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DIGITAL MUSICAL INSTRUMENT

AS A SOCIOCULTURAL PHENOMENON

EL INSTRUMENTO MUSICAL DIGITAL COMO FENÓMENO SOCIOCULTURAL

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ABSTRACT

The present study is focused on the cultural conformity of musical computer instruments in the context of relevant forms of socio-cultural functioning of new types of musical creativity. The authors conducted the analysis of pedagogical use of digital musical instruments, namely, synthesizer keyboard, digital button or piano accordion for sociocultural activity. The results of the research were presented in the collections of materials of the annual International Research and Practical Conference "Contemporary Music Education" (St. Petersburg) and collections of articles "Digital Musical Instruments" and "Music Computer Technologies". The authors insist on the implementation of music computer technology and digital musical instruments for the modernization of music educational process at all stages, i.e., at schools, colleges, and universities.

Keywords: Synthesizer keyboard, digital bayan/accordion, digital instruments, music computer technologies, socio-cultural activity, music education.

RESUMEN

El presente estudio se centra en la conformidad cultural de los instrumentos musicales informáticos en el contexto de formas relevantes de funcionamiento sociocultural de nuevos tipos de creatividad musical. Los autores realizaron el análisis del uso pedagógico de los instrumentos musicales digitales, a saber, el teclado sintetizador, el botón digital o el acordeón de piano para la actividad sociocultural. Los resultados de la investigación se presentaron en las colecciones de materiales de la Conferencia Internacional de Investigación y Práctica anual "Educación Musical Contemporánea" (San Petersburgo) y colecciones de artículos "Instrumentos musicales digitales" y "Tecnologías informáticas musicales". Los autores insisten en la implementación de tecnología informática musical e instrumentos musicales digitales para la modernización del proceso educativo musical en todas las etapas, es decir, en las escuelas, colegios y universidades.

Palabras clave: Teclado sintetizador, bayan/acordeón digital, instrumentos digitales, tecnologías informáticas de música, actividad sociocultural, educación musical.

INTRODUCTION

Digital age introduces new requirements for technological development. The study reveals the problem of the actualization of “demand” in the digital age. According to Sadovnichiy (2019), this phenomenon is called singularity, when *“changes in technological and social reality are being accelerated and less predictable”* *“before our eyes.... the very philosophy and even the ideology of education are being changed: what to teach, why to teach. After all, we do not even know what professional knowledge or skills our future students will need. Generation Z is perfectly adapted to the modern technological environment since childhood... And these are completely new challenges in the field of education and career guidance.”* (Sadovnichiy, 2019)

Currently, a number of musicians and public figures discuss the approaches to music education development (hereinafter, ME) and the necessity of its modernization. Nowadays, ME does not meet the sociocultural demands for new forms of cultural creation in the digital age. New ways of educational process development as well as the integration of its results into the socio-cultural space are being discussed by the scientific community and practicing teachers at all-Russian and international conferences and forums. International Research and Practical Conference “Contemporary Music Education”, organized by the teaching and methodological laboratory of “Music and Computer Technologies” of the Herzen State Pedagogical University of Russia and the Rimsky-Korsakov St. Petersburg State Conservatory is considered to be a striking example of such a collaboration.

Over the past decades, teaching the electronic synthesizer keyboard and digital piano has become widespread in many children’s music schools and children’s art schools (CMS and CAS) in the Russian ME system. Besides, in recent years, the digital accordion/bayan classes have been opened. The issues of the development of performance on electronic musical instruments (EMI), methodological approaches, repertoire (adaptation for particular models of instruments, transcription, etc.), and EMI functions mastering have been solved experimentally by the teachers of EMI, whose main specialization was piano, theory, accordion/bayan, etc.

Music computer technologies (hereinafter, MCT) in the initial stage of the ME are mainly used for multimedia support of the educational process at the theoretical lessons. Computer adaptation and other innovative approaches in the educational process that require a cognitive approach are performed by CMS and CAS basing on their instrumental base and the personnel potential.

According to the curriculum, for the intermediate and upper level of the ME, a synthesizer keyboard is taught as an additional tool. However, there are no clearly defined educational standards for EMI mastering. In universities MCT is studied mainly in the framework of “Acoustic Engineering” and “Teacher-musician” specializations. At the same time, EMI and MCT are introduced at a large number of All-Russian and international musical contests.

