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Mankind – Music – Technology

Technology in the Musical Thinking of the 20th and Early 21st Centuries

Martin Flašar



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Mankind – Music – Technology

Technology in the Musical Thinking of the 20th and Early 21st Centuries

Translated by Mark Newkirk

Martin Flašar

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Book reviewed by Prof. Leigh Landy, director of the Music, Technology and Innovation – Institute for Sonic Creativity (MTI²), De Montfort University, Leicester and Prof. MgA. Mgr. Michal Rataj, Ph.D., professor of the Music and Dance Faculty of the Academy of Performing Arts in Prague.

On the cover: Detail of the interactive exhibition Garden of Fantasy and Music (EXPO 2005, Aichi). From the left: organ by Václav Smolka, pool with piano and caterpillar with a camera obscura by Petr Nikl, and Dripping Machine by Milan Cais. Source: Archive of Petr Nikl.

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This book is the result of the author's long-term interest in the music of the 20th century and of the 21st century as it is now unfolding. It is also the result of his life-long interest in technology. In addition, the chapters that follow are the distillate of more than ten years of experience with leading training and lecture courses at the Masaryk University Department of Musicology devoted to music in the context of new media, electronic music, and aesthetic conceptions of multimedia. It has therefore passed the tests of time, of discussions with students and colleagues, and above all of repetition. Those tests wash facts of lesser importance away and bring inconsistency in argumentation to light.

First, I would like to take this opportunity to thank my inspirational teachers not only at the Department of Musicology of the Faculty of Arts, but also throughout Masaryk University because teachers shape not only students, but often also future teachers. At my age, I can also perhaps afford to thank my students who have inspired me with their papers or even just by their comments during lectures. I am very grateful to the Faculty of Arts of Masaryk University for providing financial support, thanks to which I have been able to spend a number of enriching days at the library of De Montfort University in Leicester, without which this study would have lacked the necessary framework of current discourse. I also wish to thank Prof. Leigh Landy, director of the Music, Technology and Innovation - Institute for Sonic Creativity (MTI²) at De Montfort University in Leicester for supporting mutual collaboration.

Last but not least, I would like to thank my parents for providing me with a musical education in addition to free access to an Atari 800XE computer at the turn of the 1980s and '90s and later to a PC 286, with which most Czech households definitely were not routinely furnished in those days. And I owe a debt of special thanks to my wife, who temporarily put this study ahead of her own interests and unhesitatingly read it and made comments.

Martin Flašar, Brno, 2023

Introduction

“As far as academia is concerned, technology is not discussed at all [...]. Apparently, this carries with it the conviction that technology concerns particular secondary aspects of life with which certain people must involve themselves, but that do not apply to mankind as such. The conflicts that technology is now causing in human societies, born paradoxically of those societies’ own productivity, are beginning to bring to the attention of even those who are most blinded the unhealthy remoteness from the human destiny, i.e. from real life, in which academia has found itself.”

José Ortega y Gasset: *Úvod: Universita a technika*¹

The question of technology and of its function in human life, culture, and the arts is surely deserving of greater attention than has so far been devoted to it. Already in 1933, the Spanish philosopher José Ortega y Gasset wrote:

“Without technology, mankind would not exist and could never have existed. [...] There can be no doubt that technology has long since become one of the unavoidable conditions of human life in such a way that present-day mankind could not exist without it, even if it wished to do so. Today, mankind no longer lives in nature, but instead makes its home in supernature, which it has created in a new day of Genesis: in technology.”²

The dependence of human existence upon technology also applies to human thought and creativity. Therefore, even music as a product of human thought is not possible without the use of technology. Music employs not only technological instruments, but also rational procedures for its production, organisation, distribution, and perception. Technology is more than just an artefact of Western

1 ORTEGA Y GASSET, José. *Úvaha o technice* [Meditación de la técnica y otros ensayos sobre ciencia y filosofía]. Praha: OIKOYMENH, 2011, p. 13. Note: the translator of this book has himself translated all quotes from referenced Czech-language materials unless otherwise indicated.

