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The Influence of Recording Technology and Practice on Popular Music Performance in the Recording Studio in Poland between 1960 and 1989

Abstract: When recorded Polish popular music between 1960 and 1989 is compared to music from the USA and Western Europe, there is a striking difference in the sound of the productions. A positivist narration of these differences might characterize them as being more ‘advanced’: of using newer technologies and the techniques that grew out of them. This article aims to look deeper into these musical and sonic differences and to explore how economic and technological factors affected these differences through a variety of social mechanisms. While a particular set of working practices and value judgments about those practices can be seen to have been maintained by these factors, the article will also look at how that caused a different set of musical and sonic developments.

By employing Actor Network Theory underpinned by the ecological approach to perception and embodied cognition, the way that occupational and social roles evolved in Poland’s music industry during this period will be examined. Although the lack of availability of new recording and instrument technologies was important, it will also be seen that by channeling musical creativity in different directions when the new technological options weren’t open, Polish popular music developed differently rather than simply belatedly.

Keywords: Actor Network Theory, Polish Popular Music, Record Production, Sonic Cartoons, Sound Recording.

Introduction

This article, with its focus on Poland, is part of a larger international study about how recording technology and recording practice have influenced the way that musicians perform in the recording studio (and outside).¹ The second, more sociological aim is to discuss how material conditions, including available recording technology, have influenced not only the musical performance but—more importantly—the social relationships between musicians and recording professionals in Poland, as compared to other countries. The analysis of music performance in different conditions must take into consideration not only technical aspects, such as recording technology and live performance arrangements, but also a larger social, economic, cultural and political context. This context includes the relations between musicians and recording professionals and is of a special importance in countries such as Poland in this period where popular culture was a subject of communist cultural policy.

¹ This larger study has involved two UK Arts and Humanities Research Council projects on Performance in the Studio and Classical Music ‘Hyper-Production’ and has produced a number of ongoing journal articles and books.

My sources include studio photographs, album sleeve notes, the CVs and biographies of producers and engineers, recording company and studio documents as well as interviews with participants. Let us first concentrate on music performance. The notion that musicians perform differently in the studio is in no way new: Frank Tirro discusses the way New Orleans jazz drummers altered their style to accommodate the recording process in relation to a 1923 recording of the Creole jazz band:

The sound of the bass drum is not heard. Indeed, Baby Dodds was probably not playing any instrument except wood blocks at this recording session. The powerful sounds of a trap drummer could not be accommodated by the recording instruments of the time... In live performance, Baby Dodds played differently from the way he did in the studio—normally, the trap drum player is almost omnipresent in a jazz group (Tirro 1993: 126–7).

Richard Peterson (1995) writes about how the ‘crooning’ vocal style grew out of microphone technology, Mark Katz (2004) has described several of what he calls ‘phonographic effects’ including the changing approach to violin vibrato after 1910 and I (Zagorski-Thomas 2010a) have written about the interaction of recording technology and popular music kit drum performance. My current research (Zagorski-Thomas 2014) utilizes Actor Network Theory (Latour 2005) and the Social Construction of Technology (Pinch et al. 2012) underpinned by the ecological approach to perception (Gibson 1979) and embodied cognition (Lakoff & Johnson 2003) to examine how technical factors such as microphone design and placement, screening, isolation, multi-track recording, signal processing and monitoring exerted an influence on performance practice in the recording studio.

Under this approach the social activity that defines both the usage and perception of technology is defined in terms of the participants’ schemata (Lakoff & Johnson 2003) based on how they identify invariant properties and affordances (Gibson 1979). A schema may exist at a very basic level, such as the notion of a container, or higher level objects or processes, such as the notion of a mixing console and what it does or an event schema such as the process of recording. The invariant properties required of a container are simply that it has physical properties such that another object can be perceived to be either inside or outside of it. A mixing console has a more complex and less universally understood or widely perceived set of invariant properties. It has inputs for a number of audio signals, some form of electrical ‘summing’ circuitry and a mono or stereo output. These invariant properties produce the affordance of combining a number of separate audio signals into a single (mono or stereo) signal.

Within the ecological approach to perception, this pairing of properties with potential action or activity is central to understanding human cognition. The various participants in a process will have different but connected perceptions of what their current environment affords. For example, a singer may perceive a microphone in terms of how their movement closer to or further from it affords different tones to their voice as it is recorded. This form of tacit knowledge (Polanyi 1966) emerges from embodied experience which binds particular forms of physical activity to the particular sonic attributes that it affords. The singer doesn’t need to develop a theoretical understanding of why their movements are connected to changes in the sound (although they may do that as well) but does need to develop an event schema that fixes the expectation of these connections at a subconscious level. The way that the performer acquires this schema is not important. They may discover it by trial

and error, they may be told about this connection or may observe it in others. These observable aspects are the more noticeable external attributes of a learning process, but it is only once they have become internalised as ‘understanding in practice’ (Lave 1990: 310) that they become part of their professional habitus (Bourdieu 1993). Bourdieu’s habitus, “generative principles of distinct and distinctive practices” (Bourdieu 1998: 8), are more than event schemata though. They incorporate a further set of schemata and schematic relationships that involve classifications and judgements: ‘I move in this way in relation to the microphone technology because I am a good singer.’ While Bourdieu uses the term as part of the categorical terminology of sociology and cultural theory, in this instance I am using it to describe the internal cognitive structures of the subject of study. The singer lives a particular habitus which is at the same time uniquely individual but also will have shared characteristics with other singers and others shared on the basis of other social and cultural features.

