The Evolution and Decline of the Traditional Recording Studio

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By Philip Ronald Kirby

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Abstract

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This thesis studies the development of the British recording studio from the early-1930s to the present day (2015). This is an area of academic study that has received relatively little attention within popular music studies. Recording studios feature in artist biographies and in studies of music production, and attention has often been focused on iconic studios that are associated with successful artists from the rock canon, rather than exploring the wider sector. Human and economic geographers have focused on specific aspects of the studio sector, such as working practices, the impact of software and the impact of digital technology. This thesis seeks to bridge the gap between the work of popular music scholars and geographical researchers by utilizing a holistic approach, which examines the evolution of the sector using the production of culture perspective, specifically the six-facet model. The development of the recording studio in the UK has been shaped by the interplay between technological innovations, developments in audio production, changes in popular culture, and the structure and financial success of the recording industry. These factors have had a significant effect upon the development of the sector and the cultural products produced within it, consequently any nuanced understanding of the sector has to take all of these factors into account simultaneously. This study draws on a body of oral interviews conducted by the author with engineers, producers, studio owners, technology manufacturers and musicians. It also integrates published materials from a variety of disciplines.

The growth and decline of the sector is explored chronologically; from its industrial beginnings as part of the manufacturing process, the emergence of an independent sector, the standardization of recording studios, the introduction of digital technology, and the evolution of the networked digital studio. Technological innovation in the recording sector is examined throughout the thesis and the development of the professional audio industry is also explored. The thesis examines how the studio sector evolved in tandem with the growth of the market for popular music, and explores the impact of digitization on the sector. A combination of affordable digital recording technology and a crisis in the market for recorded music has significantly reshaped the studio sector in the 21st century. The traditional recording studio is now no longer the main site of production, as small Internet connected DAW-based studios are the new studio paradigm. Consequently, the thesis examines how digital technologies and shifting market dynamics have influenced and shaped the current studio sector. Historicizing the evolution and subsequent contraction of the professional recording sector informs understanding of the recording sector in general, and offers an insight into the interplay between technology, practice and the market.

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Introduction

This thesis examines the development of recording studios in the UK from 1930 to the present day (2015). During this period there was extraordinary economic growth and considerable social change, during which the production and sale of popular music became a significant business. Recording studios are central to the production of popular music and engineers and producers are key cultural intermediaries in the process of music production. Record companies initially built the first recording studios and manufactured their own studio equipment. Prior to the 1960s British popular music was predominantly aimed at a local market, but from the early 1960s onwards it achieved considerable international success. The increased revenue generated by the growth in sales contributed to an expansion in the studio sector. The independent studio sector grew rapidly from the 1960s onwards, and contributed to a change in working practices and organizational structure. The independent sector also accelerated the development of an indigenous pro-audio industry. As a consequence, the vertically integrated practices of the record labels were radically reorganized in the 1960s. The studio also became a site of creative experimentation rather than a stage in the manufacturing process. Recorded music changed from being the straightforward documentation of a live performance to become a technologically mediated construction that relied on studio technology for its conception. Technology evolved steadily through the decades offering engineers and producers ever more control over the recorded musical material. These innovations impacted on the development and aesthetics of popular music. An examination of the studio sector consequently offers an insight into the relationship between technology and culture. Studio technology is intrinsic to contemporary popular music and at times the objectives and expressions of popular music have acted on the development

of studio technology. In turn, technological innovations have inspired musicians and producers to approach their craft differently. As Horning (2002, p. 344) puts it "the growth and development of the recording studio is an example of technological determinism, but of course mitigated by user choice, ingenuity and human aims". I would add the influence of the record industry to Horning's list of mitigating factors. In the last thirty-five years digital technology has been integrated into the recording process and now a recording studio may consist of just a laptop and a DAW. This study will explore the long transition from recording onto wax masters to the use of laptop technology. A key aim of the thesis was to explore the interplay between technology, practice and the market. Technological innovation, developments in recording and production practice and the market for popular music have shaped each stage in the development of the studio. These points are explored chronologically in the thesis to construct a narrative history of the sector.

Key Terms and Object of Study

The focus of this study is primarily recording studios whose core business activity is (or was) the recording and mixing of commercial popular music. This includes record company owned studios, independent studios, and home and project studios. Although a substantial number of musicians and producers own home studios, they too are often used to produce commercial releases. In order to understand the historical trajectory of the recording studio sector in the UK it is important to examine the specificities of the UK sector and the dominant production contexts, which had a fundamental influence on the studios that follow. Record companies built the first purpose-built studios in the UK; these facilities opened some years before label-owned facilities opened in the US. The label-owned studios had a

significant impact on the subsequent development of the UK studio sector. The first corporate studios were substantial facilities designed to accommodate large ensembles of musicians, including orchestras. The initial dominance of the major label studios in the UK established a template, which was then adopted as a model by the UK independent studios that emerged some time after the early corporate studios. The majority of commercially run independent studios that were subsequently built in the UK were smaller than the corporate facilities, but based on a similar layout, with the engineers and producers working in a dedicated control room and the musicians performing in a separate recording space. These studios often featured isolation booths to achieve some acoustic separation between loud and quiet instruments or vocalists. Once rock music became a dominant genre, and multitracking was introduced, studios gradually became standardized around certain acoustic design concepts and key technological items such as mixing consoles and multitrack tape recorders. The majority of the larger UK independent studios were designed to accommodate rock bands, and many of these facilities were built in the 1960s and 1970s. It is these independent facilities and the studios built by record labels that I refer to as 'traditional' studios. I refer to this model as traditional as the majority of significant large studios in the UK were built in relatively short period and were based on this model. As such, for a substantial period they offered the paradigmatic configuration of 'the recording studio' in the UK. These facilities also reflected the division of labour found in the corporate studios with strictly demarcated job roles, such as producers, engineers, maintenance staff, and front of house staff. The UK sector was initially highly centralized and London-based and when the independent sector emerged there was some overlap of personnel from the corporate studios who carried with them the practices and conventions of the

corporate studios. This geographical and organizational concentration continued to be the dominant model for a long period within the sector due to the specificities of the UK recording industry (oligopoly, centralization and the comparatively concentrated scale of the market). The US independent studio model, such as exemplified by Sun or Chess, was not seen in the UK until the 1970s, when smaller studios (often run and operated by one person) emerged to service their local markets, either for demos, or to service the small independent labels that developed in tandem with pub rock and punk.

