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Article

The Coordinator of Information and Communication Technologies: Its Implication for Open Innovation

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Abstract: This study aims to analyze the effects of open innovation on the figure of the Information and Communication Technologies Coordinator (ICTC) in the Higher Conservatories of Music (HCM) and Authorized Centers of Spain (ACSs). In some regions, the HCMs are regulated by the regulations applied to secondary education and that is why the figure of the CICT exists. In others, this figure does not exist and is not regulated by the administration. In the ACSs, because they are private centers, they do not exist either, although they do have persons in charge of these functions. In order to respond to the objective of this study, a tour has been made to the existing regulations, analyzing the endowment that the centers have in addition to applying a questionnaire to 27 CICT of 35 HCMs and ACSs of Spain. The results obtained reveal the lack of knowledge of this figure and the innovation it represents in its field, information on the functions and tasks of the ICTC is scarce, as is the degree of knowledge of the competencies of the latter. There is a clear need for the CICT to exist in all schools and to be regulated under a common competence framework that allows schools to progress in the same way.

Keywords: Information and Communication Technologies (ICT); ICT coordinator; conservatory; music; Spain

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1. Introduction

The figure of the Coordinator of Information and Communication Technologies (CICT) in the Higher Conservatories of Music (HCMs) and Authorized Centers of Spain (ACSs) is an unknown element in the centers responsible for imparting the Higher Education in Music.

The presence of the figure of the CICT in the different Spanish administrations is uneven and is generally not regulated, especially with regard to the HCMs. In many cases, it is regulated by the regulations that order the Compulsory Secondary Education, regulation of reference for many of the HCMs. In other cases, this figure does not exist and it is the schools themselves who have been concerned to designate one or more people to carry out the much-needed tasks currently involved in the teaching-learning process linked to ICT. This paper presents the results that reflect the situation of the CICT in the Spanish HCMs and ACSs.

1.1. Open Innovation Dynamics in Education

The use of external sources of knowledge to produce the advancement or transformation of certain realities is a fundamental aspect of open innovation [1]. Likewise, open innovation seeks to explore the wide variety of existing sources and opportunities, together with "the capabilities and resources of the firm, and to exploit those opportunities widely

through multiple channels, capabilities and resources, and to exploit the opportunities widely" [2]. The implications of open innovation in companies, training centers, schools, etc., affect and condition the organizational, behavioral or knowledge perspectives and strategies, and the economic and improvement implications for the organization itself [3].

The new approach and scope of open innovation has extended beyond the business environment. In this sense, and due to the effect and benefits reported to users and to the organization itself, open innovation has been a challenge to centers that have opted for the transformation and improvement of their procedures and results. For HCM, an opportunity for change and transformation from the open innovation approach is opening up. Results such as those achieved in the healthcare field after the COVID-19 pandemic [1,4,5], open the door to the transformation of training spaces that, until now, have been resistant to change and innovation.

Users and the organization's own managers share tasks, development costs and offer results to the world for free [6,7]. Establishing a culture of open innovation is essential for society [7], especially in periods of crisis such as the one we are currently experiencing, so schools and any training center, including HCM, must adopt these principles. The relationship between education and industry is evident in certain business activities or in the protection of intellectual property through patents [8]. There are university–industry collaboration frameworks that favor mechanisms for the transfer of technology, people or products [9]. The knowledge and training that students receive are, in essence, elements for innovation, especially in the field of the arts, where the basis for creative and transformative thinking is formed.

Innovation processes in the educational field generally take the form of new teaching/learning processes, new ways of using tools, new resources, new methods, etc. One of these processes is the use of new evaluation instruments and their validation [10–12], if we refer to musical training it would translate into the development of new techniques for the effective handling of musical instruments or the improvement of the teaching and learning methods themselves. This is evidenced in the study of [13], in which the authors show the usefulness of Moodle and Edmodo tools in higher education. Other authors [10,14,15] evaluate the effect of the inadequate or excessive use of ICT resources, however, the contributions and alternative use of ICT must offer educational centers and HCM new opportunities for the approach of the training processes. Awareness of the benefits of the appropriate use of ICT and the positive effects on the improvement of teaching processes requires the improvement of the digital competence of teachers [16–19].

The presentation of new content in the form of educational innovation projects is another aspect addressed by [20], with projects on the school garden and on visual arts and music. Finally, the authors [21–23] seek to understand the training, motivation and ICT skills of university students.

1.2. Higher Conservatories of Music and Authorized Centres in Spain

The centers where higher-level music education is provided in Spain are the HCMs and ACSs. Although there are references before the nineteenth century of centers of great prestige in terms of musical teaching, regulated musical education in Spain officially began with the foundation in 1830 of the Royal Conservatory of Music of Maria Cristina, by Ferdinard VII as a gift to his wife [24]. It is necessary to wait until June 1905 to see regulated the appearance of new conservatories in the [25] Royal Decree of 16 June, which until now were called Provincial Schools of Music. Subsequently, in [26] Decree 2618/1966, the regulation of the Conservatories of Music was established, placing them in Higher, Professional and Elementary Conservatories (and its subsequent modification in [27–29] 1104/1990 and 970/1994) and regulating the teachings that would be in force until the appearance of the Law [30] Organic 1/1990, of 3 October, of General Order of the Educational System (LOGSE), in which it is established that musical education will be organized into three levels: elementary, middle and higher. In the 1980–1990s most of the HCM were created [31].

Various laws and subsequent Royal Decrees, as well as the laws and decrees of each Autonomous Community, clarify the Higher Teachings of Music since then. According to [32] Royal Decree 389/1992 of 15 April in its Article 2.1 and in Article 9 c, the HCMs are those centers in which higher education is provided in this specialty. They must be equipped with a classroom of more than 150 m to teach groups, more than 20 m for individual teaching, or 30 m for teaching chamber music. Other rooms that they must have are the auditorium, study booths, library, offices, and toilets. It also specifies that teachers must have the specific qualification to teach their subjects. The ratio in non-instrumental teaching will be 1/15 (may always be lower if the administration so decides) and the 1/1 individual teaching class. In its Article 7.2, it determines that the educational administrations will provide the conservatories with the necessary equipment for the development of the activities to be carried out correctly. The curriculum of higher education is established by each Autonomous Community. After analyzing the current regulations, we show the specialties that can be studied in each of them (See Table 1).

Table 1. Specialties that can be studied in the different Autonomous Communities.