In addition, a sound engineer, on the other hand, may think of the same microphone in terms of the sonic qualities that this particular configuration of electrical components imparts to a range of different sound sources. Their embodied experience of activity that includes the microphone is based on a variety of sound sources rather than the single voice of the singer and on a more static conception of how they position the microphone in relation to the sound source. They may understand that the singer then moves in relation to the microphone but, unless they are a singer themselves, they don’t have the same nuanced and internalised tacit knowledge of how this movement and sound are linked just as the singer is unlikely to have the sound engineer’s intimate knowledge of how different types of microphones will colour the sound. The sound engineer’s habitus may contain categorical and judgemental elements to their schemata that allow them to make almost unthinking selections about the suitability of different microphones in different situations and which are also crucial in defining what they think is a good sound engineer.

These different human participants or actors in a network, work with the non-human actors (e.g. the microphone) based upon their different ideas of what the microphone ‘is’ and ‘does.’ While they may both have the same broad definition of what it does (record sound), the nuances of how you interact with it and what the results are will be different for each of them. Each of the actors has a different habitus that involves both event schemata that involve their own expected ways of doing things and schematic representations of other human actors (that include some less detailed notions of those actors’ habitus), non-human actors (that may include representations of how they themselves use the technology and how other human actors do) and a series of judgements about how appropriate and valuable those types of activity are. These are the mechanisms that give rise to concepts such as interpretive flexibility (Pinch et al. 2012) from the Social Construction of Technology and the program / anti-program in Actor Network Theory (Woolgar 1991). Both of these concepts relate not just to types of activity that might be associated with a technology but also to how an individual or group may judge the appropriateness and value of that activity: the likelihood that they might change how they do things. This theoretical framework, therefore, provides a cognitive basis to some existing sociological theory. While this doesn’t, per se, add any immediate nuance or further interpretative power to these existing theoretical constructs, it does allow for exactly that in their further development. It provides a more

detailed theoretical framework about the way that motivation and the acquisition of new behavioural traits occurs, along with a way of creating models of how and why different human actors engage with each other and with non-human actors in different ways.

On the one hand we can describe this kind of actor network in broad strokes in such a way that the description encompasses all examples of professional recording activity and at the other extreme we can examine the detailed schemata of individuals in a specific situation and theorise how their particular forms of interaction (and interpretation) make that example unique. If we use the notion of *habitus* in the way that Bourdieu does, as an external descriptor of social phenomena, it relates to the former and if we use it as a pseudo-psychological tool, as a description of the internal cognitive structures of a specific individual, it relates to the latter. Likewise, the ground in between these extremes provides plenty of opportunity to draw comparisons between various types of social grouping: what, for example, are the similarities and differences between this form of actor network activity in the 1940s and that in the 1960s? Or, to return to the focus of this article, what common characteristics can be found in Polish popular music recording between 1960 and 1989 that mark it out from the most common object of study in this field: the golden age of rock music in the UK and US that also spanned those three decades.

Popular Music In Poland—1960–1989

Before I examine the recording process though, I will undertake a brief survey of the nature and experience of popular music in Poland during this period. Access to western popular music was controlled by the absence of convertible currency rather than through censorship. There was, however, a combination of selected state sponsored releases, international radio stations heard in Poland, unofficial imports and the black market that meant the highly mediated sound of this music was both available to and an influence on musicians, sound engineers and the listening audience. Kotarba (2002) has argued that these economic restrictions had a powerful stifling effect on Polish popular music that was only removed by the overthrow of the communist authorities by Solidarity in 1989:

Before the revolutionary events of the late 1980s, popular music in Poland reflected the drudgery of everyday life under communism and the severe economic constraints placed on young people's musical experiences (Kotarba 2002: 233)

I would argue, conversely, that Polish popular music was thriving during this 'pre-revolutionary' period and that the explosion, such as it was, was based around the economic structures for marketing popular music rather than the musicians who made it. Kotarba's analysis relies on a direct correspondence between the size of the market for popular music in Poland and the quality of the experience for its consumers. Of course, the increase in choice and the access to western markets brought about by a convertible currency was a highly positive experience for Polish consumers, but the marginal utility that these additional choices afforded—the qualitative change—was very low in comparison to the quantitative change in the market.

Before discussing popular music the importance of jazz should be mentioned. Lerski (2009) documents the loosening of state control that allowed jazz to flourish in Poland in the

late 1950s. This can be seen through key moments such as the establishment of the Sopot jazz festival in 1956, the first Jazz Jamboree festival in Warsaw in 1958, the first tours by western jazz artists² such as Dave Brubeck in the late 1950s and the establishment of the first monthly music magazine (*Jazz*). Willis Conover's Voice Of America radio program had broadcast jazz and other popular music into Eastern Bloc countries in Stalinist times and this continued in the late 1950s. Ritter (2013) suggests that jazz flourished in Poland during this period because the attempts by both the USA and the Polish government to harness jazz for ideological purposes contributed to an internationalisation of jazz that "destabilized both systems, creating a worldwide listening community which proceeded to act beyond bloc boundaries." (Ritter 2013: 111)

During the 1960s a wide range of Polish popular music was produced that was a direct imitation of western artists. Perhaps the most striking example is Czerwone Gitary's emulation of the sound of the early Beatles recordings but other artists such as Niebiesko Czarni, Skaldowie and Czeslaw Niemen demonstrate the huge influence of western popular music at this time. That said, of course, this form of imitation or appropriation is not confined to Poland or the communist countries. In the United Kingdom the development of the sound of the 'British invasions' of the US market, led initially by The Beatles and subsequently by bands such as Cream and Led Zeppelin, was entirely based on the imitation and appropriation of African-American forms of music. Even in West Africa artists such as Fela Kuti were imitating the sound of James Brown. This particular aspect of this particular actor network—the writers, performers and producers of Polish popular music throughout this period—is not different in this regard from other similar national networks at the time. The primary difference is in the extent and nature of the access to the western popular music that was being emulated.