The studio sector stratified as it grew throughout the '60s, '70s, and '80s in many cases small studios were also run as commercial businesses, these too were primarily aimed at recording rock music ensembles. Consequently, the professional studio sector featured a wide range of facilities; these were initially differentiated by the track count offered by their recording equipment, and the overall level of sophistication of their technical provision. Nevertheless, smaller studios operated as part of a professional recording sector, so any reference in the thesis to 'professional' or 'traditional' studios is referring to commercially run facilities where offering band-oriented recording services was their primary business model. As recording technology evolved, a substantial home recording sector developed, in some cases these facilities took on paid commercial work, and these small-scale facilities became known as project studios. Aspiring musicians and producers also became active consumers of recording technology, within the thesis the term 'amateur' refers to practitioners who may aspire to a professional career, but do not primarily make a living from their recording activities. The manufacturing and marketing of home recording products has now developed into a substantial industry, the combination of widely available and relatively affordable technology, and the aggressive marketing

of this technology, has resulted in the emergence of substantial hobbyist sector. Hobbyists are less focused on attaining a career in the music industry and their compositional and recording activities are effectively a leisure pursuit.

The title of the thesis refers to the evolution and decline of the recording studio; the focus of this study is specifically on the growth and subsequent significant decline of the 'traditional' recording studio and its attendant professional and creative practices. Although there are now more studios than ever, at least in part due to the introduction of affordable digital technology, many of these small facilities are owned by producers, songwriters, engineers and producers, and are used primarily for their own individual professional activities. Despite the apparent size of the contemporary studio sector, very few commercially run studios are actually profitable and many of the larger facilities established in the '60s, '70s and '80s have ceased trading. Studios were once highly profitable commercial businesses, for a variety of reasons explored in the study this is rarely the case nowadays. As a consequence of technological development and changes to the market, the amount of significant professional facilities in the UK is now considerably smaller than it was in the late 20th century.

Previous Work into the UK Recording Studio Sector

However, what little research there has been on the studio sector has, on the whole, been restricted to studying iconic studios, or concerned with the experiences of key production personnel (Kehew & Ryan, 2006; Massey, 2000, 2009; Cogan & Clark, 2003). Some academics have theorized the role of producers and the nature of the studio space (Hennion, 1989; Kealy, 1990; Moorefield, 2005; Cunningham, 1998).

Horning (2004, 2012, 2013) has made a significant contribution to the specific study of recording studios and studio practitioners, but her work focuses on the American sector. Consequently, there is little research on development of the overall UK recording sector and one of the aims of this study was to develop a historical overview of the British studio sector. This aim was particularly pertinent, as the sector has been radically reshaped by the impact of digitization and the large-scale studios that I refer to throughout the thesis as 'professional' or 'traditional' studios are rapidly becoming an anachronism in the 21st century.

However, in contrast to the relative lack of analysis of the studio sector in the field of popular music studies, human and economic geographers have closely examined specific aspects of the sector. Notably, their work explores the impact of software on the organization of the industry, working patterns in the sector, the democratization of recording technology and musical tourism (Hracs, 2012, 2014; Leyshon, 2001, 2006, 2009, 2014; Watson, 2012, 2013, 2015; Gibson, 2005). Leyshon's (2009) article 'The Software Slump' was of particular relevance.
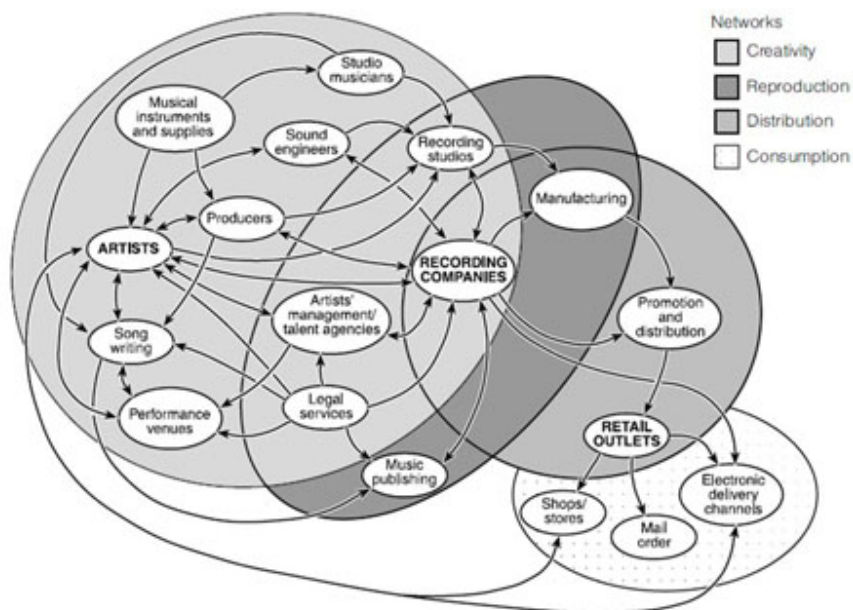
Musical Networks, (Leyshon, 2001, p. 61).

Leyshon (2001, 2006, 2009, 2014) places studios and record companies as significant nodes in both the networks of creativity and reproduction, however the role and financial viability of both studios and record companies have been significantly altered by digital technology. Indeed, their centrality in both networks has been undermined. This stance has subsequently been reiterated by a number of scholars including (Tschmuck, 2006; Watson, 2015; Prior, 2008, 2009), their work explores the impact of digital technology on the recording industry using a variety of approaches. As Leyshon (2009, p. 1309) notes, "The music industry has been radically transformed by software". Leyshon's statement conflates the recording industry with the music industry as a whole, but is not an exaggeration. The impact of digitization is explored in the thesis from the early introduction of digital technology into the studios of the 1970s, to the development and adoption of advanced DAW technology. The impact of digitization on the market for popular music is considered in the final chapter.

As the various stages in the development of the recording studio are shaped by technology, it was necessary to explore the evolution of technological change. Throughout the thesis I navigate a path through the history of recording studio technology in a chronological order. Although I have provided an inventory of technological change I have attempted to incorporate the input from human actors into the evolution of technology and explore their interaction with technology. As Latour (2005) emphasizes, it is the interaction within technological networks that is of interest rather than the technology itself. As the studio sector evolved, a substantial pro-audio industry developed in the UK from the 1960s onwards, initially from independent studios, which through necessity initially built much of their own equipment. The pro-audio sector responded to the needs of engineers and producers

and introduced a number of technological innovations that shaped production methods and in turn the cultural products that were produced in the studios. I also explore the evolution of the mixing console, as British companies were instrumental in console development and they achieved international success by manufacturing innovative console technology. The development of home studio technology is a constant theme throughout the latter half of the thesis, and Theberge's (1992, 1997, 2004, 2012, 2015) work was of particular use to frame the introduction and adoption of home recording technology. Theberge (1997) also explores the marketing of home recording technology and notes that the constant consumption of technology has become a characteristic of home recording. Bennett (2012b) revisits Theberge's (ibid) work and offers some new insights, as the pro-audio industry is now focused on the home studio consumer their work was of particular relevance. The growth of the home studio has now resulted in a thriving industry geared at producing and marketing products for amateur producers, the majority of which are hobbyists.

In an effort to explore the sector thoroughly I have drawn on works from a wide range of disciplines. This thesis used an interdisciplinary approach, informed by actor network theory, science and technology studies, urban geography and the production of culture approach. I have also integrated material from music industry studies as the recording studio sector has evolved in tandem with the fortunes of the record industry; the examination of the arc of the studio sector's development will hopefully make that link explicit.