2 *Ibid.*, p. 12.

culture. It is a model for thought and the formation of relationships, as we are reminded by Carlos Gustavo Guerra.³ Others like Collins and Young go even farther, postulating that:

“[...] music is a technology—the production and dissemination of music is a technological system, a system whose affordances have the ability to shape not only the musical content but also the extent to which music can be produced and distributed. On that basis, changes in technology are an integral part of the story of music.”⁴

Aden Evens adds:

“Sound, especially musical sound, does not generally arise spontaneously but is generated through certain techniques and by using certain technologies. The materiality of music weds it to technology, which enables its production and dissemination. The experience of music thus demands a technical understanding of musical technologies.”⁵

One of the first texts I got my hands on as a beginning musicology student was *Úvod do hudební vědy* (An Introduction to Musicology) by Jiří Fukač and Ivan Poledňák.⁶ In one of the early chapters on history, Fukač tried to use a reference to Boethius’s treatise *De institutione musica* as an argument bolstering the historical relevance of musicology. In the treatise, Boethius divides the scope of the term “musica” as part of a holistic, hierarchically arranged theory of the universe into *musica mundana*, *musica humana*, and *musica instrumentalis*. Out of respect for authorities (of the early Middle Ages and of relatively contemporary times), we are taking the liberty of borrowing this concept and applying it to the present-day situation. With a clear conscience, it seems, we can abandon Boethius’s model of *musicae mundanae* based on the period idea of the harmony of the spheres, but we will stop to consider the other two categories. The relationship between human music (*musica humana*) and instrumental music (*musica instrumentalis*) can be regarded as being at the core of our study. We shall attempt to point out the various modalities of relationships between mankind, music, and technology, which vary on a scale from utopian ideas about the influence of technology on musical thinking to sceptical approaches that can lead to a re-evaluation of technology’s function. I think composers’ and musicians’ attitudes towards new technologies are key to understanding music of the 20th and newly beginning 21st centuries.

3 GUERRA, Carlos Gustavo. The Mechanization of Intelligence and the Human Aspects of Music. In Eduardo Reck Miranda (ed.). *Readings in Music and Artificial Intelligence*. Harwood academic publishers, 2000, p. 207.

4 COLLINS, Steve and YOUNG, Sherman. *Beyond 2.0: The Future of Music*. Equinox Publishing, 2014, p. 9.

5 EVENS, Aden. *Music, Machines and Experience: Theory out of Bounds*. Vol. 27. University of Minnesota Press, Minneapolis, 2005, Preface, p. xi.

6 FUKAČ, Jiří and POLEDŇÁK, Ivan. *Úvod do hudební vědy*. Univerzita Palackého v Olomouci, 2001, p. 65.

1.1 Subject matter and methodology of research

The basic question that this book raises is how the development of technology, its relation to music, and the development of mankind's attitudes towards technology in the process of musical production have transformed musical thinking in the realm of art music composed in the 20th and early 21st centuries.

A term that is central to this publication is musical thinking, which has defined the form taken by musicology not only in Brno, but throughout this country in the hands of Otakar Zich and especially Vladimír Helfert. The latter based an objective method of studying a musical work on the analysis of two fundamental elements: the source of inspiration and the musical structure. By “source of inspiration”, Helfert means the conditions and stimuli from which an artwork arises, i.e., artists' personalities and the milieu in which the artists live, including the intellectual and aesthetic currents that influence them.⁷

“[...] the focal point of interest of a critical history of the arts must be critical *knowledge of the artwork*. This mostly means knowing the static structure of the artwork, its internal laws, its melodic, harmonic, formal, or coloristic features, and its relationship to the words being set to music (where relevant). One must also know the dynamic context of these statically recognised values with the musical values that surrounded the work in the present and the past, i.e., one must know the context in music history, and on that dual basis must arrive at a synthetic picture of the individual (or eclectic) nature of the artwork [...]”⁸

The central point of interest of this book is then the transformation of musical thinking under the conditions of the new technologies and aesthetic currents that reflect their creation.

The relationship between mankind (society), music, and technology, which is developing in an Euro-American cultural and historical context, can be expressed by the following model (Fig. 1).

