services, (a4) collection development, (a5) administration-management, (a6) technology, and (a7) communication in Figure 3. So, we

created the hierarchy to define the process of the entry-level music librarian selection. After we created the hierarchy, we determine the relative importance of 3 candidates according to each criterion by using a pairwise matrix. The relative importance weights of 3 candidates according to 7 criteria can be seen in Table 3-9.

TABLE III  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 1

(a <sub>1</sub> ): Music education	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	3	5
Candidate 2 (c <sub>2</sub> )	1/3	1	3
Candidate 3 (c <sub>3</sub> )	1/5	1/3	1
Total	Σ=1,533	Σ=4,333	Σ=9

When we look at the performance scores of the candidates concerning the criterion 1 (a<sub>1</sub>) in Table 3, we can see that the candidate 2 (c<sub>2</sub>) is better in terms of music education than the candidate 3 (c<sub>3</sub>). For example, let us compare c<sub>2</sub> row against c<sub>3</sub> column in Table 3. As c<sub>2</sub> is weakly more important than c<sub>3</sub> (see Table 1), we entered 3 in the relevant position. In this case, as c<sub>3</sub> is weakly less important than c<sub>2</sub>, we entered 1/3 in the relevant position (see Rule 1). The relative importance weights of 3 candidates according to the other criteria can be seen in Table 4-9.

TABLE IV  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 2

(a <sub>2</sub> ): Technical Services	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	3	5
Candidate 2 (c <sub>2</sub> )	1/3	1	2
Candidate 3 (c <sub>3</sub> )	1/5	1/2	1
Total	Σ=1,533	Σ=4,5	Σ=8

TABLE V  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 3

(a <sub>3</sub> ): Reference Services	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	2	1/3
Candidate 2 (c <sub>2</sub> )	1/2	1	1/4
Candidate 3 (c <sub>3</sub> )	3	4	1
Total	Σ=4,5	Σ=7	Σ=1,583

TABLE VI  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 4

(a <sub>4</sub> ): Collection Development	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	2	3
Candidate 2 (c <sub>2</sub> )	1/2	1	2
Candidate 3 (c <sub>3</sub> )	1/3	1/2	1
Total	Σ=1,833	Σ=3,5	Σ=6

TABLE VII  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 5

(a <sub>5</sub> ): Administration-Management	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	1/3	1/2
Candidate 2 (c <sub>2</sub> )	3	1	2
Candidate 3 (c <sub>3</sub> )	2	1/2	1
Total	Σ=6	Σ=1,833	Σ=3,5

TABLE VIII  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 6

(a <sub>6</sub> ): Technology	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	2	5
Candidate 2 (c <sub>2</sub> )	1/2	1	3
Candidate 3 (c <sub>3</sub> )	1/5	1/3	1
Total	Σ=1,7	Σ=3,333	Σ=9

TABLE IX  
THE RELATIVE IMPORTANCE OF 3 CANDIDATES ACCORDING TO THE CRITERION 7

(a <sub>7</sub> ): Communication	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	1	1/3	1/4
Candidate 2 (c <sub>2</sub> )	3	1	1/2
Candidate 3 (c <sub>3</sub> )	4	2	1
Total	Σ=8	Σ=3,333	Σ=1,750

After we determined the relative importance weights of 3 candidates according to each criterion, we should calculate the priorities of 3 candidates according to each criterion. For this, we use the eigenvalue method in Formula 1. The calculation of the priority values of each candidate (or Formula 1) according to the criterion 1 can be seen below in detail.

Stage 1: Sum the values in each column (See Table 3).  
c<sub>1</sub>= 1,533, c<sub>2</sub>=4,333, and c<sub>3</sub>= 9

Stage 2: Divide each value by its column total.

TABLE X  
SYNTHESIZED MATRIX CONCERNING 3 CANDIDATES ACCORDING TO THE CRITERION 1

(a <sub>1</sub> ): Music education	Candidate 1 (c <sub>1</sub> )	Candidate 2 (c <sub>2</sub> )	Candidate 3 (c <sub>3</sub> )
Candidate 1 (c <sub>1</sub> )	0,652	0,692	0,556
Candidate 2 (c <sub>2</sub> )	0,217	0,231	0,333
Candidate 3 (c <sub>3</sub> )	0,130	0,077	0,111
Total	Σ≈1	Σ=1	Σ=1

Stage 3: Find the arithmetic mean of the values in each row.