Theoretical Perspectives

I have utilized the production of culture perspective throughout the thesis to frame discussion of the studio sector. This perspective focuses on the ways in which the meanings of symbolic phenomena, or cultural objects, can be shaped by the environments in which they are created, distributed, or evaluated (Santoro, 2015). Historical change is at the heart of the perspective, cultural production systems often change slowly, but rapid changes that radically alter the aesthetic principles of cultural forms are possible. Santoro (2015) observes that the production of culture approach is a perspective not a theory, and the nearest to a formalized theory is what Petersen and Anand (2004) term the six-facet model. In this model, six factors can be identified as being of relevance to the processes of cultural production. These factors are law and regulation, technology, the market, industry structure, occupational careers and organizational structure. These factors are considered together as part of an independent production network whose structure has to be described and assessed locally (Petersen & Anand, 2004; Ryan & Petersen, 1993). The six-facet model is used throughout the thesis to consider the factors that shape the studio sector in different periods.

Technological development and innovation is a core theme of the thesis, this discussion is informed by theoretical approaches from actor network theory, technology studies, the social construction of technology and the role of users. Christensen's (2003) concept of disruptive technology is useful to understand how an innovative technology can radically reshape an industry. These theoretical approaches are referred to throughout the thesis, but will be summarized here.

Arthur's (2009) work on theorizing technology and technological development offers a useful perspective to explore the nature of technology, the impact of recording technology, and the development of the recording industry. Arthur's (ibid) core concept is that technology 'creates itself from itself'; he terms this mechanism evolution by combination, or *combinatorial evolution*. A technology is never fixed, it constantly changes its architecture, and adapts and reconfigures as purposes change and improvements occur. Technologies tend to become much more complex as they mature. Potentially, every technology can become a component in further technologies. An individual technology does a job, or serves a specific purpose; "a domain (technology-plural) does no job; it merely exists as a toolbox of useful components to be drawn from, a set of practices to be used" (Arthur, 2009, p. 28). A technology defines a product, or a process, such as a tape recorder and sound recording. A domain defines no product; it forms a constellation of technologies: "A technology is invented; it is put together by someone. A domain–think of radio engineering as a whole–is not invented; it emerges piece by piece from its individual parts" (Arthur, 2009, p. 71). A change in domain is the main way in which technology progresses. Whether domains crystallize around a novel technology or build from a family of phenomena, they are always born from some established field. The domain of audio engineering in the electrical recording era relied on the components and practices of vacuum-tube electronics. Subsequent innovations rely on developments in the fields of transistor technology, integrated circuits and digital technology. The domains of any period in fact define not just what is possible, but also that period's style, a concept that is useful to consider the impact of developments in audio technology on the type of music produced in different periods: "An era does not just create a technology. Technology creates the era"

(Arthur, 2009, p. 75). Arthur (ibid) considers that the elements of the economy (industries, firms, business practices) do not "adopt" a body of technology; they *encounter* it: "And from this encounter, new processes, new technologies, and new industries are born as a result" (Arthur, 2009, p. 153). Arthur (2009) observes that the economy is not a container for technology, but arises from its technologies. In the case of the recorded music industry, the industry emerged from Edison's development of sound recording. Arthur (2009) observes that a characteristic of modern technologies is that they can be combined and configured endlessly for fresh purposes: "Technology, once a means of production, is becoming a chemistry" (Arthur, 2009, p. 25). It is rare for a novel technology to be the work of a single originator, as typically several groups of inventors will have envisaged the principle in action at more or less the same time and have made attempts at a working version of it.

The most significant aspects of digital technology to this thesis are the personal computer (PC) and the Internet. The PC can be used to create music, upload music to an online distributor or share it via social media, and to listen to music or watch videos. The computer is the first device in the history of popular music where all these activities and functions converge (Prior, 2008a). The PC is an example of what Christenson (2003) terms 'disruptive technology', a form of new technology that disrupts the status quo of an established industry. The computer's hardware capabilities are exploited by DAW applications such as Pro Tools, Logic, Cubase, etc., as it is software that differentiates a PC or laptop used for music composition or mixing from a business machine, word-processing device or a social media tool. The PC is not the first example of a disruptive technology affecting the production or consumption of popular music; for example, transistor based recording technology

replaced studio equipment based on the vacuum tube, and Edison's gramophone completely reshaped the consumption of music despite sounding inferior to a live musical performance. Christenson (2003) notes that most new technologies foster improved product performance. He calls these 'sustaining technologies' as they improve the performance of established products. He argues, "Sustaining technologies can be either transformative (a radical shift) or continuous (incremental improvements) (Burgess, 2014, p. 147). The majority of technological advances in any industry are sustaining in character. The initial integration of computer technology into the recording studio offered an improvement on the available analogue technology, for example, the use of microprocessors in analogue tape machines and mixing desks to improve their performance and extend their capabilities. Digital MIDI equipment was a disruptive technology, as was sampling technology, but the DAW-equipped PC has become a significant disruptive technology in popular music production as it has reconfigured working practices, democratized access, and undermined the business model of the traditional recording studio. The Internet has also proved to be a disruptive technology for the record industry, as the combination of the PC and network technology has resulted in the business model of record companies being undermined or outmoded. The initial market for personal computers geared towards music composition was the home studio owner. Christensen observes that "Occasionally, however, *disruptive technologies* emerge: innovations that result in *worse* product performance, at least in the near-term" (Christensen, 2003, p. xviii). An example of this would be an early computer-sequencing package running on a PC, as this technology couldn't compete with the sonic possibilities offered by musicians working in a fully equipped recording studio. In a relatively short period of time sequencing software evolved

into the DAW, which became the equivalent of a highly specified studio, "knocking out the established technology and its established practitioners, with stunning speed" (Christensen, 2003, p. 46). The DAW has transformed the process of composition, recording and mixing. As Theberge (2012) notes, the DAW has blurred the boundaries between a home studio and a professional studio in a way that earlier studio technologies such as MIDI and narrow format tape recorders, promised but failed to do. Christensen (2003) considers that established companies often choose not to invest in disruptive technologies for financial reasons. Disruptive technologies are simpler and cheaper than the products with which they are competing; and they usually offer lower profit margins. Disruptive technologies typically are first commercialized in emerging or insignificant markets, such as the home studio market of the 1980s and 1990s. Also, the most profitable customers of established businesses often have no use for products based on disruptive technologies. In terms of recording studios, until the late 1990s personal computers were not powerful enough to offer a viable alternative to a mixing console, a tape recorder and outboard processing equipment. Consequently, established pro-audio businesses and professional studios didn't invest heavily in computer-based recording until it became the dominant production technology. Essentially, the least profitable customers in a market initially embrace a disruptive technology; which was in this case the home studio owner, as home studios integrated digital tools more rapidly than most professional studios. Companies with a policy of listening to their best customers and developing new products that offered greater profitability and growth are "rarely able to build a case for investing in disruptive technologies until it is too late" (Christensen, 2003, p. xx). This theory goes some way to explaining the shifts in fortune of the companies that dominated pro-audio before the PC-based DAW

became the dominant technology. Christensen (ibid) observes that disruptive technologies are usually successfully brought to market by new businesses. None of the now dominant DAW platforms were innovated by established audio companies; and the majority of companies producing software plugins are new entrants to the pro-audio industry.