No single element in this model of interdependence can be eliminated. There is no music without mankind because music is fundamentally a human creation, and if we object to the contrary (e.g., birdsong or algorithmically generated compositions), mankind remains as the recipient who gives meaning to the set of sounds in question and understands it as a logical system. Music therefore need not necessarily be produced as music, but music must be perceived at least in the sensualistic sense of Berkeley's dictum “*esse est percipi*”, not to mention the rationalistic perspective according to which we might only imagine music that is not necessarily heard. In any case, music depends upon human cognitive processes.

7 HELFERT, Vladimír. *Česká moderní hudba. Studie o české hudební tvořivosti*. Olomouc: Index, 1936, pp. V-VII.

8 *Ibid.*, p. VII.

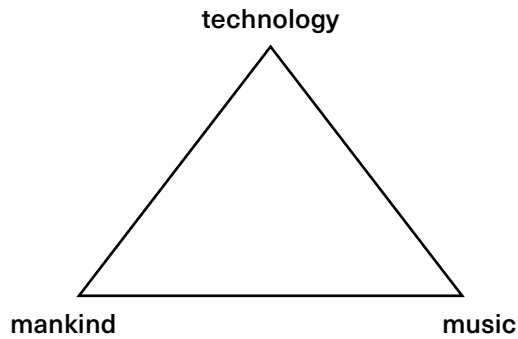


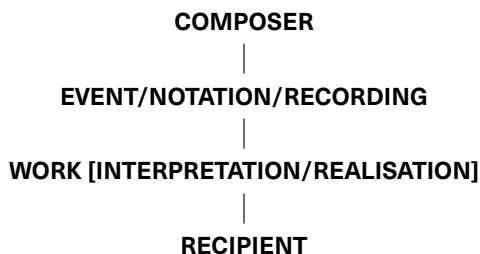
Fig. 1 Defining of the field of research in question.

Technology (or technique as its subset) is another necessary condition for the existence of music (compositional technique, singing technique, instrumental technique, the technical design of instruments, reproduction technology etc.). Nonetheless, artificially separating technology from the field of music enables us to analyse the question in a broader context (social, historical, and aesthetic).

The relationships to be examined in this study based on the triadic model shown above are:

1. Development of technology (instruments, instrumentation) in relation to art music.
2. Transformation of music (as an artefact or process) under the influence of new technologies.
3. Musical thinking in art music of the 20th and early 21st centuries as a consequence of technological transformations.

These three basic elements are also reflected in the communication model of music, which is an adaption of the Shannon-Weaver linear transmission model of communication:⁹



This is a model of a one-way flow of musical information from the composer to the recipient (or even beyond for reflections and meta-reflection on music). For our

⁹ Cf. FUKAČ, Jiří. *Pojmosloví hudební komunikace*. Brno: Masarykova univerzita, 1991, p. 53.

purposes, we will be dealing with the first half of the model between the composer and the work, i.e., the production of music. Note that the section of the model called “event/notation/recording” refers to ways that a musical work is created or comes into being. The music arises either as a live event (improvisation), a fixed structure of ideas in musical notation, or the creation of a work directly in an audio medium (e.g., *musique concrète*, electroacoustic music).

This book will not be dealing with the transformation of the reception and consumption of music through technology (nor with the questions of reception habits, environments, music distribution etc.) because that area of research requires an entirely different methodology.

After the introductory chapters of definitions, contextualisation, theoretical issues, and aesthetics more generally, this volume presents several case studies on individual creative poetics that have something to tell us about the changing attitudes of creative musicians (performers and composers) towards technologies during the 20th and 21st centuries.

It is our belief that the goal of musicology as an arts-related discipline of the humanities should not be just to ask questions of agency like “how?” (as, for example, in the case of music theory), but also to ask ontological questions like “why?”. This rule also applies to the relationship between music and technology. It is clear that heretofore, questions of the relationship between technology and music have been limited almost exclusively to asking “how?” instead of “why?” and to the examination of context.¹⁰ We lack knowledge of the causes and interpretations of why the music of the 20th century, which definitely is a domain of technology (both analogue and digital), happens to exist in the form that is familiar to us. Being more than just one of many factors in music, technology is really the key to understanding the music of the 20th century. Technology cannot be avoided in music of the 20th century; regarding it, one can only take one of the stances stated below. So far, the existing literature has devoted itself relatively one-sidedly to the perspective of technology used for the (re)production of music, and not to the perspective of the music itself, which is transformed by that technology.