Autonomous Community	Composition	Interpretation	Pedagogy	Musicology	Direction	Sonology	Production and Management	Flamenco	Total
Andalucía	X	X	X	X	X	X	X	X	N = 8
Madrid	X	X	X	X	X	X			N = 6
Cataluña	X	X	X	X		X	X		N = 6
Murcia	X	X	X	X	X				N = 5
Valencia	X	X	X	X	X				N = 5
Galicia	X	X	X	X					N = 4
Asturias	X	X	X		X				N = 4
País Vasco	X	X	X		X				N = 4
Navarra	X	X	X	X					N = 4
Islas Baleares	X	X	X	X					N = 4
Islas Canarias	X	X	X	X					N = 4
Aragón	X	X			X				N = 3
Castilla La Mancha	X	X			X				N = 3
Castilla y León	X	X		X					N = 3
Extremadura	X	X							N = 2
Total	N = 15	N = 15	N = 11	N = 10	N = 8	N = 3	N = 2	N = 1	

In Spain, there are 35 HCMs and ACSs to teach these courses. Each autonomous community has at least one, being some, such as Cataluña, Galicia, Valencia, Andalucía, or Madrid having two, or more. It is noteworthy that in Cantabria, Ceuta and Melilla and La Rioja there are no HCMs. Table 2 shows the HCMs and ACSs of the Spanish territory.

Table 2. HCMs and ACSs in Spain.

Autonomous Community	* ID	Center	HCMs o ACSs	Total HCMs	Total ACSs
Madrid	C1	Reina Sofía School of Music	ACS	N = 1	N = 8
	C2	Higher School of Singing	ACS		
	C3	High Performance School-Forum Musikae	ACS		
	C4	Royal Conservatory of Music in Madrid	RHCM		
	C5	Katarinagurska Higher Centre	ACS		
	C6	Alfonso X el Sabio University	ACS		
	C7	Higher Center of Musical Progress	ACS		
	C8	Superior Professional and Elementary Music Center Nuestra Señora de Loreto	ACS		
	C9	Musical Arts	ACS		
Andalucía	C10	H.C.M. Manuel Castillo	HCM	N = 5	N = 0
	C11	H.C.M. de Córdoba	HCM		
	C12	H.C.M. de Málaga	HCM		
	C13	H.C.M. Victoria Eugenia	HCM		
	C14	H.C.M. de Jaén	HCM		
Valencia	C15	H.C.M. Oscar Esplá	HCM	N = 3	N = 2
	C16	H.C.M. "Joaquín Rodrigo"	HCM		
	C17	High-Performance Music College	ACS		
	C18	H.C.M. Salvador Seguí	HCM		
	C19	EISM Superior School of Music	ACS		
Cataluña	C20	Taller de Músics	ACS	N = 1	N = 2
	C21	Escola Superior de Música de Cataluña	ACS		
	C22	Conservatori del Liceu	HCM		
Galicia	C23	H.C.M. de A Coruña	HCM	N = 2	N = 1
	C24	H.C.M.. de Vigo	HCM		
	C25	Higher School of Music of Galicia	ACS		
Aragón	C26	H.C.M. Zaragoza	HCM	N = 1	N = 0
Asturias	C27	H.C.M. Eduardo Martínez Torner	HCM	N = 1	N = 0
Islas Baleares	C28	H.C.M. of les Illes Balears	HCM	N = 1	N = 0
Islas Canarias	C29	H.C.M. of Canarias	HCM	N = 1	N = 0
Castilla La Mancha	C30	H.C.M. of Castilla La Mancha	HCM	N = 1	N = 0
Castilla y León	C31	H.C.M. of Salamanca	HCM	N = 1	N = 0
Extremadura	C32	H.C.M. of Badajoz	HCM	N = 1	N = 0
Murcia	C33	H.C.M. Massotti	HCM	N = 1	N = 0
País Vasco	C34	Higher School of Music of El País Vasco (Musikene)	ACS		N = 1
Navarra	C35	H.C.M. of Navarra	HCM	N = 1	N = 0
Total	N = 35			N = 21	N = 14

* ID; Identification Code.

1.3. The ICT Coordinator

Various studies highlight the importance of the CICT figure in educational institutions. According to [33], they should be a person with a good attitude towards technological innovation, persistent, restless, active, and with social skills. Informing teachers about what and how to do in the innovation process, assisting in this process once brought to the classroom, emotionally supporting and energizing coordination meetings are the most important tasks according to [33–36].

Having complete training in the use of new technologies is considered essential for the CICT to perform its functions. It is not only necessary to know the management of the different equipment and software, but the training allows you to reflect and make proposals for ICT integration and innovation [35]. This training is in many cases, non-existent and in most CTIC, completely self-taught [36].

The reference to the leadership that the CICT should offer on technological innovation is evident in the decision making in the planning, coordination, and advice of teachers [10,11].

Teaching music through ICT requires a modern, efficient and innovative classroom [9]. According to [36], the most frequent problems encountered by CICT in the centers are poor internet connectivity and slow connection. On the other hand, the lack of resources and support has been detrimental to the performance of its functions, limiting it in certain cases to the technical task [33]. Overlapping with other positions can be an advantage, since many times, having a managerial position, the same functions are performed [36].

According to the same author, the absence of regulations regarding the figure of the CICT in many communities is palpable and requires that its tasks and functions be legislated and legally protected. Despite this handicap, these agencies and administrations require them to carry out various tasks without regulation.

The need for collaboration between teachers improves the results in the teaching-learning process [37–39]. In line with [9], the establishment of the Learning and Knowledge Technologies Commission (hereinafter LKT) in schools is necessary, which sets out the objectives, stimulates ICT among teachers, and advocates the inclusion of new technologies in the programs. Conforming to this author, if this commission does not exist, it is very complicated for the CICT to be able to carry out all the functions and revitalize the ICT in the center. In the same vine, he adds that the column on which the CICT is based is the ICT team, which acts as a team of experts that drives coordination and improves the support needs of the centers. It is essential that there is an ICT plan in the centers that promotes the dynamization of ICT with CICT at the forefront.

1.4. The CICT in the HCMs and ACSs in Spain

The HCMs and ACSs are in an "inconvenient regulatory framework for the development of these centers" unlike other European higher education institutions (with specific, and consolidated regulations) [40,41]. This is because most of these centers are framed in the regulations of Compulsory Secondary Education.

There are few studies and references to the presence of CICT. According to [40–42] it is necessary that there is a coordinator of multimedia material in all HCMs, only the educational project of Aragon, Madrid, Vigo or Granada collect this figure.

Thirteen of the 15 Autonomous Communities in which HCMs and ACSs exist have been analyzed. In the País Vasco and in Castilla León, no public information has been found in the organization and regulation of the functions of the CICT.

Following the revision of the current regulations of each Autonomous Community, a compilation of the functions to be fulfilled by the CICT has been prepared. This can be seen in the list of functions and Table 3 with which it is related.