Mikolajczyk (2014) has argued that musical theatre was allowed to thrive under the communist regime at this time because the authorities thought it trivial or frivolous:

The power of the musical in Poland resided in its weakness. American musicals were staged in operetta theatres and, accordingly, they were regarded by the authorities and members of the theatre industry as a relic of the old days of nineteenth-century operetta. This kind of theatre was tolerated only because of its popularity among less educated spectators, and it was largely scorned both by theatre artists and politicians. On the other hand, this is exactly why musical theatre artists sometimes had more artistic freedom than directors of more respected productions in dramatic theatres. Since musical productions seemed less serious, the government control was much less strict in their case. As it turned out, while resistance against the government grew and censors were increasing their pressure on dramatic theatre, there were far more productions that conveyed meaningful political attitudes in musical theatre. (Mikolajczyk 2014: 77)

Pekacz (1994) takes this narrative further and suggests that, as opposed to the notion of rock being important in bringing down the communist regimes in 1989 expressed by Ryback (1990) and supported by Richmond (2010):

The history of rock in East Central Europe is not a history of persecution and struggle with the imposed political system; rock and real socialism did not prove to be natural enemies. Rock was not inherently anti-communist (neither were rock musicians inherently anti-communists); rock in many cases benefitted from communist state patronage; the state (being more pragmatic than dogmatic) succeeded in the domestication of rock; relationships

² There had been jazz tours by European and US jazz artists in the 1930s before the war but these stopped under the post-war Stalinist regime.

between the socialist state and rock were more often symbiotic than contradictory, hence many rock musicians were interested in adapting to the status quo, rather than in destroying it... rock 'revolt' was not against the dominant culture but within it. (Pekacz 1994: 48)

Even as far as the importation of western popular music is concerned, the lack of availability was more attributable to economics than to ideology. The communist authorities hosted a Rolling Stones concert in 1967, and many western rock and pop acts, from Deep Purple to Boney M, played in Poland in the 1970s and 1980s. Polish artists were signed to the state owned record company and concerts were sometimes state sponsored.³ This is perhaps more true of Poland than the Soviet Union but Pavel Palazchenko, a Gorbachov aide, is quoted by Richmond as saying that the Beatles “helped us create a world of our own, a world different to the dull and senseless ideological liturgy that increasingly reminded one of Stalinism... The Beatles were our quiet way of rejecting ‘the system’ while conforming to most of its demands” (Richmond 2010: 205). While access to western popular music through the purchase of records was made very difficult by currency restrictions, the making of bootleg cassettes and listening to foreign radio stations such as Willis Conover’s nightly two hour Voice Of America popular music and jazz show (Richmond 2010: 207) provided alternative avenues for listening.

Thus, while both audiences and musicians in Poland had access to western popular music, the market for recorded music centred on Polish and other soviet bloc artists. This form of protected market allowed for the development of a vibrant local scene even if it did exist in the shadow of the more exotic and desirable western acts.

The Sound Of Recorded Popular Music

I want to now turn to an examination of how the sound of recorded Polish popular music differed from that of the UK and the US during this period and then look briefly at three factors that I contend were influential in the creation of these differences:

1. Access to recording and musical instrument technology in Poland at the time.
2. The training and practice of sound engineers and record producers.
3. The cultural and socio-economic climate amongst musicians.

Firstly though: what are the differences we are talking about here? Although the various compositional and performative differences will be discussed briefly later in this article, my focus is on the sound imparted by the mediation process and the recording technology: the sense of space, the timbre of the instruments and voices, and the frequency and dynamic alterations.

I’ve engaged in a listening exercise involving a wide variety of examples from well known Polish bands in the period between 1960 and 1989 and a few key themes emerged from this process that I will explain with help from some examples. The recording of ‘To Właśnie My’ by Czerwone Gitary⁴ from 1966 is very reminiscent of Beatles songs from

³ For example the annual Jarocin rock festival in eastern Poland which started in 1980 was subsidized by Polish cultural institutions until 1992 (Pekacz 1994: 48).

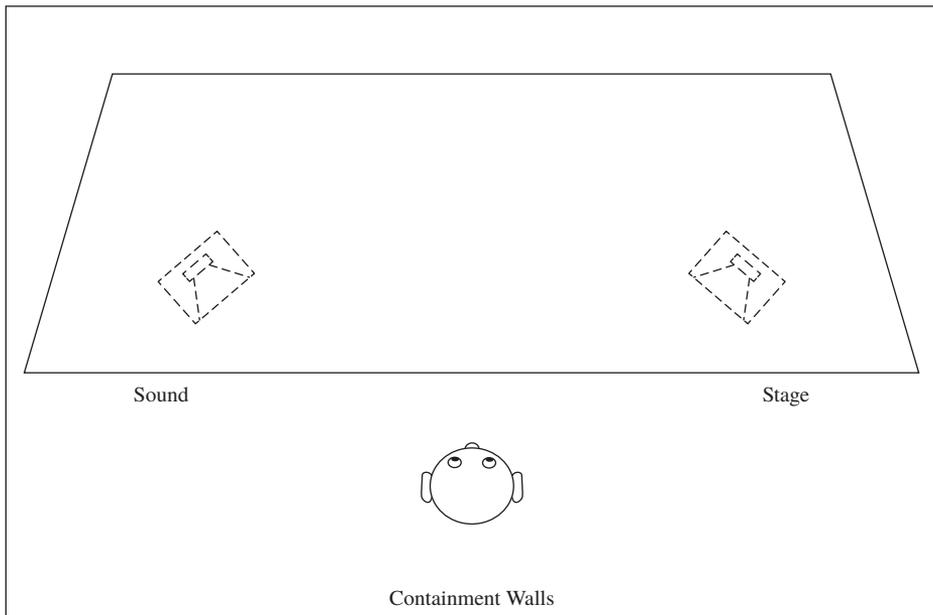
⁴ I have created a Youtube playlist where these examples can be heard: https://www.youtube.com/playlist?list=PL30jdDSZvkQqflfvswzD37AZ9ghU7S_2W [Accessed 7th Mar. 2015].