The most famous are the following: the All-Russian competition of electro acoustic music “DEMO” (St. Petersburg), All-Russian contest-forum “CLARINI of the 21st Century” (St. Petersburg); International competition “Music and Electronics” (Moscow); International Internet contest “Electronic Keys” (Moscow), etc.

Various aspects of musical art and MCT functioning in the digital era were studied in the dissertation research by Gromadin (2010); Romanenko (2015), etc. Fundamental work in the field of music digital technologies studying and their implementation in educational process is being conducted in various research educational centers, among which the work of the teaching and methodological laboratory of “Music and Computer Technologies” of the Herzen State Pedagogical University of Russia (Gorbunova, 2018; Gorbunova, 2019; Gorbunova & Kameris, 2019; Gorbunova & Zalivadny, 2019; Gorbunova & Hiner, 2019; Gorbunova & Zalivandy, 2018) and Computer Music Department of *Gnesin Russian Academy of Music (RAM)* is the most significant.

Various aspects of digital performance and the pedagogical process using EMI and MCT in the framework of cultural studies, musicology, art pedagogy, ethno-organology, philosophy, etc. were covered at all-Russian and international research, practical and theoretical conferences, such as: “Contemporary Music Education”, “A child in the modern world”, “Communicative strategies of the information society”, “Music education today: traditions and innovations”, “Music and digital technologies: education - creativity - media”, “Music computer technologies in the system modern education”, etc.

The analysis of the research and practical works presented at the annual International Research and Practical Conference “Contemporary Music Education” (López, 2014), “Electronic Musical Instruments”, as well as the materials devoted to various aspects of the EMI use contributed to the conclusion that implementation of EMI and MCT in the educational process and concert activities, as long as used competently, provides great advantages over traditional teaching methods. This is the opinion of area specialists closely involved in the development of a new instrumental direction using EMI.

However, conservative musicians who are not aware of the digital performance specifics are *a priori* confident that digital “quasi-art” cannot be regarded as academic one and therefore there is no need in its professional development. Such a pseudoscientific predicate is introduced into the sociocultural space by conservative musicians, forming the paradigm of digital performance as “an amateur music making”, which is undoubtedly extrapolated to all types of MCT art and preclude the development of EMI performance in the system of professional ME.

The purpose of the present research is to study the socio-cultural influence of digital performance in different social strata and the perceptual readiness of the society for digital instrumental art. We have to study a very controversial issue, i.e., whether there is a socio-cultural demand for digital instrumental performance or not? Is professional digital performance and digital technologies necessary to be integrated in ME or are well-known genres of acoustic performance and old-school training enough? The authors conducted a sociological monitoring to find out the presence of social intention for new forms of cultural creativity.

MATERIALS AND METHODS

The authors analyzed the audience's opinion as to the digital instruments application. This provided the opportunity to confirm the hypotheses of the study, to justify the criteria for the perceptual readiness validity of the “digital” listener and the sociocultural demand for new forms of instrumental music making. The monitoring results are based on the feedback left after concerts and events, opinion polls, i.e., interviewing spectators at concert-lectures, opinions of professional instrumental musicians. The material of the study is the author's arrangements for various models of synthesizer keyboard, digital pianos, digital accordion/bayan, and digital (electronic instruments) and mixed (acoustic and electronic instruments) types of bands performed at numerous social and cultural events. Besides, the development of multimedia content for concerts, which creates additional immersiveness in the semantic space of digital performance, is also regarded as the material of the present study. Sociological survey was carried out both during the educational process and at social and cultural events, namely: concerts, concert-lectures, and theatrical performances, literary and musical evenings conducted by the researchers outside the educational institution. Monitoring was conducted among three different social groups, namely: *children, adults, and professional musicians*.

- » “Children” is an age group that consists of the young listeners from preschoolers to teenagers, who attended

career guidance, cultural and educational lectures in kindergartens and secondary schools.

- » The age category “adults” involves adult audience, without age restrictions, namely: parents and relatives of the performers, spectators of musical and theatrical shows, etc. Musical awareness and musical experience can vary from “not competent” to “competent amateur”. Gender characteristics were not taken into account in this study.
- » The category “expert musicians” involves professional musicians of various practical (instrumental, vocal) and theoretical specializations who have received an academic music education and whose competent opinion is very valuable for the present research.