Table 3. Functions of CTIC in the Autonomous Communities.

FUNC.	Canarias	Valencia	Cataluña	Aragón	Madrid	Andalucía	Asturias	Murcia	Galicia	Islas Baleares	Navarra	Extremadura	Castilla La Mancha	Total
1.		X	X		X	X	X	X	X		X	X		N = 9
2.				X	X	X	X			X	X	X	X	N = 8
3.	X		X		X		X	X		X		X		N = 7
4.		X						X	X		X			N = 4
5.				X	X	X		X						N = 4
6.		X				X	X	X						N = 4
7.	X	X		X			X							N = 4
8.	X	X	X			X								N = 4
9.	X	X							X	X				N = 4
10.		X	X						X					N = 3
11.	X	X			X									N = 3
12.		X								X				N = 2
13.	X	X												N = 2
14.					X						X			N = 2
15.						X			X					N = 2
16.			X			X								N = 2
17.				X									X	N = 2
18.	X						X							N = 2
19.					X									N = 1
20.								X						N = 1
21.	X			X										N = 1
22.				X										N = 1
23.				X										N = 1
24.				X										N = 1
25.							X							N = 1
26.	X													N = 1
27.	X													N = 1
28.	X													N = 1
29.	X													N = 1
30.	X													N = 1
31.			X											N = 1
32.			X											N = 1
33.			X											N = 1

1. Teacher support/2. Energizer/3. Resource management/4. Inventory/5. Participation in collegiate bodies/6. Contact with management/7. Promote platforms/8. Regulation/9. ICT plan/10. Material maintenance/11. ICT integration/12. Classroom coordinator/13. Data protection/14. Installation and configuration/15. Community Manager/16. Inclusivity/17. Training needs/18. Informing teachers/19. Needs analysis/20. Evaluation/21. Center training plan/22. Exchange/23. External internships with university students/24. Teacher training center (CEP in Spanish) 25. Budget/26. Communication/27. Knowledge of support services/28. Training programs/29. Innovation projects/30. ICT risk prevention/31. Language/32. Digital identity/33. Open format.

ICT training in the Spanish HCMs and ACSs has no consolidated presence and the existence of ICT subjects in the curriculum is uneven [43]. In this regard, Reference [41] states that around 60% of HCMs teachers have not received ICT training, although they show great interest in it. The reason is the lack of relevance of the training to the competence profile of the ICT coordinator of the centers. This contrasts with the figure provided by [40], who states that 58.3% of HCM teachers have received ICT training. However, in relation to ICT training for music education, 87.5% said that they need more training in ICT, specifically in relation to tools and software, educational use of ICT, and resources for work and research. Conservatory teachers prefer that the training is carried out in the school through workgroups and that these courses are short, intensive, and individualized [42]. Teachers highlight the demand for technical and didactic training in audio and video recording and editing.

2. Materials and Methods

2.1. Study Objectives

The CTIC in the MSCs have emerged as consequences of the updating and modernization needs of these centers. The inclusion of ICT and new teaching resources, as well as the regulation and recognition of music studies, has generated a lack of coordination between the different autonomous communities when it comes to recognizing and regulating both the need for the coordinator and his functions and competencies.

It derives from the panorama from this reality that we set out a series of objectives and research questions that will guide this study, in order to shed light on a reality that today is seen as uncertain.

As a general objective of this work, we set out to know and analyze the figure of the CTIC in the HCMs and ACSs of Spain to know the profile associated with it.

The following specific objectives are set for this study:

SO1. Identify the centers in Spain that have CICT.

SO2. Analyze the legal regulation and functions associated with the profile.

SO3. Know the ICT endowment of HCMs and ACSs.

SO4. Assess the training of HCMs teachers in ICT skills.

SO5. To analyze the quality and adequacy of the training offered to CICT in ICT competencies.

SO6. To detect the use made by the different centers of the social networks.

SO7. Determine whether the COVID-19 pandemic has led to changes in the functions of the CICT.

2.2. Sample

The population of this study is made up of the 35 CICT of the different Spanish HCMs and ACSs. There has been an intense search and contact with all the CICT, being constituted the sample by a total of 27 CICT of 15 different Autonomous Communities, that is, 77.14% of the population. The Autonomous Communities of La Rioja and Cantabria, in addition to Ceuta and Melilla, did not participate in the study since they do not have any HCMs or ACSs. As can be seen in Figure 1, of the total of 27 CICT, 24 were men and only 3 women, 21 of them belonging to HCMs and 9 to ACSs.

Of these, 44.4% are between 41 and 50 years old, 37% between 31 and 40 years old, 14.8% between 51 and 60, and 3.7% between 20 and 30 years old (See Figure 2).

The CICT of the HCMs and ACSs that collaborated in the study are detailed in Table 4.

Of the 27 participants, 62.9% of them had specific training for the position in exchange for the 37% who do not have it (See Figure 3).

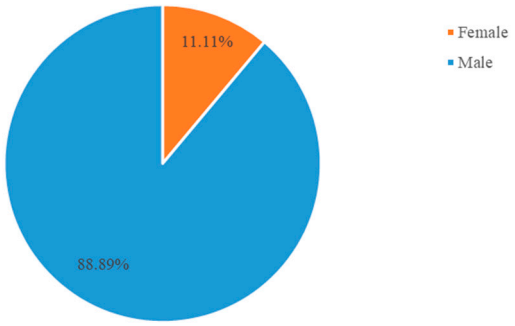

Figure 1. Gender of the CICT of the HCMs in Spain.

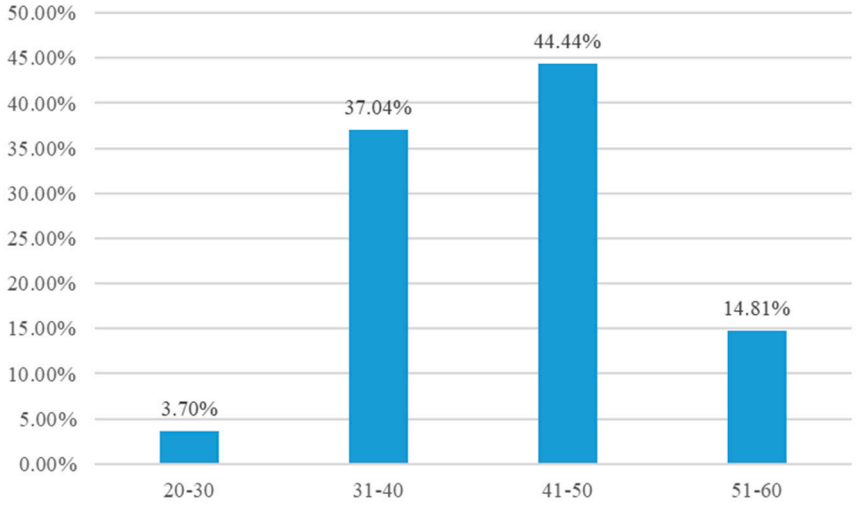

Figure 2. Mean age of CICT of HCMs in Spain.