a few years earlier but if we play The Beatles 'From Me To You' from 1963 you can hear that the sound is much more processed than the Polish version. There's a much punchier sound to the drums and guitars on the Beatles' recording and the vocals are both more present and also have a different reverberant quality to the rest of the instruments. If we move a little later on to 'Juhas Zmarl' by Skaldowie in 1972 and compare that to 'Superfly' by Curtis Mayfield from the same year, there has been a move in both instances to the close microphone placement techniques that create this less reverberant style that provides much greater, if somewhat artificial, clarity to the recordings. When I played this Skaldowie example, along with several others, to Pip Williams, a guitarist and record producer who has been active in both the UK and the US from the 1960s through to the present day, he suggested that the two principle differences were that there was less 'depth of field' in the Polish recordings and that there was less 'pumping compression.' These statements require a little more in the way of a technical explanation as they become important as signifiers of my later hypothesis.

The 'depth of field' that Williams is describing refers to the notion of staging in record production. This is the process by which various mediating techniques can create the impression of a three dimensional audio scene. This has been described by Moylan (1992: 50) and he uses diagram to explain the idea (Figure 1).

Figure 1

Perceived Performance Environment (Moylan 1992: 50)



Musical elements can be positioned in a stereo mix by panning them on a left to right axis between speakers but also by making them appear closer to or more distant from the listener. As I have described elsewhere (Zagorski-Thomas 2014; Zagorski-Thomas 2016),

this type of representation of sonic phenomena is schematic rather than realistic: some aspects of spatial hearing are called upon and not others. This perception of distance can be achieved through a variety of techniques including the use of equalisation (the adjustment of frequency content) and the use of real or artificial reverberation and delay. Just as we recognize that certain aspects of a drawing, painting or photograph are similar to the experience of reality and others are not, so too can the representation of sonic space in a recording be more and less realistic. In general, though, a key feature of these techniques is that they rely on new technology⁵ and the changes in the sound of staging that occurred in the UK and the US during this whole period were closely aligned to the introduction of various new generations of signal processing technology.

The ‘pumping compression’ that Williams refers to is one of a variety of techniques that developed in the 1960s and 1970s, mainly in the UK and the US, whereby deliberate and controlled forms of distortion were used in the recording process to alter the dynamics and timbre of a performance. Probably the most obviously audible of these types of signal processing are the forms of harmonic distortion applied to electric guitar sounds in rock music. Musicians, sound engineers and record producers have developed a broad range of these types of effects over the years. In the case of ‘pumping compression’ a dynamic compressor that reduces any signal amplitudes that go over a set threshold is adjusted so that the volume changes occur in time with the rhythmic pulse of the music. Just as a visual artist might emphasize, exaggerate or distort a feature in an image to influence our interpretation, so too is this dynamic distortion used to emphasize the rhythmic character of the music.

Later examples show similarly profound differences: ‘Stoje, Stoje’ by Maanam in 1980 compared to ‘Life During Wartime’ by Talking Heads in 1979 and ‘Tacy Sami’ by Lady Pank in 1988 compared to ‘There Must Be An Angel’ by The Eurythmics in 1986. These differences, once again, relate to both staging techniques and the ways in which processing has been applied to distort the audio signals. As I shall now describe, a range of factors that influence the embodied experience and habitus of the participants have contributed to both the similarities and the differences in the sounds of these musical cultures.

Recording Technology In Poland—1960–1989

This section will start with a brief look at the types of technology that were available in Poland during this period and how they compared with the equipment in use in the UK and US. Recording history in the UK and US is fairly well documented in the literature and on a bewildering array of time lines and articles on the internet—but it utilizes a contradictory combination of measures: invention and patent dates, first commercial product releases, first release of a recording using a particular technology and more general approximate dates when a form of technology was in wide use. In the case of multi-track tape technology, according to the Audio Engineering Society’s timeline (<http://www.aes.org/aeshc/docs/audio>).

⁵ The ‘new technology’ to which I am referring is the use of multiple close microphone placement as a technique to get more separation and clarity in a recording. If all of these close microphone signals are then mixed together without differentiation there is no ‘depth of field.’ That differentiation needs to be created artificially with further technology.