The recording studio business model was based on the studio investing in equipment that offered profitability and growth, equipment that was technically far beyond the possibilities offered by an early home studio, and financially beyond the means of most musicians and producers. Christensen argues that "Disruptive technologies typically enable new markets to emerge" (Christensen, 2003, p. xxiv), and in this instance, the PC-based DAW has reconfigured the pro-audio market, as selling products to the home studio owner is now the most lucrative area of the market, rather than addressing the declining professional sector. The recording studio business has been reshaped by the DAW, as musicians and producers, both amateur and professional, can realistically aspire to own the means of production: "Indeed, computer and software developers have spread the tools of production more widely than any previous technology" (Theberge, 2012, p. 83). A DAW enables multitrack recording and mixing at a quality level previously only attainable in a professional studio. In many respects, due to the inherent micro editing and automation possibilities, a DAW exceeds the capabilities of a conventional studio (Watson, 2015).

Pinch and Bijker (1984), in defining the Social Construction of Technology (SCOT) approach, saw users as a social group that played a key part in the construction of a technology. Rather than viewing users as passive consumers of technology, the SCOT approach focuses on how users interact with artifacts and become agents of

technological change. Developments in audio technology were often based on feedback from users, and this is apparent in both the corporate studios and subsequently in the independent sector. As Horning argues, "From the very beginning of sound recording, users as well as inventors helped to refine technology and practice even as new technologies suggested new applications, a good example of the co-construction of users and technologies" (Horning, 2013, p. 6). The connection between designers and users was made more explicit with the concept of a technological frame; users can be said to share a technological frame with the equipment's designers (Oudshoorn & Pinch, 2003). As consoles evolved, numerous facilities were gradually added at the request of engineers and producers, demonstrating the co-construction of users in the development of console technology.

Taylor (2001) notes that common assumptions about the impact of technology usually fit into one of two viewpoints.

> The first is the familiar voluntarism argument: technology is a tool that people use, nothing more, and is thus essentially neutral; it is only good or bad depending on its use. The second is the position known as technological determinism, in which the technology is assumed to transform its users directly. (Taylor, 2001, p. 26)

Taylor (2001) considers that in practice, although technology is in essence a tool, it is nevertheless capable of determining an outcome to some extent. So, the binary opposition explained in the above quote is an inadequate stance from which to understand the impact of technology on practice. Technological determinism is a crude stance from which to explore technology, a more nuanced understanding must be developed. Actor Network Theory (ANT) is a useful framework for considering the role played by technology in the process of composing and recording music in

the studio (Watson, 2015). One can consider musical creativity as a process that involves human actors (musicians, producers, engineers) and non-human actors (studio equipment, instruments, DAWs). The non-human actors play a significant enabling role in human action, as technology mediates ideas and can enable particular forms of musical production (Watson, 2015). As noted by Strachan (2016) a DAW is not just a tool for organising musical creativity, but can be viewed as an actor capable of shaping and directing musical outcomes. Within Actor Network Theory non-human actors are not seen as simply resources or as passive actors, but can "intervene actively to push action in unexpected directions" (Callon & Law, 1997, p. 178).

Consequently, a key contribution from ANT is to move beyond simple cause and effect explanations (or technological determinism). Instead, ANT allows the description of phenomena as relations that emerge due to the interaction between humans and technologies. Digital technology (as a set of technologies) has no clear determining effect in and of itself. It is only "affording" or "rendering possible" certain types of actions (Latour, 2005, p. 72). Arguably then, "What matters is how it is put to use, and ascribed meaning" (Spilker, 2012, p. 776). There are two key strands to consider here. Firstly, the integration of digital technology into music composition, recording and production, and secondly, the effect digital technology has had on the recorded music industry. Akrich (1992) uses the term 'script' to attempt to explain how technological objects can enable or constrain human relations, as well as explaining the relationships between people and things. Akrich (1992, p. 208) compares technologies to film, and suggests, "Like a film script, technical objects define a framework of action together with the actors and the space in which they are supposed to act." The concept of the script is useful as it makes

visible a new kind of user, a projected user. Akrich (1992, p. 207) suggests that in the design phase technologists attempt to "anticipate the interests, skills, motives, and behaviour of future users". Consequently, these representations of users become integrated into the design of the new product. Akrich (1992, p. 208) considers that as a result, technologies contain a script (or scenario), "they attribute and delegate specific competencies, actions, and responsibilities to users and to technological artifacts". Technological objects can then create new "geographies of responsibilities" or transform or reinforce existing ones (Oudshoorn & Pinch, 2003, p. 9). To avoid technological determinism, Akrich (1992) suggests the negotiations between designers and users are significant. The script approach makes users more visible as active participants in technological development. Akrich (1992) is aware that a focus on how technological objects can constrain the ways in which people relate to things and to one another could be viewed as technological determinism, particularly if designers are represented as active and users as passive. To avoid this, she emphasises the reciprocal relationship between objects and subjects and explicitly addresses the question of the agency of users (Akrich 1992). To further underscore the active role of users in shaping their relationships to technical artefacts, Akrich and Latour introduced the concepts of subscription, de-inscription, and antiprogram. "Antiprogram" refers to the users' course of action that is in conflict with the designers' program (or vice versa). "Subscription" or "de-inscription" is used to describe the reactions of human (and nonhuman) actors to "what is prescribed and proscribed to them" and refers respectively to the extent to which they underwrite or reject and renegotiate the prescriptions (Akrich & Latour, 1992, p. 261). There are numerous examples of studio technology being used (or misused) in unexpected ways, which again confers agency to users. As Katz (2004,

p. 71) observes, "To be sure, design circumscribes use, and users often alter their actions to best accommodate a technology's limitations or exploit its possibilities. Yet no design is completely deterministic". This is a brief overview of the theoretical perspectives pertinent to technology; these concepts will be referred to throughout the thesis.

Thesis Structure

The initial chapter provides a historical base for the thesis, and provides an overview of the development of the UK studio sector from 1930 to 1960. The chapter argues that early studios were the result of the interplay between the technology available in the UK sector, the corporate concepts and practices associated with major label audio production, and the structure and financial success of the recording industry. The chapter also argues that the recording process was discursively framed as part of an industrial process in this period. The corporate studio with its A&R directors, arrangers and unionized session musicians was gradually superseded in the 1960s as the craft-union mode of production became outmoded.