Table 4. Centers involved in research.

Content/Autonomous Community	Asturias	Andalucía	Canarias	Cantabria	Aragón	Castilla y León	Pais Vasco	Madrid	Valencia	Total
Sound production	X	X	X	X	X	X	X	X	X	N = 9
Bow strokes	X	X	X	X	X	X	X	X	X	N = 9
Positions	X	X	X	X	X	X	X	X	X	N = 9
Memory	X	X	X		X	X	X	X	X	N = 8
Reading at first sight	X	X	X		X	X	X	X		N = 7
Repertory	X	X	X	X	X	X		X		N = 7
Position			X	X	X		X	X	X	N = 6
Hearing sensitivity		X	X	X	X		X	X		N = 6
Study habit	X	X	X	X	X		X			N = 6
Set			X	X	X	X	X	X		N = 6
Coordination	X			X	X	X	X		X	N = 6
Vibrato	X	X		X		X	X		X	N = 6
Musical language		X	X	X	X	X				N = 5

Table 4. *Cont.*

Content/Autonomous Community	Asturias	Andalucía	Canarias	Cantabria	Aragón	Castilla y León	Pais Vasco	Madrid	Valencia	Total
Double stops	X	X				X				N = 3
Tuning	X	X				X				N = 3
Postural habit	X		X							N = 2
Improvisation		X	X							N = 2
Fingering	X	X								N = 2
Technique	X	X								N = 2
Instrument maintenance	X	X								N = 2
Concert	X	X								N = 2
Joint		X								N = 1
Relaxing		X								N = 1
Hand joint			X							N = 1
String changes		X								N = 1
Bariolage	X									N = 1
Harmonic	X									N = 1
Pizzicato	X									N = 1
History	X									N = 1
Recordings	X									N = 1
Pianist				X						N = 1
Total	N = 21	N = 20	N = 14	N = 12	N = 12	N = 12	N = 11	N = 9	N = 7	

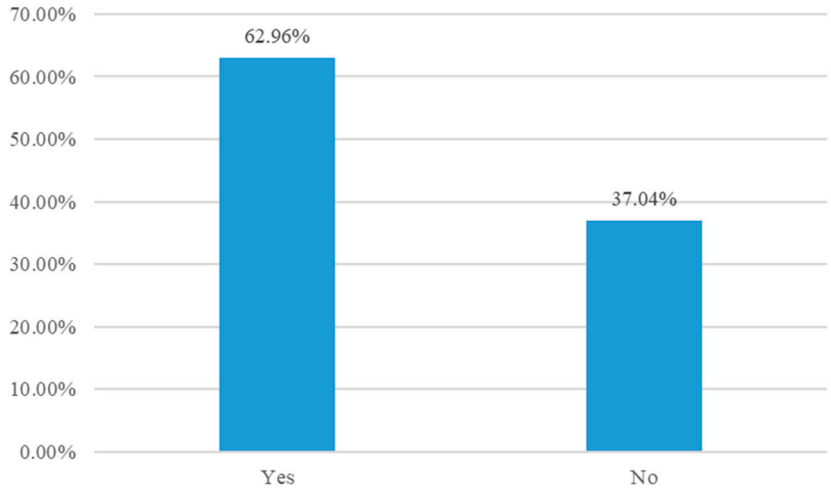

Figure 3. CICT who have specific training for the position.

In addition, an interview was conducted with 3 CTIC volunteers who participated in the study. To identify their answers in the results section, the identification code "Tn" was used, where T refers to "teacher" and "n" to the identification number.

2.3. Instruments

A questionnaire and an interview were used to obtain data. The Ad hoc questionnaire was administered to the 35 CICT of the HCMs and ACSs in Spain and was answered by 27 of them.

This is a mixed questionnaire, with 11 open questions, 4 multiple choice, and 9 Likert scale. The questionnaire was evaluated by a total of 5 expert judges (2 from the University of La Laguna and 3 from the H.C.M. of Canarias).

The test was open for 4 months, during which time the different CICT was responding. Saving the sensitive data of those surveyed under the Organic Law 3/2018, of December 5, on the Protection of Personal Data and guarantee of digital rights, the answers to these can be found in Annex II.

Four previous theoretical dimensions were established for the analysis and interpretation of the results, as shown in Table 5.

Table 5. Dimensions of the questionnaire.

Dimensions	Ítems of the Questionnaire
TIC Coordinator	5, 7, 8, 9, 11, 14, 17, 25, 26
Legal framework	6, 10, 18, 19
Resources, staffing and visibility	15, 16, 20, 21, 22, 23, 24
Training	12, 13, 22

In addition, three interviews were conducted using the structured interview technique. There were 13 open questions organized around the dimensions of the questionnaire. The relationship of interview questions to specific objectives can be found in Table 6.

Table 6. Relationship of specific objectives to interview questions.

Specific Objectives	Research Questions	Questions from the Interviews
SO1	RQ1	2
SO2	RQ2, RQ3	3, 8, 9, 10
SO3	RQ4	11, 12
SO4	RQ5	4, 6, 7
SO5	RQ6	5
SO6	RQ7	13
SO7	RQ8	-

2.4. Data Analysis

The statistical analysis of the data was carried out using the Statistical Package for Social Sciences (SPSS) version 25.

For the analysis of quantitative data, an exploratory descriptive analysis was carried out by item and the dimensions of the questionnaire.

In addition, and on an exploratory basis, the intergroup differences in the dimensions of the questionnaire and the independent variables considered were analyzed.

For the analysis of qualitative information, a content analysis was carried out, gathering the main ideas that the participants expressed in the open questions of both the questionnaire and the interview.

3. Results

The results of the study obtained from the CICT responses are presented in this section.

3.1. Reliability Analysis of the Questionnaire

In order to assess the reliability of the questionnaire, Cronbach's Alpha internal consistency coefficient applied to the 9 scale elements of the questionnaire was used. The

value obtained (0.896) allows us to consider as appropriate the scale used in this study (See Table 7).

Table 7. Reliability value of the scale.

Cronbach's Alpha	Number of Elements
0.896	9

3.2. Exploratory Descriptive Analysis

The data were analyzed to shed light on the CICT figure in the HCMs and ACSs. The CICT exists in only 10 of the 27 sites consulted, as shown in Figure 4.