The degree of sociocultural interest in digital music technologies was revealed by means of interviews, interactive games including various reductions of musical material and timbre combinatorics, a comparative analysis of the sound of the works in the original internal signal voice mode and arranged on the EMI, the creation of a special immersion synesthesia sound space at the shows.

RESULTS AND DISCUSSION

For convenience, all the social and cultural events were divided into two categories, namely, - children's and adults'. Digital instruments were also divided into two groups, such as: digital synthesizer keyboard/piano and 2) a digital accordion/bayan. The results obtained were summarized in the table.

At the events, various forms of cultural, educational and career guidance work were applied. The authors selected the following for their research: *concert presentation* of digital instruments potentiality; *a comparative listening analysis* of a music work in the “original language” (in our case, on the piano or button accordion/bayan) and “in transcription” on EMI; *musical and immersion performance* on EMI in a modern theater acting space.

Performance on EMI for children was preceded by an explanation of the performed repertoire content and verbal immersion of the listener into the musical semantic space. The arrangement plan was revealed to the children, explaining the timbres according to the listeners' age characteristics and a preliminary acoustic demonstration of the timbre or sound effect. Firstly, young spectators define the character's features presenting a verbal description. For example, *a hedgehog* is prickly, small, and funny; *the sun* is warm, luminous, and joyful; *the shadows in the night forest* are terrible, frightening, and terrifying, etc. Then a musical image of a prickly little hedgehog “is drawn” with a xylophone timbre combined with *pizzicato* of bow-instruments; rain “is drawn” with bells; fears - with

FireWire timbre using wave effects and *Pitch Bend*, etc. After this preliminary cognitive work, a musical composition is performed. For the immersion effect, slide shows or videos specially prepared for each concert item can be shown on a video screen.

The repertoire, namely its semantics was selected for each particular concert, according to the audience age and perception intentionality.

In the context of *a comparative listening analysis*, the audience was asked to listen to the same piece of musical composition on the acoustic prototype and then arranged on an EMI (piano => synthesizer keyboard, button accordion/bayan => digital button accordion/bayan). After listening, the audience could compare the presentation of the artistic image and sound coloristics on a monotimbre instrument and on EMI. To maintain the experimental integrity, the works were performed by a teacher-musician. Opinion polls were carried out using pre-prepared tests and questionnaires by means of on-the-spot voting, interviewing and questioning methods.

Another type of sociocultural activity with EMI is participation in musical theatrical performance. It is to involve adult audience (age restrictions: 12+). During a theatrical performance, the digital artist creates a special immersion sound space, performing compositions either in the background or in musical interludes (in whole or in fragments), helping to reveal the semantic space of the literary text more accurately and creating a synesthetic perception and an illusion of the presence "within the event". Because of the work carried out, a number of criteria for a modern listener's readiness and intentionality for the digital music perception were developed. For illustration purposes, the answers were presented with points system:

1. Criterion for the instrument recognizability: always recognizable (10 points)/not always recognizable (5 points);
2. Criterion for primary perception of a timbre: recognizable (10 points)/not recognizable (0 points), full conformity with the original (10 points)/partial (5 points);
3. Criterion for primary perception of the instrument potentiality: surprise/admiration (10 points); indifference/rejection (0 points);
4. Criterion for the comparative analogy of EMI with an acoustic analogue: it sounds more interesting on "acoustics" (5 points), it sounds more interesting on EMI (10 points);
5. Criterion of immersiveness into the musical semantic space and the artistic image presentation: full compliance (10 points), incomplete compliance (5 points), does not meet the artistic tasks (0 points);

6. Criterion of the sociocultural impact of digital instrument: interesting (10 points)/not interesting to listen to (0 points), informative (10 points)/not informative (0 points), is likely to be listened to (10 points)/is not likely to be listened in the future (0 points);
7. Criterion of the intention for the digital instrument mastering: intent to master (10 points)/not intent to master (0 points)/could not make a choice (5 points).

The results of the work showed that the criterion of *instrument recognizability* for digital instrument (construction) and its *timbre* prototype in the "children" group depends on empirical experience. In the framework of our study, we intended to find out whether the timbre of the piano or harmonica is similar to its acoustic analogues, and whether the timbres of other instruments are recognizable. In the category of preschoolers, a synthesizer keyboard was usually called a "piano", not distinguishing a large acoustic piano from a small synthesizer, but regarding these instruments according to the similarity of a piano keyboard. A digital accordion/bayan in children's audience was immediately called a "harmonica, accordion", like an acoustic instrument. In the "adult" audience, the digital accordion/bayan is also correlated with the acoustic prototype.