The second chapter explores the sector in the 1960s and argues that certain key individuals had a significant effect on changing the working practices of the recording industry in this period. The transition from craft-union mode to entrepreneurial mode in the UK was initiated by a small number of independent producers (Kealy, 1990). The chapter also argues that the emergence of these figures was part of a convergence of historical factors relating to the recording studio and pro-audio sectors in the UK, changes in the aesthetics of popular music and a subsequent shift in the market. The chapter will argue that the emergence of independent producers and greater numbers of independent studios in the 1960s

facilitated the shift from craft-union mode to entrepreneurial mode, and then subsequently to art-mode in the late 1960s (Kealy, 1990). The studio also became perceived as a creative space in this era. The transition from the restrictions of the corporate studio to collaborative creative practice happened over a relatively short period. The introduction and diffusion of new technology in the 1960s also contributed to the shift to entrepreneurial mode, shaped the rock aesthetic and also started to reshape the vertically integrated structure of the recording industry. The 1960s was a decade in which the studio sector went through considerable change and the market for popular music increased substantially.

The third chapter will explore the expansion of the sector in the 1970s, and continue to examine how the relationship between the market for popular music and the aesthetics of production impacted on the success of the studio sector and the pro-audio sector. The chapter will argue that the decade constituted a consolidation and continuation of the major trends that transformed the recorded music sector in the 1960s. The chapter includes a focus on home recording, as there were considerable innovations in home recording technology in the 1970s, and from this decade onwards, home recording began to impact on the professional sector. The chapter will argue that although the studio sector integrated new technology, and expanded considerably throughout the 1970s, in many ways the changes were less significant than the radical change that occurred in the sector in the 1960s. The decade was defined by the rock aesthetic that emerged in the 1960s, with the studio as a site of experimental creativity.

The fourth chapter examines the 1980s, a decade that featured radical change to both the record industry and the studio sector, as the introduction of digital technology began to reshape both the production and consumption of popular music. The chapter

will argue that there is clearly a feedback loop between the market for popular music, technology, technology manufacture and practice. It will also argue that the introduction of digital technology in the 1980s had a number of unforeseen disruptive effects, although these were not initially clear at the time. Developments in the sector in the 1980s were driven by the introduction of digital technology, and studio equipment and studio design became standardized in this period. The introduction of innovative digital technology into both home and professional studios influenced production practice and facilitated the emergence of new musical genres. Home studios begin to be technologically advanced in this decade, often incorporating digital technology more rapidly than the professional sector.

The next chapter will examine the transition from hardware-based recording to software-based recording that occurred in the 1990s. The impact of digital technology became particularly significant in the 1990s, as the latest innovations in digital technology were widely adopted in both home studios and professional facilities. In practice, home studios adopted the emerging digital audio workstation (DAW) technology and other digital recording tools before many professional studios. The blurring between domestic and professional technology – which was facilitated by advances in digital technology – undermined the professional studios' business model. The chapter will argue that the introduction of the DAW was a significant paradigm shift that completely reshaped the studio sector in the following years, as the DAW proved to be the disruptive technology that reinvented the recording studio. Significant disruptive change to the business models of both studios and record companies occurred at the end of the decade. Worldwide sales of popular music reached a peak at the end of the 1990s, then the combination of network

technology, software and PCs coalesced to cause significant disruptive change in the record industry.

The final chapter explores the studio sector in the 21st century. The chapter will argue that the relevance and financial viability of professional recording studios was specific to a particular mode of cultural production, which explained their development in tandem with the growth of rock music. It will argue that the studio sector was radically reshaped by the drastic decline in sales that the record companies suffered after the millennium. The chapter will also argue that developments in computer technology and software resulted in the home or project studio offering musicians and producers the tools to produce commercially acceptable material without recourse to using a professional studio. The studio sector started to decline as software-based technology become more widely diffused, and an era of flexible specialization ensued in the 21st century. The prevalence of electronic music in the contemporary market was another factor in the decline of the traditional studio, as the design, technology and practices of traditional studios were developed and refined in the rock era. The chapter will argue that large studios have largely become an anachronism in the 21st century and small Internet connected DAW-based studios have become the new paradigm.

The length of each chapter is proportionate to the amount of change and innovation in each period. Certain periods feature radical change and are consequently examined in more depth.

Methodology

This thesis aims to provide an overview of the recording studio sector in the UK from the first corporate studios of the 1930s to the small-scale digital facilities of the 21st century. This encompasses an exploration of the growth of the record industry, the development of studio technology and an associated manufacturing industry, the introduction of independent production and independent labels, and the impact of digital technology on the record industry and the recording studio. In order to explore the topic the initial stages of research consisted of identifying relevant academic material, identifying any relevant non-academic material such as biographies, and collating material from the trade press. These sources were utilized to provide a theoretical underpinning to the study and to develop some historical perspective.

A mixture of methodological approaches was utilized to address the key research aims and related themes. Blaxter, Hughes & Tight (2010) note that it is common for researchers to use more than one method of data collection, and that most projects in the social sciences are multi-method. By using a range of research techniques it is possible to verify or triangulate the validity of the information being collated. The thesis includes both quantitative and qualitative approaches. In terms of quantitative data, historic record sales figures were directly obtained by contacting the BPI (British Phonographic Industry); contemporary sales figures are more widely available from IFPI (International Federation of the Phonographic Industry) and BPI reports that can be accessed online. These figures were augmented by sales statistics found in academic literature. Trade yearbooks, archive material and websites that promote contemporary studios provided useful data on the number of UK studios operating at different points in time. However, establishing the number of studios operating in the sector at any point proved problematic, as the available data is

clearly not entirely accurate. Every published list of studios from the 1960s to 1990s has obvious omissions, or includes studios that were no longer operating at the time the list was collated. The contemporary data is equally flawed, as studios that carry out little commercial work are listed on websites such as allstudios.com, or duplication occurs when rooms in a studio complex are listed separately. Manufacturer's websites and industry trade press provided some useful material on sales figures in the manufacturing sector.

The primary research generated qualitative data and was gathered using ethnographic techniques; specifically semi-structured interviews, participant observation and digital ethnography. Secondary research consisted of desk-based historical research, which involved the summary, collation and synthesis of existing research and the interpretation of primary and secondary sources. A wide range of sources was used to triangulate evidence in order to build up a rich and accurate construction of the development and subsequent decline of the studio sector. The secondary research shaped the interview questions and gave me sufficient understanding of the topic to gather useful material from experienced industry practitioners. The interview material then offered a more nuanced perspective on the issues and themes raised by the secondary research, it also filled in some of the gaps in the published literature.