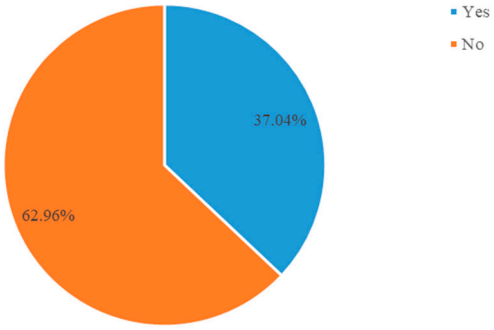

Figure 4. Percentage of Conservatories in which CICT exist.

Of the 10 centers in which the CICT figure exists, only 7 have a time reduction due to having this position, see Figure 5.

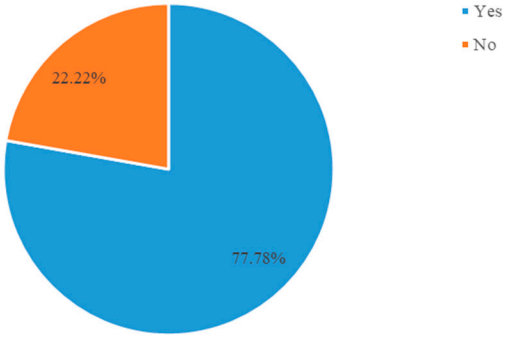

Figure 5. Percentage of CICT that have a time discount for the charge.

Regarding the functions performed by the different CICT, we found that 63% of them are responsible for advising teachers in relation to ICTs, 51.9% of the social networks, 51.9% to solve various problems with the center's equipment, 48.1% of the website, 40.7% to organize teacher training courses in ICT, 29.6% to coordinate with other CICT and 11.1% to the center portal (see Figure 6).

With regard to the training offered by education administrations to CICT, Figure 7 shows the lack of specific training in ICT. Some 77.8 percent of those currently serving on CICT acknowledged that they had not received training.

When asked about the need to implement the CICT figure in the HCM, 70.3% of the participants responded that it is very necessary (See Figure 8).

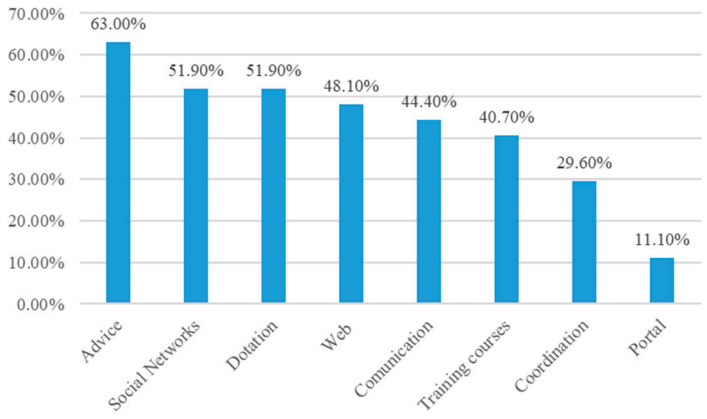

Figure 6. Functions performed by CICTs in HCMs and ACSs.

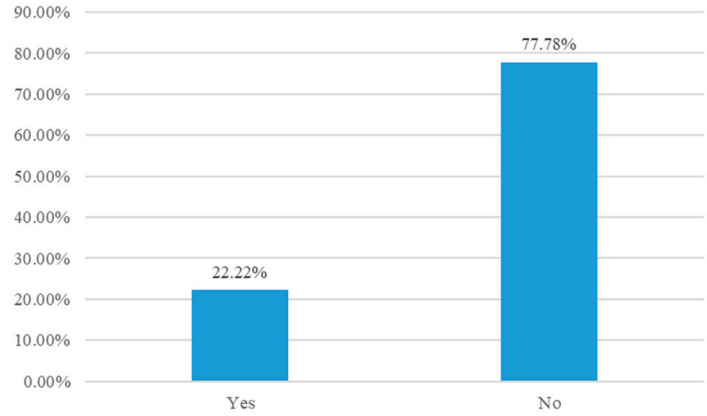

Figure 7. CICT trained by the administration.

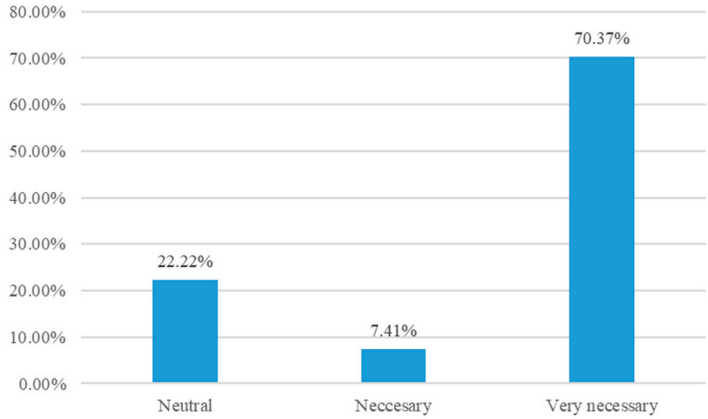

Figure 8. Assessment of the need for the existence of the CICT.

When asked about whether the position of CTIC in the CSM was regulated in the Autonomous Community of each participant, it was observed that only 25.92% of the participants responded that the position was regulated or very regulated (see Figure 9).

It has been estimated that 100% of the centers have computers, 92.1% cameras, 88.9% microphones, 77.8% recorders, 66.7% sound interfaces, 55.6% recordings studios, 51.0% sufficient and up-to-date software, 40.7% digital whiteboards, and 25.9% tablets (see Figure 10).

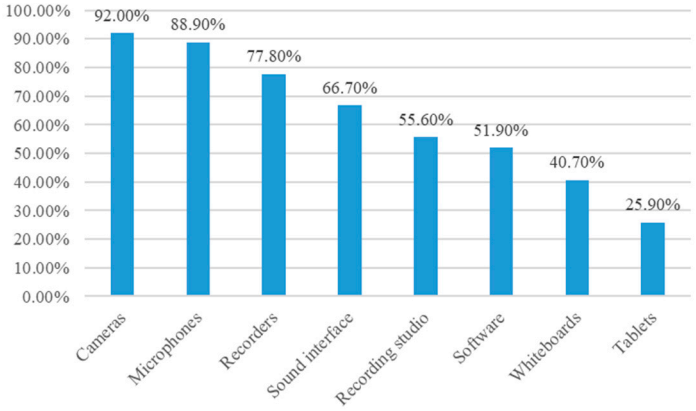

Figure 9. Endowment of HCM and ACS.