[history.timeline.html](#)) Ampex developed Selective Synchronous (Sel-Sync) Recording in 1955. This was the process which allowed the playback of one track of tape while recording onto another and Les Paul worked with them to create an eight track tape recorder which he used to make commercial recordings from 1958 onwards. On a practical level, however, the signal to noise performance of this machine wasn't good enough for most sound engineers and the commercial products that they promoted were much less technically ambitious: Ampex released a three track machine in 1960, four tracks emerged around 1964 and eight tracks in 1968. At this point, the move to sixteen and twenty four track recording was probably more hindered by the expense of having to buy a larger mixing console than by the availability and quality of the technology. Despite that, the huge profitability of the recording industry at this point meant that sixteen track became widespread around 1970 and twenty four tracks from around 1972. During the same period the features available on mixing consoles also expanded. Aside from accommodating the increasing number of tape tracks and microphone channels being required, they also added equalisation and panning on every channel and more sophisticated signal routing, splitting and combining possibilities. And whilst processing in the 1950s and 60s mostly focused on the dynamic control of signal levels and, to a lesser extent, additional ambience, there was an explosion of technology in the 1970s: noise gates, echo and delay, phasers, flangers, aural exciters, resonant filters as well as more sophisticated compressors, limiters and reverb units. The same was true of instrument technology: synthesisers and other keyboards; electric guitars, amplifiers, effects pedals and kit drum technology all advanced in ways that changed the sound of popular music dramatically.

In the 1980s, the development of digital audio technology meant that there were similar leaps but the most profound change in that decade was the consumerisation of production technology and the resultant reduction in cost. While the 'top end' studios continued to use extravagantly expensive, custom made equipment and charge similarly extravagant fees, there was a surge in small commercial and semi-professional studios, especially in the dance music market, that used this new, relatively inexpensive technology to create commercial recordings.

Of course in Poland things were very different. While the recording industry expanded during the 1960s and 1970s, there was nothing to compare to the huge profits being made in the UK and US and, correspondingly, neither the money nor the financial mechanisms was available to facilitate any capital investment in these new technologies. The technology available in Polish studios was therefore very limited in comparison. Jacek Mastykarz worked in television sound in the 1970s but became a record producer / engineer at the recording studio in Teatr Stu in Krakow in the 1980s and later moved into live sound for large festivals. During the 1980s he engineered and produced for Maanam, Skaldowie, Lady Pank and others. He recalls:

In 1980/81 I was responsible for bringing the first twenty four track Studer and many other bits of up to date equipment to the studio in Teatr Stu. At that time most studios and radio stations, including Polskie Nagrania (the biggest record production studio in the country) operated a sixteen track. As I recall, in the 1970s Korowód [an album] by Marek Grechuta was recorded on an eight track. The sixteen track was standing in the corridor awaiting a compatible console.

"During communism, most recording facilities were equipped with domestic kit produced by a firm called Fonia mostly made with western parts." (Mastykarz: personal email communication Sep. 2012).



Image 1. **Four Channel Fonia Mixing Console in Use at a Gdańsk Radio Station in the Late 1960s**

One major difference in the way that the Polish recording industry was organised was that many studios served both the recording and radio industries: they were designed as radio studios and then co-opted into producing recorded music as well. This meant that the technology was also primarily radio based. Image 1 shows a four channel Fonia mixing console in use at a Gdansk radio station in the late 1960s.

This kind of console, along with German built Telefunken and the Hungarian Mechanikai Laboratorium consoles and tape machines, made up the bulk of the equipment in Polish studios, at least up to 1980. The 1973 Mechanikai Laboratorium tape machine (see

Image 2) further indicates the technology gap that existed at the time—the Hungarian company producing four track 1” tape machines when, for example, the Swiss company Studer were making sixteen and twenty four track machines at this point in time.



Image 2. **1973 Mechanika Laboratorium Tape Machine**

Although products from a few companies from non-communist European countries such as Studer and Telefunken were used in the 1960s and 1970s, as Mastykarz mentioned in our correspondence, it wasn't until the 1980s that Polish engineers started to get access to the technological developments that had spread through the UK and the US in the 1970s. And these were still very much the exception rather than the rule.

Mastykarz mentions that in 1980, when he installed a Swiss Studer tape machine and a US Harrison mixing console into Theatr Stu, he knew only of a radio station studio in Poznan with a US made MCI console and Polskie Nagrania in Warsaw with a UK made Neve console.

If we consider the differing forms of recording technology in terms of their invariant properties and affordances, we can see how the design principles that are inherent in particular forms of technology can encourage particular types of activity and inhibit others. Steve Albini, an outspoken recording engineer who champions the idea of working with analogue tape rather than non-linear digital recording software,⁶ has spoken about this phenomenon:

⁶ Digital Audio Workstation (DAW) software such as ProTools and Logic is described as non-linear because it allows instantaneous movement of audio signals around on a timeline. The use of the term to distinguish DAWs from tape based systems is slightly disingenuous because the Sel-Sync based multi-track tape systems described

In the digital paradigm, virtually all of the recording tools have developed from digital audio editing systems, not digital recording systems... The history of non-linear digital recording systems has been all about developing newer and more complicated ways of editing and manipulating the sound. An industry whose reason to exist is to make it possible for engineers to do more editing and manipulation more radically and more easily... the net result of that is going to be music that is more radically edited and more radically manipulated than it would have been if the principal directive had been 'making an accurate recording.' In the analogue world the developments were made assuming that making an accurate recording was the goal... so all of the technological developments were geared towards increasing the accuracy, increasing the facility and ease with which you could make an accurate recording of a performance. (Steve Albini: lecture given at the London College of Music on 2nd Dec. 2010)

In a similar manner, the development of eight, sixteen and twenty four track tape machines with the affordance of recording on different parallel tracks at different times encouraged both musicians and recordists working with this technology in an actor network to change the way they thought about the recording process. As Albin Zak (2001: 130–141) discusses, the ways in which recordings became 'constructions' throughout the twentieth century were shaped by the development of the technology. Multi-track recording affords the creation of collages of sound where different layers and patches of recorded performance are slowly built up in the studio to create the finished artifact. With three and four track tape machines, the affordances were relatively limited and mostly involved recording a backing track on two or three tracks, recorded as a single performance by a group of musicians, followed by adding lead vocals (and backing vocals) on the other one or two tracks. As more tracks became available, the creation of more and more complex 'collages' became possible and the performance process became more fragmented, adding one instrument at a time to build up complex constructions. And this involves both musicians and technicians thinking in different ways about what recorded music is and how it should be made: they need to change their image and event schemata that define recording and recorded music. Their embodied experience builds a habitus of tacit knowledge that alters the participants' understanding not just of what is done to create a recording but also, through their understanding of how it became possible to manipulate aspects of individual recorded performance, of what a recorded performance is.