In view of the historical nature of the question at hand of the problem of the relationship between music, technology, and mankind, which spans the 20th and early 21st centuries, one must take into consideration theories now regarded as outdated in many ways, such as technological determinism. In this critical reflection on technology, one can demarcate more narrowly the relationship between music and technology in musical thinking. The modalities of coexistence of the two areas can be expressed by movement along a scale depending upon the intensity of mutual interaction (dominance of one of the areas) from a strongly positive to a somewhat positive, a somewhat negative, and finally a strongly negative (critical) attitude.

10 For notable exceptions, cf. LANDY, Leigh. *Understanding the Art of Sound Organization*. Cambridge, Mass.: MIT Press, 2007, p. 36ff; EMMERSON, Simon and LANDY, Leigh (eds.). *Expanding the Horizon of Electroacoustic Music Analysis*. Cambridge: Cambridge University Press, 2016, p. 11ff.

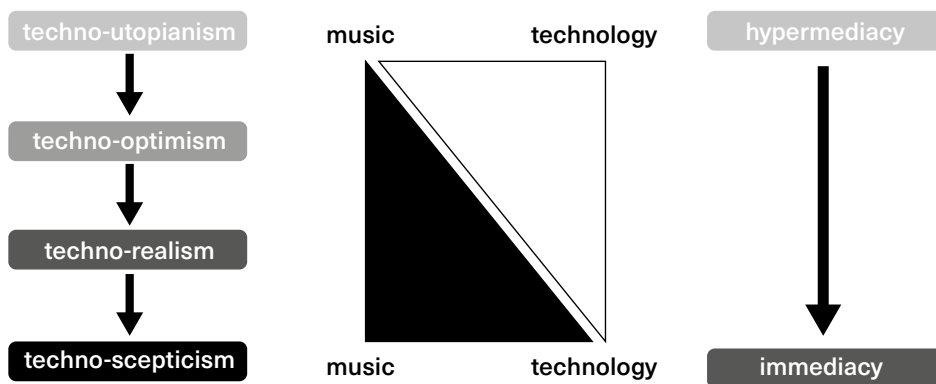


Fig. 2 The range of people's attitudes towards technology in music with respect to the function of technology in music.

Techno-utopianism (technological utopianism, largely synonymous with technological determinism). Music is in a submissive position with respect to technology, to which absolute value is assigned in this case. It is assumed automatically that technological innovations will lead to a (positive) change of musical thinking and expression. From the perspective of Bolter's and Grusin's theory of remediation,¹¹ one finds here the application of the logic of hypermediation, i.e., the tendency to make a particular technology visible. (We find these tendencies for example in Ferruccio Busoni's *Entwurf einer neuen Ästhetik der Tonkunst*, in Luigi Russolo's manifesto *L'Arte dei rumori*, and in John Cage's book *The Future of Music: Credo*.)

Difficult to differentiate from techno-utopianism, **techno-optimism** (technological optimism, technicism) is an attitude that perceives technology as a source of inspiration or as determinative (e.g., Honegger: *Pacific 231*; Reich: *Different Trains*; dodecaphony, serialism, stochastic music etc.).

Techno-realism (technological realism). The relationship and function of music and technology are balanced. This is an instrumental relationship; here, technology is given the role of agency for music. Composers assign technology a strictly defined instrumental function in relation to the musical work. The work and its idea are primary (e.g. Stravinsky and his poetics; Varèse: *Déserts*; Boulez: *Répons*; Saariaho and her creative aesthetic).

Techno-scepticism (technological scepticism, technological pessimism, techno-dystopianism). Music rejecting technology as an end in itself or as determinative.