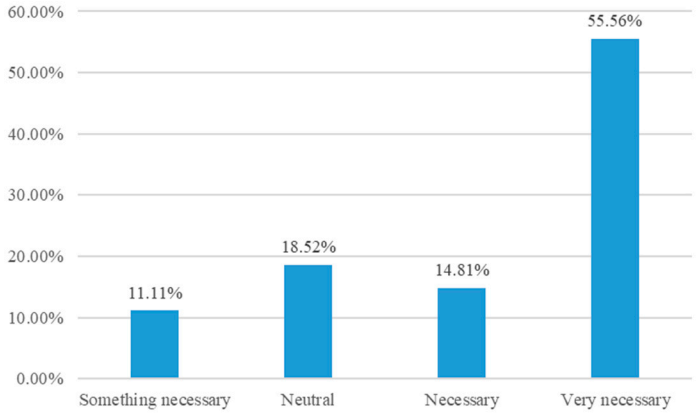

Figure 10. Assessment of the need to regulate the position.

Despite this, the CTIC believes that it is necessary to have more resources in the Spanish CSMs and PPAs, 51.85% of them replied that it is very necessary to increase it (See Figure 11).

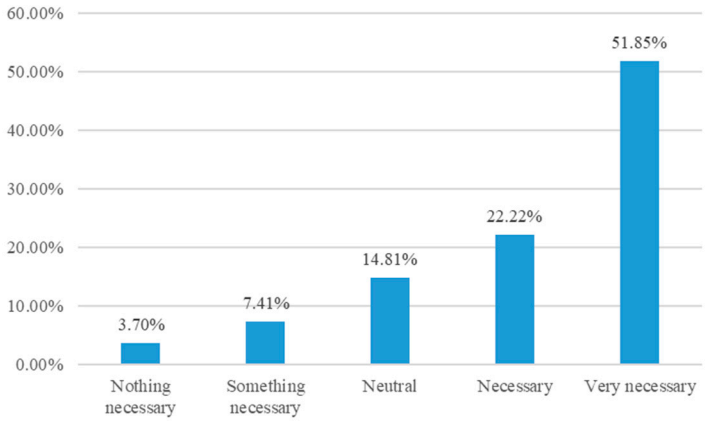

Figure 11. Assessment of whether more funding is needed in HCM.

Of the CTIC, 51.9% think that it would be very necessary to improve the internet network of their Conservatory (See Figure 12).

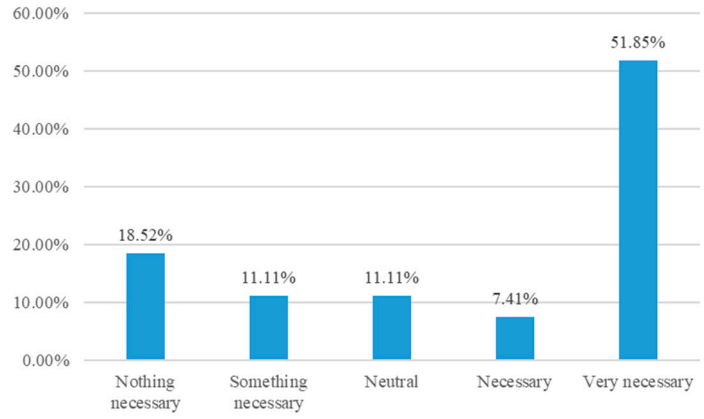

Figure 12. Assessment of whether the network needs to be improved.

The use of social networks in HCM and authorized centers is essential. When asking about the networks used in the different conservatories, it was observed that 96.3% use Facebook, 85.2% Instagram, 85.2% YouTube, 70.4% Twitter, 14.8% other networks, and 3.7% Tik Tok (see Figure 13).

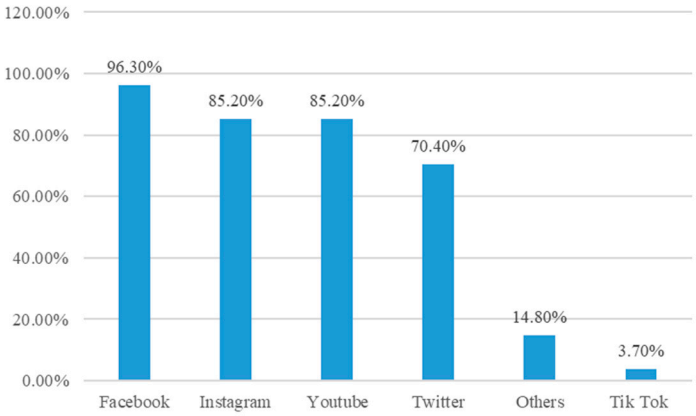

Figure 13. Use of social networks in HCM and ACS.

Of the CICT, 33.33% considered it necessary to improve the visibility of the centers on their social networks, which they believed to be necessary or very necessary (See Figure 14).

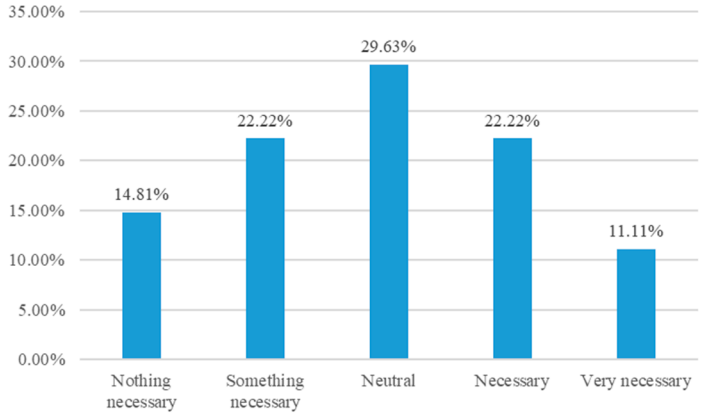

Figure 14. Assessment of whether networks need to be improved.

Finally, 44.4% of respondents believe that they have changed their roles in relation to their previous performance after COVID-19 (See Figure 15).

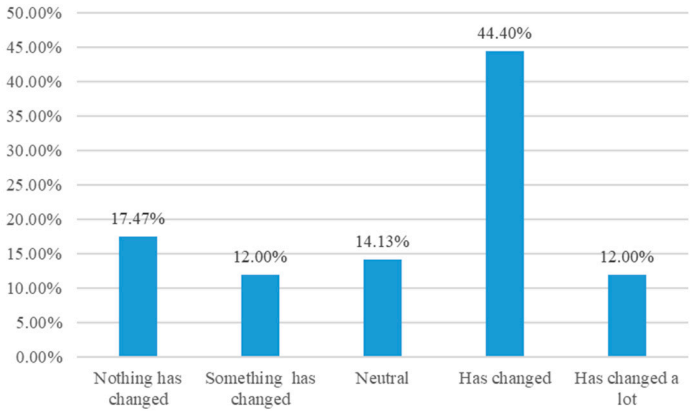

Figure 15. Assessment of whether functions have changed after COVID.