Albini's strongly ideological analysis does gloss over the fact that the tools of "radical manipulation" weren't just a result of the digital revolution at the turn of the twenty first century, they developed first in analogue and hardware forms during the 1960s and 1970s. Those additional tools—dynamic compressors and limiters, noise gates and expanders, various forms of frequency equalization, phasing, chorusing, flanging and a wide array of artificial reverberation and delay—as well changes in studio design, are a further reflection of a move towards the greater separation of the individual sound sources in recording. And primarily for economic reasons these new tools spread more slowly outside of North America, Australia and Western Europe.⁷ It's important to bear in mind that this is a process that develops its own momentum. As the practices and the mindset of the musicians and recordists in the networks change, the industries that supply the production technology

earlier are also non-linear to the extent that they allow musicians to 'drop in' at any point on the tape and add additional audio at a chosen point on the 'timeline' of the tape.

⁷ The term Western Europe is problematic in that it was usually used to mean non-communist Europe. Indeed, these economic restrictions on the uptake of new recording technologies were also applicable in Spain, Greece, southern Italy and Ireland at this time.

adjust their approach accordingly and create products that further reinforce these practices and mindsets. This is an example of Bijker's (2012) 'technological frame': a socially constructed tendency to frame a set of questions or problems in a particular way which sets the technological agenda in a particular field by creating economic pressure and, therefore, a particular research narrative. The changing habitus of the performers, producers and engineers, in turn affects the ways in which designers and manufacturers develop new tools for them and think about the potential affordances that new tools should offer: a circular, or at least self-reinforcing, process.

Professional Practice Of Musicians And Technicians

I now want to examine how the training and practice of sound engineers and record producers had an impact on this phenomenon. Edward Kealy (1979) characterised the development of post second world war sound engineering practice according to three modes:

The craft-union mode in which large, complex studios were run by large corporations and where the approach was essentially technical and utilitarian and the record companies:

encouraged their engineers and mixers to develop their craft skills and strive for a recording aesthetic of 'concert hall realism' and 'high fidelity'... The relationship among collaborators at such recording sessions tended to be formal and impersonal. The mixer recorded whomever the company brought before his microphones. (Kealy 1979: 5)

The second was the entrepreneurial mode heralded in during the 1950s by the development of cheaper tape recording technology that allowed small-scale studios and record companies to emerge and where the stricter delineation of tasks under the craft-union mode broke down.

This in turn led to Kealy's art mode:

Another important consequence of the integration of functions in the entrepreneurial mode was the integration of the sound of the studio technology with the musical aesthetic of popular music... The accomplished rock musician develops a natural interest in the craft of sound mixing as a means of artistic expression. (Kealy 1979: 6)

The consequence of which was the emergence of engineers and producers whose practice involved working closely with musicians to achieve their joint creative ends.

While Kealy's analysis misses a great many of the nuances of the process (and is built specifically on the US model), it does provide a broad picture of the way that studio practice changed between the 1950s and the 1970s in the UK and the US. Overall, studios changed from places where technicians applied strict rules of good practice that applied broadly to all styles of music to places where technicians and musicians collaborated, usually through the conduit of a producer, to create recordings where the mediation of the sound contributed alongside the musical arrangement to the final output.

According to Charlie Gillett (1996), John Lennon of the Beatles:

recalled his frustration with British engineers who would not allow their volume meters to go into the red. He was sure that the harsh crack on the off-beat on so many Motown records was achieved by ignoring such rules. The Beatles made all their records with producer George Martin at EMI's Abbey Road Studios, and had to nag the engineers into experimenting. (Gillett 1996: 269)

While this may have been true to some extent in the early sessions, although engineers like Norman Smith and Malcolm Addey had been using some of these distorting techniques in the 1950s, later Beatles engineers such as Geoff Emerick and Ken Scott embraced their creative potential more fully. Indeed the period from 1955 to 1975 is a critical period of adjustment in the way that musicians and recordists in the US and the UK conceptualized the process of recording and the nature of recorded music. Kealy's three modes relate primarily to the way that the structure of the economic entities involved in the production of recorded music functioned. In addition, as we have discussed in the previous section, the gradual creation and reinforcement of this new technological frame in recording centered on the notion of separating the component performances and processing them differently: a desire for clarity rather than 'concert hall realism.' This, alongside the changes to working relationships engendered by the economic facts that Kealy identified, was a key driver for these changes in conceptualization.

In Poland, this change seems to have occurred both at a different pace and in a different way. As I mentioned earlier, the radio and the recording industry were often using both the same facilities and the same staff. Technicians were trained in-house, as they were throughout the world in these forms of large scale organization, based on widely accepted practices built on two fundamental principles: to record with the least possible distortion and added noise and to attempt to recreate an idealized version of the sonic landscape of the concert hall. Throughout the 1960s and 1970s a survey of the engineering and production credits on Polish rock and pop albums reveals a series of names that can also be found on jazz, classical, folk and children's albums. These were the staff engineers and producers at Polskie Nagrania and a handful of other state owned record companies and they frequently worked on both radio and record productions.