However, the survey results showed that many "children", despite their age, as well as more competent "adults", were not aware of the digital instrument functionality until they first become familiar with it. The *criterion of primary perception of the instrument potentiality* is based on the constant positive reaction of the listener to the sound of the instrument and its functionality. The ability to "be any kind of a musician at the same time" (the multi-temporal characteristics of EMI allows a digital musician to be a flutist, an organist, and a guitarist, etc.); to play to the drum kit, like in a pop band; to play in any musical styles and directions (from classical and jazz to pop music, DJing, etc.), to create live complex timbre tectonic structures, which is impossible on a monotimbre instrument, performs ***axiological functionality of modern music-making which is of sociocultural significance in modern cultural process.***

The criterion of *immersiveness* is based on recognizability of the presented artistic image or the involvement of the listener in a specific semantic space. *Immersiveness* in each group was studied by means of different sound material. Thus, preschoolers and primary schoolchildren were offered compositions with "speaking" names, such as: "Little hedgehog" by Kabalevsky, "Lost" by Metallidi, "Rain" by Korenevskaya, "Two cocks" by Razorenov, "Popcorn" by Kingsley, etc., as well as familiar compositions from Russian and foreign cartoons and films. Senior children were offered modern compositions from famous films (in accordance with their inner world and romantic

ideals), well-known classical works for organ, symphony orchestra, etc. The category of “adult” listeners as well as the category of “musicians” are almost always present at any event (both for children and for adults) and actively express their point of view according to the criteria that we are interested in.

The monitoring results showed the following criteria for perceptual readiness and intentionality for the digital music making for a modern listener (Table 1, 2, 3, 4, 5, 6 y 7):

Table 1. Instrument (construction) recognizability: always recognizable (10 points)/not always recognizable (5 points).

Listeners category	EMI (synthesizer/digital piano)	EMI (Digital accordion/bayan)
Children	5	10
Adults	10	10
Expert musicians	10	10

Table 2. Primary perception of a timbre: recognizable (10 points)/not recognizable (0 points), full conformity with the original (10 points)/partial (5 points).

Listeners category	EMI (synthesizer/digital piano)	EMI (Digital accordion/bayan)
Children	10 - 10	10 - 10
Adults	10 - 10	10 - 10
Expert musicians	10 - 5	- 5

Table 3. Primary perception of the instrument potentiality: surprise/admiration (10 points); indifference/rejection (0 points).

Listeners category	EMI (synthesizer/digital piano)	EMI (Digital accordion/bayan)
Children	10	10
Adults	10	10
Expert musicians	10/0	

Table 4. Comparative analogy of EMI with an acoustic analogue: it sounds more interesting on “acoustics” (5 points), it sounds more interesting on EMI (10 points).

Listeners category	EMI (synthesizer/digital piano)	EMI (Digital accordion/bayan)
Children	10	10
Adults	10	10
Expert musicians	10	

Table 5. Immersiveness into the musical semantic space and the artistic image presentation: full compliance (10 points), incomplete compliance (5 points), does not meet the artistic tasks (0 points).

Listeners category	EMI (synthesizer/digital piano)	EMI (Digital accordion/bayan)
Children	10	10
Adults	10	10
Expert musicians	10	

Table 6. Sociocultural impact of digital instrument: interesting (10 points)/not interesting to listen to (0 points), informative (10 points)/not informative (0 points), is likely to be listened to (10 points)/is not likely to be listened in the future (0 points).

Listeners category	EMI (synthesizer)	EMI (Digital accordion/bayan)
Children	10 /10 /10	10 /10 /10
Adults	10 /10 /10	10 /10 /10
Expert musicians (As it was already noted, expert ratings can be very polar, i.e., from enthusiastic to strictly negative. However, correctly arranged interesting adaptations and the performing skills of a digital musician almost always contribute to positive attitude by conservative musicians.)	10 /10 /10	10 /10

Table 7. Intention for the digital instrument mastering: intent to master (10 points)/not intent to master (0 points)/could not make a choice (5 points).