The arithmetic mean of the values can be seen in Table 11.

TABLE XI  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE CRITERION 1

(a <sub>1</sub> ): Music education	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,633
Candidate 2 (c <sub>2</sub> )	0,261
Candidate 3 (c <sub>3</sub> )	0,106
Total	Σ=1

When we look at Table 11, we can see that the candidate 1 (c<sub>1</sub>) has the highest score (0,633) for the criterion 1 (a<sub>1</sub>). So, the best candidate who has music education is the candidate 1 (c<sub>1</sub>). Additionally, the priority values of each candidate according to the other criteria can be seen in Table 12-17.

TABLE XII  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE CRITERION 2

(a <sub>2</sub> ): Technical Services	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,648
Candidate 2 (c <sub>2</sub> )	0,230
Candidate 3 (c <sub>3</sub> )	0,122
Total	Σ=1

TABLE XIII  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE  
CRITERION 3

(a <sub>3</sub> ): Reference Services	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,240
Candidate 2 (c <sub>2</sub> )	0,137
Candidate 3 (c <sub>3</sub> )	0,623
Total	Σ=1

TABLE XIV  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE  
CRITERION 4

(a <sub>4</sub> ): Collection Development	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,539
Candidate 2 (c <sub>2</sub> )	0,297
Candidate 3 (c <sub>3</sub> )	0,164
Total	Σ=1

TABLE XV  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE  
CRITERION 5

(a <sub>5</sub> ): Administration-Management	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,164
Candidate 2 (c <sub>2</sub> )	0,539
Candidate 3 (c <sub>3</sub> )	0,297
Total	Σ=1

TABLE XVI  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE  
CRITERION 6

(a <sub>6</sub> ): Technology	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,581
Candidate 2 (c <sub>2</sub> )	0,309
Candidate 3 (c <sub>3</sub> )	0,110
Total	Σ=1

TABLE XVII  
THE PRIORITY OF EACH CANDIDATE ACCORDING TO THE  
CRITERION 7

(a <sub>7</sub> ): Communication	Priority (w)
Candidate 1 (c <sub>1</sub> )	0,123
Candidate 2 (c <sub>2</sub> )	0,320
Candidate 3 (c <sub>3</sub> )	0,557
Total	Σ=1

After we determined the importance weights or the priorities of each candidate, we should test the consistencies of the judgment matrices. So, we may provide the logical consistencies of judgments used in determining the priorities. The overall consistencies of judgments are measured by means of the consistency ratio (CR). To calculate the value of CR, we should find the value of the consistency index (CI) in the Formula 2.

The calculation of CI in the Formula 3 for the matrix in Table 3 can be seen below in detail.

Stage 1: Calculate the consistency vector: For this, we should multiply the pairwise matrix by the weights vectors (or the priority values). So, we determine the weighted sum vectors.

$$0,633 \times \begin{bmatrix} 1 \\ \frac{1}{3} \\ \frac{1}{5} \end{bmatrix} + 0,261 \times \begin{bmatrix} 3 \\ 1 \\ \frac{1}{3} \end{bmatrix} + 0,106 \times \begin{bmatrix} 5 \\ 3 \\ 1 \end{bmatrix} = \begin{bmatrix} 1,946 \\ 0,790 \\ 0,320 \end{bmatrix}$$

And then we should divide the values of the weighted sum vectors (1,946, 0,790, 0,320) by the priority values (0,633, 0,261, 0,106). So, we obtain (3,074, 3,027, 3,019). Afterwards, we can find the value of λ<sub>max</sub> in the Formula 3 by calculating the arithmetic mean of the values that we found.

$$\lambda_{\max} = \frac{3,074 + 3,027 + 3,019}{3} = 3,040$$

Stage 2: Calculate the value of the consistency index (CI) in the Formula 3:

$$CI = \frac{3,040 - 3}{3 - 1} = 0,020$$

Stage 3: Find the value of the random index (RI) in the formula 2: As the value of n is 3, RI must be 0,52 (See Table 2).