For example, Jacek Złotkowski (Image 3) was a producer and engineer (and conductor / musical director) on a wide range of projects from Penderecki to children's albums to rock groups such as Skaldowie and Czerwone Gitary. He worked for both the Polskie Nagrania record company and Polskie Radio which used the same studio complex in Warsaw. The photograph shows what appears to be a four channel Telefunken console with a 1" Telefunken four track tape machine in the background, still in use in a major Warsaw studio in the 1970s.



Image 3. Jacek Złotkowski (photographed here in the 1970s in the Filharmonia Warszawska studio)

It makes sense then that this craft based mode of sound engi-

neering, striving for a “recording aesthetic of ‘concert hall realism’ and ‘high fidelity’” (Kealy 1979: 5), held sway for longer. For these engineers their professional integrity, or cultural capital (Bourdieu 1993), lay in clearly established criteria of technical expertise. Distortion was a marker of poor workmanship and not of creative practice. The ‘depth of field’ that Williams described also required a step further than ‘concert hall realism’: it involved a deliberate move to think of ‘staging’ as a creative act that combined different types of ‘good’ and ‘bad’ technical practice to produce artificial but musically effective spatial and timbral impressions. In short, it required a larger step towards the technological frame based on separation and clarity. The habitus of thinking and working with musical sound for Polish engineers and producers was built on this broad base of musical styles. Classical music, folk and jazz, for a variety of reasons, have been much slower and more conservative in their adoption of creative recording techniques and in the UK and the USA sound engineers and record producers began to specialize in particular musical styles from at least the 1960s onwards. In Poland, until this form of separation began in the late 1970s and 1980s, the inherent characteristics of these forms of embodied practice and tacit knowledge created resistance, reinforced by the lack of access to the newer technologies of staging, to this schematic and ‘unrealistic’ sonic landscape.

This delineation between the technical and the musical was also mirrored in the practice of the musicians involved. The sound of Polish popular music throughout the 1970s retains the feel of live performance even when the eight and sixteen track recording methods would have allowed more in the way of ‘artificial’ and constructed recordings. The musicians were working within a system that maintained a formal division between the control room (for technicians) and the live room (for performers) and which didn’t grant the musicians the same status as their counterparts in the west: who, as high value ‘assets’ could demand greater control over the production process. The break down of these barriers and the establishment of creative partnerships between performers and technicians happened much more slowly in Poland than in the UK and US. This is as much because the economic environment required for the development of Kealy’s various modes of production was not present. The more rigid organizational characteristics of *Polskie Nagrania*, a state run, large scale business, maintained this formal division for longer. That, in conjunction with the relative scarcity of this new processing technology that helped to drive the new technological frame, allowed (perhaps even encouraged or forced) Polish musicians to maintain the schemata, the mental picture of the ‘norm,’ of recording as a process based on linear performance.

In fact, it seems to me that the longer this status quo persisted, the more it became part of the accepted musical culture and the more entrenched the mind sets became. In both Poland and the west pop and rock musicians’ creative identity was built on notions of progress and change but with the avenue of studio experimentation closed to them, Polish musicians sought novelty and creative development through performance and composition. It is perhaps no coincidence that the styles that thrived the most in Poland are those where the perceived authenticity of live performance and/or virtuosity are most entrenched: blues rock and progressive rock. Within the UK and the USA, a parallel strand of creative authenticity, based on the musicians’ ownership (or at least active participation within) of the recording process encouraged them to develop an alternative, studio informed, perfor-

mance practice.⁸ One of the key ways in which authenticity is attributed relates to what participants and audience members perceive to be norms of practice in given types of situation. The performance habitus in Polish rock musicians hadn't provided the opportunities to engage in these types of studio performance and this encouraged them to retain these live performance and virtuosity informed notions of authenticity despite the popularity of western studio albums.

Alongside this divide in practice, the lack of access to new technologies as they developed made it harder or impossible to build change and novelty on technological innovation. Thus, while progressive rock in the UK drew heavily on new developments in keyboard technology (such as ELP, Yes and Genesis), the Polish parallels use a much narrower range of electronic keyboard sounds and concentrate instead on complex musical structures and instrumental virtuosity (SBB, Niebiesko Czarni). And later in the 1980s when rock incorporated the new digital and sampling technology in the UK and US (acts such as Hall & Oats, Duran Duran, The Cars), Polish acts developed a more guitar based new wave (such as Maanam and Lady Pank). All of these aspects of performance practice reflect the fact that the perceived invariant properties and affordances of the participants' circumstances are constrained by their embodied experience of what their musical activity can and can't be or even usually is or isn't. This habitus both directs and constrains their notion of creativity and, in large part, determines what they construe as authentic practice.