3.3. Analysis of Qualitative Results Obtained from the Questionnaires

The analysis of the assessments made by the CICT shows the disparity of opinions and visions that they have both public and private centers.

C24 expressed the need "to create an ICT team that can really meet all the needs arising from the use of technology for our daily teaching activity". In the same line, C23 said that "it would be very necessary a regulation of the ICT realistic and adapted to the needs of a higher conservatory. (. . .)". In this ICT regulation, they felt that there should be more than one ICT coordinator.

As we have seen, in many of the HCMs, there is no CICT figure. C14 replied that they did not believe that it was necessary to establish the figure of the CICT in the HCM, "since the current norm in Andalucía stipulates the same competencies to the TDE coordinator". In the same line as C1, he replied that "not really, the small structure facilitates better coordination among all departments". C23 stated that the CICT performs "so many functions and so varied that a single person cannot cover them and at the same time maintain the teaching function". The regulations in this area are designed for a secondary school and the reality of a superior covers many more things. C10 indicated the need for the CICT in the HCMs, and said that it was necessary to "improve the internal communication and management systems (. . .)" and "project the Center and its important concert, research, and artistic activity".

On the contrary, C26 stressed that the figure of an ICT coordinator, a qualified technology specialist, is necessary to collaborate with the management team, as well as with the rest of the faculty, as the technological demand advances very fast. In addition, C32 pointed out something that many CICTs claim, which is that "this position is being filled by volunteers without a time reduction".

When asked if the functions they perform are regulated in any regulations, only C14, C23 and C35 responded positively. Only C29, C3 and C30 reported knowing the regulations.

It was found that the functions of the CICT have been changed after the pandemic by COVID-19. C2 indicated that "presence has been reduced and online teaching has increased", as has C20, which noted that "there has been an increase in online teaching, telematic meetings and teleworking".

With reference to the allocation, C24 highlighted that the level of demand in terms of quality NETWORK (Connections) and computer resources of the educational community has increased exponentially. However, the quality of the center's telematic resources in relation to instrumental subjects in online classes and, in general, in all the subjects they consume today is low.

Regarding the use of virtual platforms and virtual classrooms, C23 commented that previously, only some teachers of the center used the virtual classroom. It is now compulsory for everyone and "many do not have enough training to do so". In the same vein, C26 specified that "the launch of the Gsuite platform in the wake of the pandemic in an

accelerated manner, made its use essential to continue with online teaching and our center did not have it created".

The need for teacher training was reflected in the opinions of C18 and C23, who noted that the training and ICT counseling needs of teachers have changed. They stressed that "there is a need for adequate and professional equipment". In particular, there is no provision for software, despite the fact that specific subjects require up-to-date professional software. For its part, C31 stated that "I have had to train teachers in the use of various technologies and help them to acquire independence in the use of the materials of the center".

The pandemic caused by COVID-19 has generated important changes in the Spanish HCMs and ACSs, especially in terms of social networks, and streaming concerts. About this, C32 commented that it has had "a lot more activity from social networks, online classes, the web, and the information screen".

In addition, C27 noted that "many broadcasts are made on Streaming and more people use telematics communication applications with students and between teachers". On the other hand, C31 emphasized that it already carries "a time being necessary the figure of a person to make recordings and concerts where electronics are used, with the incorporation of concerts by Streaming to the center has become more evident the need for a person who manages the materials, teach its use and help configure the items that are needed".

3.4. Analysis of the Interviews

Regarding the trajectory of CICT and how they came to the position it holds, T1 stated that he arrived "by appointment of the Director. I am in it obviously for this appointment and for my degree". For his part T2 commented that it takes 3 years and is "the Professor of Music Technology and for my academic profile and the type of subject I impart, the management team agreed to propose me the position". Finally, T3 explained that "he arrived at the post pointed out by a finger, someone thought that he was doing the programming well layered, that he had computer idea and I tried to learn as much as possible".

These professors had an uneven training in ICT: T1 is in a Technical University in computer systems and T2 is a Professor of Music Technology (. . .) and Software architect, has a Master's degree in Advanced Artificial Intelligence, and a Doctorate in Computer-Assisted Musical Composition. However, T3 acknowledged that they had very basic ICT training, "some courses I have done through Teacher training center or university, to know how a classroom works", but not much more.

When asked about the functions of CICT, T1 responded: "Preparation of the digital signage system (information screen); maintenance of it; preparation, programing of such publications. Assembly and design of the official website. Maintenance of the same. Elaboration of the entries and informative pages. Publication of these entries and pages. Coordination of the Social Media team. Maintenance of the repository of the center's common graphic material: photographs, videos, logos, and posters". T2, for their part, added "the installation, updating, and management of software licenses, maintenance of operating systems; incident communication (screens, projectors, audio equipment, etc.); inventory management and control of recording material". T3 stated that the needs of teachers should be warned, and "try to suggest solutions and encourage them to use social networks, I try to help as much as possible to optimize the use of resources", as it is often confused to be an ICT coordinator with a specialist technician.

With regard to the training received by management of ICT, T1 and T2 agreed that they had not received any. However, T3 acknowledged that they have tried to train, "although through the Teacher training center or the university, or with tutorials on the internet". All of them would like to be trained in different ICT subjects such as "cryptography, digital signature, computer security" (T1), "networking and remote computer maintenance" (T2), or "recording for classes and making video montages" (T3). T1 referred to the lack of training for teachers in the HCMs and ACSs and stated that "there is a lack of training in

computer security, in office automation and in everything related to the preparation and editing of images, posters and graphic communication".

The regulation of the position of the CICT is unknown among the interviewees, since only T2 claimed to have knowledge of it. Referring to it, he suggested that "functions should be more precisely and accurately identified and those not". Furthermore, the number of reduced hours, which are currently completely under-estimated, should be "increased".

In relation to the endowment of the HCMs and the ACSs, T1 commented that the activities and functions were carried out in its center "at zero cost, with a minimum material and reusing the existing resources", an issue that T2 corroborated by stating that "it has the minimum and is not updated". With regard to the number of students, opinions are mixed, with T1 and T3 stating that it is sufficient and T2 that it is not.

3.5. Analysis of Differences Based on Independent Variables

For comparative analyses, non-parametric tests were used, since the conditions for the distribution of the sample for parametric assumptions are not met. None of the quantitative variables that are compared according to the qualitative variables meets the condition of normality of the distributions.