Online Research

Hammersley & Atkinson (2007, p 137) observe, "Digital technology has expanded our very notion of what constitutes a 'field'". Virtual fields and virtual fieldwork are now possible and are assuming greater significance in a social world that is simultaneously global and digital. Online research revealed a wealth of relevant material, as there are a number of websites that host primary material on recording

studios and their associated technology, some of these sites function as community archives. Although, as Baker and Collins note, "grassroots institutions and sites of popular music heritage may not be considered as, or consider themselves to be, 'archives' in the traditional sense" (Baker & Collins, 2015, p. 3). Although grassroots sites of popular music heritage are not considered official archives, they are sometimes organized along similar lines to a museum or official archive and are often created by individuals or small groups who share a specific interest or hold a personal collection of artefacts. "The endeavours of community archives of popular music therefore uncover rich research materials for scholars, cultural and popular music historians and those with an interest in popular music in general" (Baker & Collins, 2015, p. 2). There are potential problems with the sustainability of resources of this nature, as the websites may not stay online due to lack of finance, human resources or copyright issues. Whenever I found a useful site, I endeavoured to save the website as a web archive file in case the site was not accessible online at a later date.

The individuals responsible for the website 'philsbook.com' (The Classic UK Recording Studios Resource) have utilized the resources of the British Library to scan a significant number of articles and images from the now defunct 'Studio Sound' magazine and other historical trade periodical sources. Their website has also been augmented by numerous personal submissions from the engineering and production community and is consequently becoming a community archive. This website was an excellent resource for material on the major UK studios and audio manufacturers. The Manchester and District Music Archive was also a source of relevant material and links to other websites.

In contrast to online – institutional sites, online – community archives are driven by activist archivists who seek to preserve and share popular music culture. These are often ad hoc and either seek to digitise and make available material they collect or come across, or they deal only in digital items. (Baker & Collins, 2015, p. 4)

Due to the relative ease of publishing web material nowadays there is a plethora of user generated content available online. Relevant to this thesis were websites or blogs constructed by enthusiasts of light music, early UK radio, recording studios and audio equipment.[1] I incorporated useful material on early studios and audio equipment from a number of these websites. These sites often include personal memoirs from employees and practitioners from the studio or audio equipment sectors. I discovered a website that offered information on the histories of defunct UK audio companies, which was useful for researching the histories of audio manufacturers. A similar website exists that is specifically devoted to British tape recorder manufacturers. Both of these websites feature material submitted by ex-employees who worked in the UK audio industry, they also host period images of advertising copy that can be considered primary sources.

There are numerous video interviews with key technological innovators available online, which were useful to corroborate and augment print and web sources concerning the development of the mixing console and the manufacturing sector. NAMM (National Association of Music Merchants) has made available an online oral history library, which features video interviews with key technical innovators and industry practitioners. The websites of the majority of equipment manufacturers feature information on the development of their companies, in the cases of Sound Techniques, Amek, SSL, AMS-Neve and Rupert Neve Designs this information is very extensive and presented in a timeline. The website for the audio magazine

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[1] Light music is a generic term that refers to a mainly British style of 'light' orchestral music, which originated in the 19th century. Its heyday occurred in the mid-20th century.

Sound on Sound is searchable back to 1996, which offers a useful source of interview material, information on equipment manufacturers and discourses concerning home recording and professional studios.

The audio industry journalist Gary Cooper has posted a large number of interviews and articles on his website, which provided a useful overview of the key protagonists in the UK audio industry. Cooper's material was a collation of many articles that he had previously published in the trade press. This site was particularly useful in terms of sourcing material on the development of the manufacturing industry and the dealers that serviced the early home studio market. I contacted Cooper by email, who commented that he had posted the articles online a decade ago and no one had previously made any comment on the material. Whenever possible these online sources were triangulated, although this was obviously not always the case with any online images that were used as primary sources. Google have digitized numerous editions of *Billboard* magazine, this proved to be a valuable resource, material from the late 1960s onwards was integrated into the thesis, and period advertisements from UK studios were useful primary sources. The magazine ran a section on the London studio sector for some years, which provided an overview of the sector from a non-UK viewpoint. In the 1990s *Billboard* started to itemize the equipment used to record and mix the American top ten records each week, this chart demonstrated the international success of UK audio products.

Ethnography

The main focus of this study was cultural producers and technologists whose activities share a group culture; this thesis drew upon methodological approaches developed within the fields of sociology and anthropology. An ethnographic

approach was utilized that encompassed a combination of observational methods, primarily participant observation and interviews. A traditional objective of ethnography is to gain insight into the culture and behavior of a particular social group, in this case studio practitioners and associated technologists.

Cohen (1993) suggests that ethnography should involve a lengthy period of study, and possibly residence with a particular group, ideally involving knowledge of their spoken language. Porcello (2004) notes the existence of a specialized vocabulary used by studio engineers, which could present problems to those unfamiliar with the lexicon. In this instance, I have worked in the recording sector for some years; and have consequently gained empirical knowledge of the culture, practices, technology and terminology of the sector. I have recorded in a considerable number of studios and I ran a small commercial studio myself for some years. This gave me a degree of 'insider' status, which facilitated access to potential respondents and provided background historical and technical knowledge of the studio sector. This was particularly useful when interviewing some of the older and more experienced practitioners, as it seemed as if I had to demonstrate a degree of knowledge and insight to gain their trust in an interview. As McDowell notes, there is a real benefit to developing "a genuine rapport with your interviewees because this will facilitate the free expression of opinion" (McDowell, 2002, p. 119). One small challenge was the age of some of the interviewees, as some of the respondents were in their seventies or eighties. McDowell (2002) notes that it is sometimes easier to elicit information if there is some proximity of age and social class between interviewer and interviewee. Any significant issues of age and class were to a degree offset by a common interest in the subject area.

Another facet of participant observation pertinent to the thesis is I have been putting together another recording studio during the period I have been researching this thesis, which has meant I have been using online forums to research equipment and acoustic design; this has been useful to maintain my familiarity with contemporary discourses amongst practitioners. To a degree I have acted as virtual participant observer in the virtual worlds of audio forums, as online environments offer a rich contemporary resource for ethnographic research. "There is no distinction between 'virtual'; and 'real' environments in social terms, and research in the digital age needs to take account of that" (Hammersley & Atkinson, 2007, p. 139).

In terms of access to respondents, a degree of 'insider' status proved invaluable, as the sector can be problematic to research. In his work on the sector Leyshon found that studios, "proved to be difficult if not impossible places to access without a personal referral or reference to an already known contact within the recording studio sector" (Leyshon, 2009, p. 1316). Unlike Leyshon I had few difficulties in terms of contacting potential respondents and setting up interviews. I initially interviewed key respondents and often found that the respondents then suggested other potential interviewees and made available their contact details. The interviews took place in the respondents' homes or workplaces and were recorded into a laptop as audio, allowing the interviews to be transcribed at a later date. The respondents signed a consent form, which explained the purpose of the study and how their contributions were going to be used by the researcher. The interviews undertaken comprised a mixture of semi-structured interviews, and unstructured interviews, the majority of the interviews were between an hour and 90 minutes in duration. Over 30 respondents were interviewed (listed in appendix three), the respondents were a mixture of producers, engineers, musicians, studio owners and manufacturers;

original material from the interviews is used extensively throughout the thesis. Initially, an interview schedule was considered necessary to ensure specific information was obtained. The majority of interviews then followed a relatively unstructured format once the researcher was familiar with the main themes and issues, although some respondent-specific questions were included when appropriate.