Stage 4: Calculate the consistency ratio (CR) in the Formula 2:

$$CR = \frac{0,020}{0,52} = 0,038$$

Stage 4: Check the final consistency of the matrix: If the consistency ratio of the pairwise comparison matrix is less than or equal to 0,10 (CR ≤ 0,10), then the consistency is considered acceptable (Ishizaka & Nemery, 2013, p. 23). The consistency ratio value of the matrix concerning all candidates according to the criterion 1 in Table 3 is considered satisfactory (CR (0,038) < 0,10). After we tested the consistency of the pairwise comparison matrix in Table 3, we can test the consistencies of the other pairwise comparison matrices in Table 4-9. The consistency ratio values concerning the matrices in Table 4-9 can be seen below.

TABLE XVIII  
THE CONSISTENCIES OF THE MATRICES CONCERNING THE  
CANDIDATES ACCORDING TO A2-A7

λ <sub>max</sub>	CI	CR
3,005	0,002	0,004 < 0,10
3,019	0,010	0,019 < 0,10
3,009	0,004	0,009 < 0,10
3,009	0,004	0,009 < 0,10
3,004	~0,002	0,004 < 0,10
3,019	0,010	0,019 < 0,10

Consequently, as we decided the extent to which the librarian candidates satisfy all criteria, we can determine the importance weights of each criterion. The importance weights of all professional criteria can be seen in Table 19.

TABLE XIX  
PAIRWISE COMPARISON MATRIX FOR THE SELECTION CRITERIA

Criteria	(a <sub>1</sub> :ME)	(a <sub>2</sub> :TS)	(a <sub>3</sub> :RS)	(a <sub>4</sub> :CD)	(a <sub>5</sub> :A-M)	(a <sub>6</sub> :T)	(a <sub>7</sub> :C)
(a <sub>1</sub> :ME)	1	2	2	2	3	5	3
(a <sub>2</sub> :TS)	1/2	1	2	1/2	1/3	2	2
(a <sub>3</sub> :RS)	1/2	1/2	1	1/2	2	2	2
(a <sub>4</sub> :CD)	1/2	2	2	1	3	2	2
(a <sub>5</sub> :A-M)	1/3	3	1/2	1/3	1	3	3
(a <sub>6</sub> :T)	1/5	1/2	1/2	1/2	1/3	1	2
(a <sub>7</sub> :C)	1/3	1/2	1/3	1/2	1/3	1/2	1
Total	Σ=3,367	Σ=9,5	Σ=8,333	Σ=5,333	Σ=10	Σ=15,5	Σ=15

There is no doubt that the importance of the criteria needed by a music librarian is different from each other. For example, when we compare the criterion 1 (a<sub>1</sub>) to the criterion 6 (a<sub>6</sub>), we can see that the criterion 1 (a<sub>1</sub>: Possesses a strong background in music) is strongly more important than the criterion 6 (a<sub>6</sub>: Possesses up-to-date technology skills and follows new technologies to best meet the needs of users). In this case, we enter 5 for the value of (a<sub>1</sub>,a<sub>6</sub>), while we enter 1/5 for the value of (a<sub>6</sub>,a<sub>1</sub>) (See Table 19). Furthermore, if the decision makers want to hire more than one librarian, they may change the numerical values concerning all criteria in Table 19 according to the departments in which the candidates will work. For example, if the decision makers need a librarian working in the technical services department of the library, they may assign the criterion 2 (a<sub>2</sub>: Knows of technical services on cataloging, classification, and indexing to ensure easy access to users' music materials) to the highest numerical value as 9 according to the criterion 6 (a<sub>6</sub>: Possesses up-to-date technology skills and follows new technologies to best meet the needs of users)<sup>10</sup>. So, the relative priorities of each criterion can be seen in Table 20.

TABLE XX  
THE RELATIVE PRIORITIES OF ALL CRITERIA

Criteria	Priority (w)
(a <sub>1</sub> :ME)	0,278
(a <sub>2</sub> :TS)	0,126
(a <sub>3</sub> :RS)	0,125
(a <sub>4</sub> :CD)	0,193
(a <sub>5</sub> :A-M)	0,147
(a <sub>6</sub> :T)	0,071
(a <sub>7</sub> :C)	0,060
Total	Σ=1