And finally, there's the issue of lyrics and politics. Polish musicians were subject to less severe censorship than in most other communist European countries but the history of oppression and restricted freedom had fostered an aesthetic based on oblique references and analogy that existed in other art forms such as film, theatre, visual art and literature as well as song. Particularly in the 1980s after the rise of *Solidarność*, lyrical content in the songs by the more rebellious bands (such as *Republika* and *Perfect*) reflected the bizarre and contradictory nature of everyday life under communism rather than overt confrontational statements. These forms of lyrical content are reliant on the perception of a direct connection between the singer and the audience. Allan Moore (2002) and I (Zagorski-Thomas 2010b) have both written about the ways that artists and audiences can perceive audible technological mediation as a marker of insincerity: the closer the recording is to the 'original performance,' the more the recording is perceived as an honest representation of the content. This idea of perceived creative authenticity being compromised by technological mediation is relevant in a variety of ways. As well as the question of sincerity in delivering a lyrical message, 'studio trickery' can also be seen to bring a musician's performance integrity into question. The sound of technological mediation is a reminder that recording is an industrial process and that the performers are subject to filtering and manipulation. The less polished and professional sounding the product, the less it appears to be part of this establishment, this industrial complex. And a third strand to this authenticity issue relates to the technicians. If they are basing their professional integrity on producing 'concert hall realism' then the mediation needs to be as transparent as possible. Of course, by the 1970s, concert hall realism in rock and pop music involved a good deal of mediation as well—

⁸ This is reflected in the studio work of The Beatles, The Beach Boys, Pink Floyd, Queen and many others.

multiple microphones going through a mixing console and a PA system—so the criteria changed but the principle remained the same.

Discussion and Conclusions

Thus, the broad conclusion of this article is the, perhaps unsurprising, assertion that the economic and technical conditions in Poland in the period between 1960 and 1989 contributed to the petrification of occupational and social roles within the popular music recording industry. The two key features in this were the structure of the recording industry and the availability of new technology. As recording engineers and record producers continued to be employed to work on a wide range of musical styles rather than developing specialisms, there was little incentive to change their habitus, practices that preserved the notions of high fidelity and the reproduction of an aural facsimile of the concert hall, as that was still the most common aesthetic outside of popular music in jazz, classical and folk recordings. This was reinforced by the lack of access to the new technologies that allowed recording technicians to create new versions of expert event schema. In the USA and Western Europe, this development of a new habitus of recording not only involved new ways of working with this new technology but also new judgments about what constituted appropriate and valuable activity (authenticity) based on an aesthetic of clarity, separation and exaggeration rather than ‘realism.’ This laid the foundations for a fundamental shift in the organization of labour in the recording process which took much longer in Poland than in the USA and Western Europe. This shift provided recording technicians with a set of tools and processes that allowed them to creatively shape the finished recorded sound rather than working towards a standardized sonic goal. This introduction of creativity into their habitus meant that their aims and goals became more aligned with those of the musicians and both occupational groupings started to collaborate and work more closely together. This shift happened much more slowly in Poland and musicians therefore focused their creative development on traditional performance and composition techniques rather than the creative possibilities of recording technology. As discussed, this shift was crucially not just about changing practice and technology but was also deeply concerned with the participants’ perception of what constituted authentic practice in their occupational sphere.

The basis of this analysis is Latour’s (2005) assertion that the ‘social’ only exists in as much as it is performed and interpreted by a group of participants. Any talk of social ‘structures’ is metaphorical and the social is in our heads and in our activity and interaction. As such, one way to describe these ‘structures’ is as networks of activity involving human and non-human actors. The human actors have agency and the non-human actors, for example the technology and architecture, while they do not possess agency, involve design and construction that restricts and directs the agency of the human actors: their invariant properties suggest specific affordances for human activity and thought. They need, therefore, to be included in the equation. By basing this use of Actor Network Theory on the ecological approach to perception and embodied cognition, I am seeking to explore a psychological basis to these sociological and historical phenomena. The way that the invariant properties and affordances of a network help to shape the actions of the participants create norms of

embodied practice and ways of thinking about the process and the participants that are built on this ‘understanding in practice’ (Lave 1990: 310).

This article has sought to explore the influence of recording technology and practice on musical performance in the recording studio in Poland between 1960 and 1989 through this analytical lens. The divide between technicians and musicians was maintained by the socio-economic system within which they were working and prevented the development of the forms of creative collaboration that characterized a good deal of musical activity in the UK and US during the period. In addition, the restricted access to both recording and musical instrument technological innovations encouraged Polish musicians to ground their creative identity in the areas of performance and composition. Both of these factors, plus the importance of lyrical content, meant that there were conflicting motivations at work: the desire to sound ‘modern’ through reference to the sound of western rock and pop and the various issues with perceived authenticity that technological mediation brought with it. These three aspects of my analysis, the division of labor, the access to technology and the notion of authenticity, can be examined in terms of actor networks and the image and event schemata that underpin them. The invariant properties of the network, partially determined by this access to technology, encouraged particular forms of habitus among different groupings of participants that served to maintain pre-existing divisions of labour and encourage notions of authenticity based on common practice that further maintained these divisions.

The divide between the technicians and the musicians was maintained longer in Poland than in the UK and the US because the organizing principles of recording studios and record companies in Poland sustained the type of schema that involved a relatively limited conception of recording as collaboration, seeing each group’s activity as delineated, separate and, to some extent, mutually exclusive. At the same time, the technological frame that approached recorded music with a primary goal of separation and clarity rather than ‘concert hall realism’ took longer to take root in Poland. On the one hand, the production and availability of the associated processing technology that reinforced and accelerated this change of conceptualization (change of schema) was, as we have seen, limited in Poland. On the other hand, the availability of western popular music to listen to (rather than to purchase commercially) allowed the resulting sound of this change of aesthetic to seep into the schemata of what the appropriate sound of popular music was. However, the producers and sound engineers who might have changed their schemata in this way were almost exclusively also employed in the production of a wide range of other musical styles for which this aesthetic of clarity and separation was not only inappropriate but could also be perceived as distortion and therefore as sloppy professional behavior. This further maintained a potential divide between musicians and the technicians in their schematic representations of what constituted appropriate forms of activity in the studio, the appropriate sound for recorded music and the nature of their own creative and professional practice.

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