In terms of reflexivity, potential problems could have been caused by the fact that the researcher was known by some of the respondents, as those who use a participant strategy are known to potentially affect the group's behavior. Reflexively, this may have had some impact on the responses of the respondents. As Cohen has noted, "The ethnographer has come to be recognized as an active participant in the research process whose presence affects situations 'in the field'" (Cohen, 1993, p. 124). The problems raised by the insider status of the researcher were outweighed by the advantages of increased access and greater subject knowledge. However, the majority of the respondents were previously unknown to the researcher which limited the above problem to a significant degree.

Historical Research

Historical research represents a systematic enquiry into the past, and by examining a wide range of material it is hopefully possible to separate true from fictionalized accounts of historical events. One of the key categories of primary source material is documentary evidence; in this case a wide range of published literature and online material was utilized in an attempt to make an original contribution to the subject area. McDowell (2002) raises a number of issues to consider when interpreting primary sources. These include identifying the target audience for the document, as documents intended for a wide audience may be highly polished. Other key factors to

consider are the degree of involvement of the author in any documentary evidence, and whether the author was seeking any personal advantage in preparing the document, such as covering up mistakes. This is particularly relevant to autobiographical material, some of which was integrated into the thesis. The work of other historians from published books and articles was used as a source of inspiration and ideas. Secondary material, although useful, is considered to be less relevant in a historical study, as it is written by people who were not present at the events that they describe. The careful analysis of primary sources may extend the boundaries of historical knowledge, as original documents can yield new evidence and insights.

McDowell (2002) considers the gathering of source material need not be confined to documentary sources, as interviews with individuals who were closely involved in a subject of historical interest can often offer valuable insights. The interview material was in some instances generating a form of oral history. Oral history provides a useful tool to illuminate the changing practices of the recording studio sector and musicians. Oral history has been increasingly exploited since the late 1960s and is a useful technique for shedding light on recent social history. As Tosh (2006, p. 316) notes, oral history can be an effective 'instrument for re-creating the past'. The interviews explored aspects of musical and social history; Tosh (2006) identifies a number of issues and limitations with oral history. "It is naïve to suppose that the testimony represents a pure distillation of past experience, for in an interview each party is affected by the other" (Tosh, 2006, p. 318). Also, in the case of testimony from hindsight, the present may colour recollection of the past. Jenkins (2007, p. 8) observes that the past has gone and history is produced by the work of historians. Any narrative constructed must be viewed "as one of a series of discourses about the world " (Jenkins, 2007, p. 6). Problematically, in constructing a historical narrative

there is the inevitable bias of the historian's perspective as narrator. "…no matter how verifiable, how widely acceptable or checkable, history remains inevitably a personal construct…" (Jenkins, 2007, p. 14). This places an epistemological limit on the validity of any historical narrative, of which the historian (and reader) should be aware. Despite the many well-documented pitfalls and problems involved in historicizing the past, which can include ideological bias, methodological limitations and epistemological validity, a scholarly and reflexive approach can nevertheless produce a valid representation of the past. The research problems discussed above were to an extent unavoidable, as any social scientist or historical researcher can have an effect on the research process and outcome. However, to ensure objectivity it was necessary to triangulate material from a range of respondents and ensure close attention to other primary sources such as statistics, artifacts, relevant trade press articles and archive material from the specific periods that were studied.

Chapter 1

<u>The Emergence of the UK Studio Sector 1930-1960</u>

Introduction

This chapter provides a historical basis for the rest of the thesis, and will give an overview of the development of the UK recording studio sector from 1930 to 1960, with a specific focus on popular music recording. The chapter will also explore the growth of the record industry and the technological barriers to entry that slowed the emergence of an independent studio sector. It will argue that the development of the studio sector in the UK is closely related to the evolution of the British record industry and its subsequent trajectory. Previous work (Cunningham, 1998; Kehew & Ryan, 2006; Burgess, 2014; Cleveland, 2001; Warner, 2003; Watson, 2014; Leyshon, 2009) has examined facets of the history of the UK studio sector, but has not drawn together an overall picture that accounts for the specific factors that were crucial in its development. The development of the American recording industry has been widely covered, particularly the rock 'n' roll era (Horning, 2013; Peterson, 1990; Peterson & Berger, 1975). Whilst the US sector had a different set of institutional and structural conditions, it nevertheless provides a useful comparison in examining historical factors pertinent to the UK. Unlike the American recording industry the established UK record companies were not threatened by competition from an independent sector. As a result, the UK recording industry was structurally rigid and was dominated by two vertically integrated companies (EMI and Decca) until two other major labels entered the market in the 1950s (Pye and Philips). The major label studios worked in isolation from each other, so there was little diffusion of knowledge, and recording was part of a defined, structurally coherent industrial process, which meant that certain practices stayed in place longer than they did in

America. In addition, technological developments that occurred in sound recording during the period were slower to permeate the UK industry because of entrenched industrial structures and international trade restrictions. There was very little audio equipment available commercially in the UK, and as a consequence the major labels, through necessity, manufactured much of the equipment used in their studios. What I want to suggest in this chapter is that these structural factors had significant material effects upon the way in which music was recorded, and the sonic and aesthetic qualities of recordings made in the UK in this period. These factors also slowed the development of an independent studio sector and independent labels. Indeed, the differences between the UK and US sectors are illustrative of the way in which cultural products are shaped by the systems "within which they are created, evaluated, distributed and preserved" (Peterson & Anand, 2004, p. 311). Every phase in the development of the recording studio in the UK has been a result of the interplay between evolving technologies, the concepts and practices associated with audio production, trends in popular culture, and the structure/financial success of the recording industry within its specific geographic/social contexts. These factors have a fundamental effect upon the way in which the UK studio sector has developed over the past century, and the cultural products produced within it, consequently any nuanced understanding of the sector has to take all of these factors into account simultaneously. In order to come to terms with these elements the chapter examines the structures of the corporate studios before including an analysis of the early independent studios. The chapter then examines the growth of the recording industry, proprietary systems in the corporate studios and considers the factors that slowed the development of the UK studio sector. A summary of the key technological innovations that occur in the 1950s and the early UK audio manufacturers are also

included, as this provides historical context for subsequent discussion of these topics in later chapters. The chapter argues that the recording process was discursively framed as part of an industrial process in this period; it was only in the 1960s that the studio becomes considered as a creative space.

Corporate Studios

As an integral part of the production of popular music, recording studios have always had a symbiotic relationship with record labels. Record companies initially developed the UK studio sector, and the sector has subsequently adapted to structural and financial changes in the record industry. Until the late 1950s, with very few exceptions, British recording studios were owned by major record companies and could be considered "spaces to centralize, control and channel creativity" (Watson, 2015, p. 93). Recording studios required a significant investment in the studio building itself, the associated technology, and skilled personnel, which only the vertically integrated major labels could afford (Watson, 2015). In contrast, in the USA, the independent studio sector achieved considerable success throughout the 1950s, largely as independent labels were a significant part of the American industry. Recording technology was also more widely available in the USA and relatively affordable (Peterson, 1975; Peterson, 1990; Horning, 2013). In contrast to the US market – which was to an extent based around local markets in urban locations dispersed across the country – the UK record industry was also much more centralized geographically and has historically been mainly based in London, which became the location of the first studios.