When we look at Table 20, we can see that the most important criterion for an entry-level music librarian candidate is a<sub>1</sub> (Possesses a strong background in music) that has the highest score as (0,278). Furthermore, if we test the consistency of the pairwise comparison matrix for the selection criteria, we obtain λ<sub>max</sub>= 7,596, CR= 0,073, and CI= 0,099. So, we can see that the consistency of the judgment matrix for the criteria is acceptable (CR = 0,073<0,10). After this, we should obtain the overall scores of each librarian candidate to complete the last stage of the selection process. For this, we multiply the weights of the criteria by the weights of the candidates and then add these values to each other.

$$\text{Candidate 1 (c}_1\text{)} = 0,278 \times 0,633 + (0,126 \times 0,648) + (0,125 \times 0,240) + (0,193 \times 0,539) + (0,147 \times 0,164)$$

$$+ (0,071 \times 0,581) + (0,060 \times 0,123) = 0,464.$$

$$\text{Candidate 2 (c}_2\text{)} = (0,278 \times 0,261) + (0,126 \times 0,230) + (0,125 \times 0,137) + (0,193 \times 0,297) + (0,147 \times 0,539) + (0,071 \times 0,309) + (0,060 \times 0,320) = 0,296.$$

$$\text{Candidate 3 (c}_3\text{)} = (0,278 \times 0,106) + (0,126 \times 0,122) + (0,125 \times 0,623) + (0,193 \times 0,164) + (0,147 \times 0,297) + (0,071 \times 0,110) + (0,060 \times 0,557) \approx 0,240.$$

In this case, we should choose the candidate 1 (c<sub>1</sub>) who has the highest performance score (0,464) as the best entry-level music librarian.

## VI. Conclusion

This paper has demonstrated that the decision makers can select the best entry-level music librarian from all candidates through the Analytic Hierarchy Process as a new model.

In this paper, we firstly described 7 professional criteria (a<sub>1</sub>, a<sub>2</sub>, a<sub>3</sub>,..., a<sub>7</sub>) that must be met by 3 entry-level music librarian candidates (c<sub>1</sub>, c<sub>2</sub>, and c<sub>3</sub>). Secondly, we decided each candidate's performance scores (or the priorities) representing the extent to which each candidate meets these criteria. For this, we used both a 9-point scale for pairwise comparisons and Saaty's eigenvector method. Thirdly, we assigned the importance weights to the required criteria. Fourthly, we performed the consistency test to measure the consistencies of our calculations with the aid of the consistency ratio (CR). Fifthly, we calculated the final performance scores of each candidate as c<sub>1</sub>= 0,464, c<sub>2</sub>= 0, 296, and c<sub>3</sub>= 0, 240. Hence, we selected the candidate 1 (c<sub>1</sub>) who earned the highest score (0,464) in total as the best entry-level music librarian from all music librarian candidates.

## Notes

1. Holy Bible, I. Samuel 16:16: If your lordship will order it, we, your servants here in attendance on you, will look for a man skilled in playing the harp. When the evil spirit from God comes over you, he will play and you will feel better. Holy Bible, I. Samuel 16:23: Whenever the spirit from God seized Saul, David would take the harp and play, and Saul would be relieved and feel better, for the evil spirit would leave him (The American Bible, 2002).
2. The results obtained from several studies done on this subject are different from each other. For

example, according to Steele, Ball, and Runk's (1997, p. 1182) research, listening to Mozart may not make people smarter.

3. We should see Satan in heavy metal music as a symbolic means of escaping from social, religious and moral pressures.
4. Some words of the song entitled Fade to Black sung by the popular heavy metal band, Metallica:
5. ...I have lost the will to live
6. Simply nothing more to give
7. There is nothing more for me
8. Need the end to set me free
9. Things are not what they used to be
10. Missing one inside of me...
11. According to a claim that was never substantiated, the Kiss is a short form of Knights in Satan's Service (Phillips & Cogan, 2009, p. 207).
12. RDA (Resource Description and Access) is a new metadata standard providing guidelines and instructions on formulating metadata to support resource discovery (Taniguchi, 2012, p. 929; 2013, p. 601).
13. Three fields in MARC format are 045: time period of content, 047: form of musical composition code, and 048: number of musical instruments or voices code.
14. Saaty and Sodenkamp (2010, p. 99) do not recommend comparing more than 7 items in any single matrix.
15. Some researchers using the AHP method can choose larger values of RI such as 0,58 for n =3. But, the small values are more consistent for the judgment matrix.
16. Clark' study (2013, p. 472) may generally give us an idea about the importance weights allocated to the criteria.

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