Listeners category	EMI (synthesizer)	EMI (Digital accordion/bayan)
Children	10	10
Adults (here, we consider hypothetical intention: if they had such an opportunity in childhood)	10	10

Expert musicians (here, we consider their real intention to improve their competencies and to master the art of performing and EMI arranging)	5	5
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These criteria are based on a numerous events over a number of years (from 2010 to 2019). The number of listeners present at one event ranged from 60 to 100 people. Thus, in secondary schools, CMS and CAS up to 500 participants were involved (for example, Red Square in Moscow during a theater show in the framework of the International Festival "Red Square").

The survey of the children was conducted directly during the events by means of on-the-spot voting, interviewing and questioning methods. Adult listeners expressed their opinions orally and in writing, i.e., in the form of feedback on the event, answers to test questions and questionnaires. In addition, partial interviewing of participants was conducted. **General pattern of the emotional perceptive activity of the listeners of the events** is introduced through the criteria and points presented in the tables.

We do not exclude the possibility of incorrect use of EMI and transcriptions (arrangements) for EMI by other users. Among the expert musicians it can lead, first, to a destructive perception of EMI as a component of modern ME. It is worth highlighting that performing on EMI does not only include performing skills on the instrument itself. It implies a great preliminary cognitive work for the definite composition adaptation taking into account the specific EMI model functionality. It requires a digital musician to be interdisciplinary competent, i.e., to have deep knowledge in the field of instrumental studies, MCT, musical sound engineering, musical and artistic culture, musical aesthetics, etc.

The researchers distinguish digital synthesizer keyboard/piano and digital accordion/bayan according to the principle of structural difference and dynamic activity of the instrument. Synthesizers in CMS and CAS, especially at the initial stage of training, are used in the mode of a dynamically passive keyboard (the *Touch* function is disabled).

This is largely because students have multivalent finger activity, i.e., one finger strikes harder than the other. Too active and inept sounding on the synthesizer keyboard that is light in touch (not weighted) can have a negatively impact. Therefore the keyboard of the synthesizer is often "aligned" dynamically by teachers. The problem of dynamically flat performance, which is recognized by some

musicians as "inanimate sound", is leveled by the literal arrangement of the timbre tectonics.

On the other hand, digital accordion/bayan, has the flexibility of dynamic nuances and a wide dynamic scale (from *ppp* to how any *ff*) that is due to the physical modeling of the sound wave (Gorbunova & Chibirev, 2019). From the professional apperception point of view, digital performance on an accordion/bayan has good perspectives for development.

The authors consider the criterion of *primary* perception of EMI to be the most relevant indicator of sociocultural perception and cultural conformity of the active introduction of EMI into the system of professional ME. A number of teachers and psychologists point out that modern generation Z, brought up in terms of clip culture and universal computerization, requires different educational approaches, different techniques, and different instruments, including musical, to involve young people in the educational process and to promote national cultural codes with innovative informational format relevant to its perception.

The problem of art-pedagogical education is becoming increasingly relevant. Due to its functionality, digital musical instruments allow the teacher to implement the basic functions of art pedagogy into the educational process. These functions are the following:

- Culturological, which is characterized with the objective relationship of personality with culture as a system of values, human development based on the artistic culture awareness, becoming its creator;
- Educational, which is aimed at the development of personality and the perception of reality through art. It provides knowledge in the field of art and practical skills in artistic and creative activities;
- Formative, which forms moral-aesthetic, communicative-reflective foundations of the personality and contributes to its socio-cultural adaptation with the help of art;
- Correctional, which purpose is to provide preventive measures, correction and compensation of developmental deficiencies.

The present study has shown that performing on EMI and MCT mastering carries axiological functionality relevant to the young generation. It is an important component of socialization in the sociocultural space, and in particular in its subculture youth stratum.

CONCLUSIONS

The results of the present study prove that despite the general positive dynamics of digitalization of ME, the integration of innovative digital technologies into different types of musical performance and MCT-creativity is insufficient. In addition, the number of qualified teachers to implement new forms of work with digital music technologies is also insufficient.

There is a sociocultural demand for new digital forms of musical art. Sociocultural paradigm of EMI directly depends on the professional use of EMI by digital performers and educators, on their professional competencies and interdisciplinary knowledge, on the orchestral mode of thinking, etc. The authors consider all these educational components essential for the implementation of a modern professional ME, for the musical culture in its sociocultural functioning to be in demand in the digital era.

Summarizing the above, we would like to cite the words of Varlamov (2015), who believes that *“another time is about to come: it is necessary to discover new ways in art, although it requires a restructuring of the attitude to creativity and innovation in the sphere of education”*.

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