A **post-technological** attitude has a sense of the overcoming of the conditionality of music by electronic technology and belief in its potential for innovation. With

¹¹ BOLTER, Jay David and GRUSIN, Richard Arthur. *Remediation: Understanding New Media*. Cambridge, Mass.: MIT Press, 2000.

respect to remediation theory, one can use the term *immediation*, which designates a tendency to disguise the use of technology for the sake of presentation of the work (e.g. Ligeti: *Atmosphères*, the creative aesthetics of N. Collins or J. Richards).

This range of attitudes towards technology overlaps partially with David Chandler's typology,¹² where within the framework of criticism of technological determinism, the author differentiates between:

- **hard technological determinism** – technology as an exclusive factor of changes to social behaviour;
- **soft technological determinism** – technology as a key factor in changes, but not the only one;
- **sociocultural determinism** – technology shaped by the societal and cultural context; and
- **voluntarism** – technology fully controlled by the subject's intentional approach.

In our case, we are not examining the impact of technology on social behaviour, but instead its influence on individual musical thinking and creativity. From the degree of dependence or value of technology in the creative process, we derive the individual categories of attitudes of creative artists to technology. These categories will be explored in more detail in individual chapters.

1.2 Definitions of basic terms

We can use a whole range of approaches to define the basic terms used in this study. From the set of types of definitions offered in *Úvod do ontologie*¹³ (Introduction to Ontology) by Josef Šmajš and Josef Krob, we have chosen the following for use in this book:

1. enumeration of all **elements** belonging to the defined class,
2. enumeration of **properties** of objects of the given class, i.e., descriptive definition,
3. **contextual definition**, which defines by using the term being explained in a context from which the meaning of the term in question is implied by the overall meaning. For our study, this type of definition seems to be the most natural. It enables the defining of a technology in the context of its function connected with the production of art music of the 20th and early 21st centuries.

12 CHANDLER, Daniel. Shaping and Being Shaped: Engaging With Media. *Computer-Mediated Communication Magazine* [online]. 1996. [Accessed on 13 Sept. 2010]. Retrieved from: <http://www.aber.ac.uk/media/Documents/short/determ.html>.

13 ŠMAJŠ, Josef and KROB, Josef. *Úvod do ontologie* [online]. [Accessed on 15 July 2017]. Retrieved from: https://www.phil.muni.cz/fil/eo/skripta/kapitola_1.html. 2nd edition corrected and expanded. Brno: Masarykova univerzita Brno, 1994. (1st edition 1991).

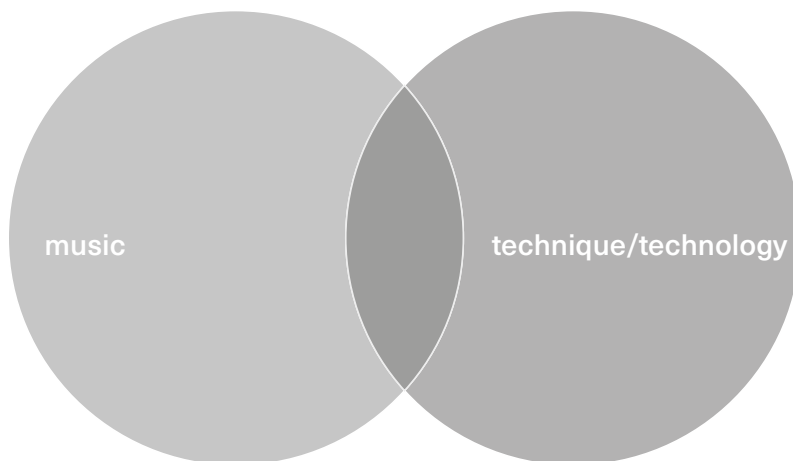


Fig. 3 Intersection of the semantic fields of the terms “music” and “technique/technology”.

Since “technology” is a transversal term that comes from a wide variety of spheres of human thought and action, its contextualised definition must be sought in fields and disciplines that are closely interconnected with music, such as aesthetics and sociology.