We opted for the two most used and powerful tests in this research design. Thus, the Mann–Whitney U test was used for variables of two response levels, and the Kruskal–Wallis H test for variables of more than two levels.

In this way, it was found that there are no significant differences by age, in the presence of the CICT in the centers, in the specific training for the position, or in the training provided by the administration. This may be due to the lack of specific training for CICTs in the HCMs and ACSs and the lack of specific regulation for these centers by the different administrations.

4. Discussion

4.1. The Coordinator of Information and Communication Technologies

The figure of the CICT in the Spanish HCMs and ACSs is variable in terms of its existence and functions. Some of the things you need to do are inform teachers, innovate in ICT, energize the different meetings, install software, resource managers, etc., [10–13]. This is evident in the responses provided by the different CICTs, where it was found that counseling (with a 63% positive response) and the maintenance of social networks and funding (with 51.9%) are three of the functions most performed by ICTs in these centers. It is noteworthy that during the pandemic, the functions of the CICT changed, as stated by C2 and C20, when noting the increase of virtual or online tasks.

With regard to the need for the creation of the CICT figure, it is pointed out that the profile of the CICT needs to be recognized and competently defined. It also notes the importance of creating an ICT work team capable of responding to the needs arising from its use.

In relation to the regulation of the CICT profile, the absence of a clear and concise regulation was evident, only in Madrid was found a specific regulation in this regard. In Valencia and Baleares there is this regulation, but it refers to the Professional Conservatories of Music and in the rest of the centers, the regulations referring to Secondary Education and Vocational Training have been used since many of the HCMs are under its protection. Of the respondents, 55.56% considered it necessary to specifically regulate the CICT for HCMs and ACSs.

When comparing the regulations in force in each Autonomous Community with the functions to be carried out by the CICT, we find that many of them converge on the need to support and energize teachers in terms of ICT, in addition to managing the center's resources.

ICT training is essential if CICTs are to know how the centers work and if they are to be able to develop ICT innovation proposals [35]. It was noted that teachers had not

received ICT training [37,40]. The administration provides little training to ICTs, which demand up-to-date ICT training.

The various educational laws have specified how the different centers should be equipped. In HCMs and ACSs, the most commonly used are video cameras, the computer, the digital whiteboard, the various operating systems, and the specific music editing or recording software [42,43]. This is in line with [44], who warns that the resources most commonly used are computers and audio and internet equipment. On the other hand, reference [45] describes its use in these centers and concludes that there are deficiencies in the ICT equipment of the Conservatories. This coincides with the results of this study, in which participants have determined that the most widely used resources are the computers, cameras, microphones, and recorders. It should be noted in this connection that the resources are mostly old. That is why 51.85% of the CICT consulted considered that it is very necessary to have more resources and that, in addition, it is very necessary to improve the internet network of the centers.

Finally, we must highlight the importance of the presence of social networks in the life of the educational community of the HCMs and ACSs, all of them being, to a greater or lesser extent, in social networks.

4.2. The Coordinator of Information and Communication Technologies and its Effects of Open Innovation

The creation of musicograms to work on listening and emotional development is part of the proposal of [17,45,46], which proposes new resources as part of innovation in the musical field. In the same sense, on Youtube and Vodcasting, and reference [11], which choose the programs Irealb and Band in a Box as ICT resources to be used in professional and HCM, pronounce themselves in the same sense. Another example to highlight is the one proposed by who uses flashmob as a tool that favors motivation in the orchestras of the different centers.

Likewise, we find references to new methodologies, such as the one presented by [47], who brings a new proposal for the development of auditory education to the Musical Language class. Others, such as [48], introduce the action-research methodology as an innovative resource for educational practice in conservatories.

In relation to ICT tools, we find studies on the use of the digital whiteboard [49] or its use to improve dictation in the Music Language class in conservatories [32]. There are also studies, such as the one by [50], which try to know the competencies of the students of conservatories in this regard.

Coordination between different centers is part of the innovation experiences proposed by [51,52], creating working groups to connect music teaching in schools with that of the conservatories.

It is important to note that there are no studies on open innovation in the field of ICT coordinators in Conservatories of Music and authorized centers. In itself, this work is an innovation in the sense of revealing the importance and need for joint actions to be developed in all music centers, coordination would facilitate the dissemination of good practices and innovative practices, which would help significantly to improve the quality of the centers and promote innovation in them.

5. Conclusions

Based on the main findings of our study, the following conclusions have been drawn. In relation to the objectives of this study, we have concluded that:

- All Spanish HCMs and ACSs have been described, with a count of the centers and a profile of them. In addition, a review of the history of the HCMs in Spain has been made and it has specified the specialties that are taught in each of them, turning out to be the most numerous Composition and Interpretation.

- After analyzing the current regulations that fall within the competence of these HCMs and ACSs, it has been possible to conclude that only in two Autonomous Communities there is a specific legislation for the HCMs and ACSs' CICT.
- Thirty-three different functions have been identified in the existing regulations, including teacher support, the role of facilitator, resource management and inventory.
- The ICT endowment of the centers is uneven, being scarce in many of them. Computers, cameras, and microphones are the resources that are most present in HCMs and ACSs.
- Training in ICT skills available to teachers in HCMs and ACSs are scarce. Some CICTs have specific training in the field and others have had to be trained to be able to exercise the position.
- CICT demands more training in cryptography, recording, computer security, video editing, etc.
- The use of social networks in different centers is widespread. Facebook, Instagram, and YouTube are the most used by Spanish HCMs and ACSs.
- The COVID-19 pandemic has significantly increased the functions to be performed by CICT.

No previous study of this subject is known, which is why the lack of information from primary and secondary sources related to the study has been a handicap. Other difficulties encountered were the difficulty of access and the language of the regulations of some of the Autonomous Communities (Catalan, Valencian, etc.) and the intense search and contact to the 35 CICTs, which delayed the study several months.

The results obtained converge directly with the demand presented on 9 March 2021 by the European Commission. It calls for more than 20 million ICT specialists, a minimum of 80% of the population with basic digital skills, a clear transformation and innovation in companies and the digitization of public services [53]. It is, therefore, essential that the figure of the CTIC is established in all HCMs and ACSs and that all of them are properly trained, both in basic digital skills and in the more complex skills associated with the position of coordinator.

No studies have been found on open innovation in the field of music in conservatories or other music training centers. Therefore, this study is relevant because it is an innovation in itself, highlighting and defining the competencies of the CTIC coordinator is a challenge that HCMs and ACSs have to take on if they want to place these centers at the forefront of innovation.

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