In *Encyklopedie estetiky*¹⁴ (Encyclopaedia of Aesthetics), the economy of the efforts at defining words is surprising, and the entry for the Czech word “technika” (technology, technique) is one of the briefest. I think the following passage is the most helpful:

“‘Technika’ [technique, technology] is a conscious and directed approach capable of being reproduced and transferred. It is a way of doing things in any area, and not just in industrial manufacturing or the applied sciences: there can be techniques of craftsmanship and techniques of an empirical or even irrational character (e.g. techniques based on the use of magical knowledge). The practical value of individual techniques rests in the effectiveness with which they are capable of achieving the desired result.”¹⁵

While there is an allowance for the possibility of technology of an irrational nature, the interpretation is clearly erroneous. Although one can imagine magical rituals based on an irrational belief, their performance and application are always rational acts because they are working with the assumption of logical causality (an action followed by a reaction). The author determines the value of a technology from its potential to enable achieving the intended result. In other words, this is a teleological definition of technology.¹⁶

14 SOURIAU, Anne. Technika [entry]. In SOURIAU, Étienne. *Encyklopedie estetiky*. Praha: Victoria Publishing, 1994, p. 858.

15 Ibid.

16 Also cf. TONDL, Ladislav. *Věda, technika a společnost: Soudobé tendence a transformace vzájemných vazeb*. Praha: FILOSOFIA, 1994, p. 106.

On the other hand, the entry for “technika” in the *Velký sociologický slovník*¹⁷ (Large Dictionary of Sociology) presents a much lengthier exercise in lexicography. It explains that:

“technika [...] [represents] all the artificially created procedures and products that are involved in human activities and social processes [...]. Today, technical products and procedures are so entangled with people’s actions and have so much influence on diverse forms of coexistence and on the conditions of life that the question of the nature of technology arises with respect to the consequences of their functioning in society and their subordination to human purposes.”¹⁸

It is the area of the collision between technology and human purposes that represents the subject of our investigation. On a general level, this involves the dynamic delineation of the degree of mutual interaction and influence of the sphere of technology and the sphere of human thinking and creativity. However, the problem is more complicated than the dictionary entry would admit. The dichotomy between the world of technology and the human world is a mere theoretical illusion because technology is just the extension and application of human thought and action, and not an isolated entity.

The text of the entry also mentions two categories of “technika” in a narrower and a broader sense respectively. The narrower sense refers to material resources for action towards a purpose, meaning machines, tools, instruments etc., as well as transformational procedures. The broader sense refers to “*procedures of action and thought, which abide by methodical rules of operation and lead to a definite strategic goal.*”¹⁹ It must be emphasised that in this definition, “technika” becomes the common strategy for all human activity including the arts and sciences. That fact also becomes one of the initial premises of this book, which understands science, the arts, and technology as areas of realisation of human thinking, which become interrelated to varying degrees.

Then in the entry for the Czech word “*technologie*”, the same dictionary warns us that in the Czech language, the terms “technika” and “technologie” overlap, so those Czech words are understood in this study as synonyms.²⁰ We may furthermore regard technology or technique as a set of applications of results of research in the natural or applied sciences. The problem of the relationship between technique (or technology) and music at the highest level is a question of the relationship between music and the natural sciences.

As we continue with basic definitions by the method of focusing, i.e., gradually drawing nearer to the area being examined at the cost of narrowing our field of view,

17 MüK. Technika [entry]. In *Velký sociologický slovník*. II, P-Ž. Praha: Karolinum, 1996, pp. 1278–1279.

18 Ibid., p. 1278.

19 Ibid., p. 1279.

20 Ibid., p. 1283.

we arrive at the definition of “technika” in *Slovník české hudební kultury*²¹ (Dictionary of Czech Musical Culture). There, the problem is divided into several parts in which “technika” is defined in various contexts. The entry, written by Jiří Fukač and Jana Pavlíčková, defines “technika” as a set of procedures and resources (especially instruments) that serve to supply what is needed in connection with music.²² Since the 19th century, the term “technika” has been used in relation to music with other meanings:

1. Technique of playing, singing, or interpreting in general (etudes, instrumental method books).
2. Compositional technique (counterpoint, orchestration, the rationalistic procedures of 20th-century music).
3. Technique of making musical instruments.
4. Reproduction technology (in certain cases, the difference between production and reproduction is not obvious, such as in *musique concrète*).
5. Technology as the subject matter, inspiration for, and formative factor of a musical work.

From amongst these explanations of the word “technika”, in this book we will be using numbers 2 through 5. The technique of making instruments usually precedes the concept of a musical composition, which is written in most cases for a particular instrument that restricts the range of the composer’s ideas. Technology thus does not directly predetermine the result of the creative process, but it provides the conditions for the change of social and cultural practices.²³ It is also for this reason that in the musical poetics of the 20th century (F. Busoni, L. Russolo, J. Cage, E. Varèse, K. Stockhausen et al.) we often find discussion of the need for new instruments that will enable the creation of new music. Electronic reproduction technology is put at the level of instruments just to enable us to consider whether musical instruments are not just a special kind of reproduction technology.

1.3 Framework of discourse and the present state of research

The basic frame of discourse for what follows consists of systematic musicology and especially musical aesthetics as a specialised philosophy of the arts, along with music theory and musical sociology. A diachronic aspect is represented by the chronological arrangement of the material of certain chapters.

Hierarchically, the highest disciplines in which the chosen approaches intersect are philosophy and musicology. The tradition of philosophical thinking provides us

21 FUKAČ, Jiří and PAVLÍČKOVÁ, Jana. Technika [entry]. In VYSLOUŽIL, Jiří and FUKAČ, Jiří. *Slovník české hudební kultury*. Praha: Editio Supraphon, 1997, pp. 920–921.

22 Ibid., p. 920.

23 COLLINS and YOUNG, op. cit., p. 11.

with the conditions for intellectual reflection on technology involving consideration of the essence of this question in relation to mankind and society, or, for example, reflection on the ontological status of a technological work, while musicology offers an analytical, interpretive, and pragmatic framework of interpretation. Concerning the philosophy of technology, there are two treatises we should mention as being of primary importance for the purposes of this book: *Die Frage nach Technik* (The Question Concerning Technology) by Martin Heidegger and *Meditación de la técnica* (Meditation on Technics) by José Ortega y Gasset.²⁴

Because a number of incorrect assumptions and rigid categories in the realm of theory have persisted to the present, hindering our view of the music of the 20th and 21st centuries, we would like to devote this study (with an awareness of the difficulty of such an intention) to expanding our ideas about newer and contemporary music and to offer new perspectives on relations between music and technology in the music of the last century and of the present one.

There is not a large quantity of foreign literature, let alone Czech literature, dealing with the relationship between music and technology at a general level. It is remarkable how successfully this area of inquiry escapes theoretical reflection. If we find a publication with “music and technology” or some variation thereof in its title, upon opening the publication we find that it amounts to a practical handbook for musicians or sound designers on how to use specific technologies to achieve a particular result, or else the publication is devoted to the influence of technology on the distribution and reception of music.

We find meagre numbers of foreign publications focusing on the relationship between music and technology, and in what we do find, we discover that their topics are so disparate and narrowly specialised that they are of little help with creating a consistent view of the issue. For example, there are the proceedings of the event *Music and Technology*²⁵ held by UNESCO in Stockholm in 1970. Other collective monographs in this field are of a similarly fragmented character, e.g. *Music and Technologies* (2013)²⁶ and *Music and Technologies 2* (2014),²⁷ where studies on computer music are found alongside discussions of architecture. Reference works like the *Oxford Handbooks* series can also be rather problematical. They mostly cover narrowly specialised topics, but they do not offer a synthesised view of the topic of “music and technology”. Next page brings a selective list of the existing handbooks that have at least something to say about the relationship between music and technology.

24 HEIDEGGER, Martin. *The Question Concerning Technology and Other Essays*. Translated and with an introduction by William Lovitt. New York & London: Garland Publishing Inc., 1977; ORTEGA Y GASSET, José, op. cit.

25 Paris: La Revue musicale, 1971.

26 KUČINSKAS, Darius and DAVISMOON, Stephen. *Music and Technologies*. Newcastle upon Tyne: Cambridge Scholars Publishing, 2013.

27 KUČINSKAS, Darius and KENNAWAY, George. *Music and Technologies 2*. Newcastle upon Tyne: Cambridge Scholars Publishing, 2014.

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