Abbey Road

The first large-scale recording studio in the UK was EMI's Abbey Road Studios in St John's Wood, London. The studio was originally known as EMI Recording Studios Ltd, and opened in 1931, the year EMI (Electric and Musical Industries) was formed from the merging of the Gramophone and Columbia Graphophone Companies (Southall, 2009, p. 20). The chief rivals to EMI in the European market at this point were Decca and Deutsche Grammophon, but once formed "the consolidated organization was able to dominate the European market" (Burgess, 2014, p. 35).
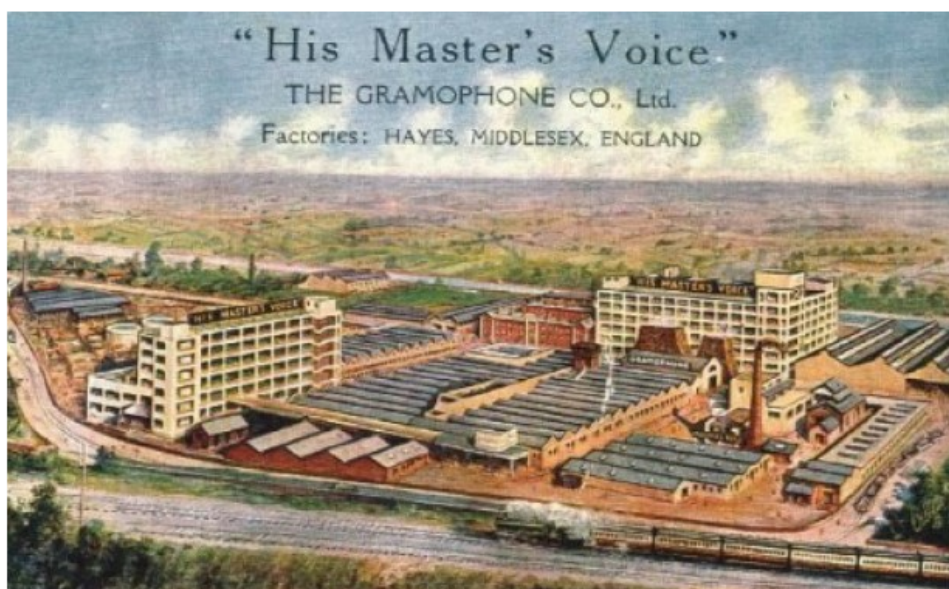
The Hayes Factory (2015)

Prior to the development of Abbey Road Studios, the Gramophone Company had utilized small recording studios (introduced in 1912) at their manufacturing plant in Hayes, Middlesex (Kehew and Ryan, 2006). The company ambitiously conceived of developing a dedicated recording complex capable of recording large ensembles in an acoustically controlled environment. Kehew and Ryan (2006) note purpose-built

audio facilities were unusual in this period and that sound recording had previously taken place in ad-hoc locations, such as concert halls, churches, homes and hotel rooms.

Copyright courtesy of EMI Group Archive Trust

Gaisberg's makeshift studio in the Old Coburn Hotel in 1898 (2015)

As an indication of the ambition and scale of the project in this period, the first American purpose built label-owned recording studios were the Capitol Records' studios, which were built in 1956. [2] Abbey Road predates Capitol's studios by a quarter of a century. The main advantage of a dedicated audio complex featuring three studios was the greater control over the acoustic environment the studios would offer sound engineers. Some of the real-world spaces used to record music offered excellent acoustics, but engineers would be confronted by numerous problems, such as outside noise and electrical issues (Kehew and Ryan, 2006). Location recording also meant that the recording equipment had to be portable. Building a dedicated

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[2] The US broadcast industry invested in purpose-built studios before the music industry (Horning, 2013, p. 84).

facility would ensure that engineers had the benefit of 'control rooms', acoustically isolated spaces where the recording team could work without interrupting the performers, but close enough to the recording area to still communicate effectively (Kehew and Ryan, 2006). A dedicated recording facility would allow the three studios to share equipment such as microphones and instruments, and would feature a permanent staff of maintenance engineers to repair and maintain the studio's equipment: "These concepts are, of course, now commonplace, but in the 1920s, nothing of the sort existed in the UK" (Kehew and Ryan, 2006, p. 14). The building itself cost £16,500 and over the course of its conversion to a studio complex another £100,000 was spent.[3] This was a considerable sum at the time, and was indicative of the "boom in record sales that preceded and accompanied the construction" (Kehew and Ryan, 2006, p. 16). The first test session in the largest studio (Studio One) took place on the 7th October 1931; commercial recording had already started in Studio Three at this point (Barfe, 2005). The studio complex was initially plagued with problems due to the acoustic properties of the rooms, as acoustic design was still an imprecise science in this era. In the early days of sound recording the acoustics of the recording area largely determined the sonic quality of the recordings. Studio Two opened in 1932, and was designed to sound 'brighter' than the other two rooms. Studios One and Three were subsequently acoustically refitted in the early years of the Second World War (Barfe, 2005). The background to the investment in Abbey Road was the success of the Gramophone Company in the 1920s; for example, the British dance bandleader Jack Hylton sold over seven million records (on the HMV imprint) in a ten-year period from 1923.[4] The Gramophone Company reported profits

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[3] Allowing for inflation, £116,500 in 1930 is equivalent to almost £6.5 million today.
[4] Hylton subsequently signed with Decca in 1931.

exceeding £1 million in 1928, these grew to £1.2 million [5] in 1929; at this point the company had assets of £5.3 million [6] (Southall, 2009, p. 19).

Decca

Frith (1987), Southall (2009) and Burgess (2014) argue that the British record industry was shaped by the consequences of the economic recession in the 1930s. The combination of a financial crisis and the nascent popularity of radio and talking pictures had the effect of reducing the number of labels manufacturing large numbers of records in the UK to just EMI and Decca by the end of the decade. [7] Originally named The Decca Gramophone Co. Ltd. the company initially manufactured gramophones, before being sold to former stockbroker Edward Lewis in 1929 (Decca, 2010). Lewis then purchased a struggling record company, the Duophone Unbreakable Record Company and Decca moved into the recording business (Barfe, 2005). Decca followed EMI's example and developed a recording centre at Broadhurst Gardens in North West London. The label Crystalate Records had initially converted the building to a studio in 1933, Decca bought Crystalate in 1937 and based their recording facilities there until Decca was in turn acquired by Polygram in 1980. Crystalate manufactured budget records for chain stores, and had built "two acoustically good and well-equipped studios in the former Hampstead Town Hall" (Barfe, 2005, p. 133). With this purchase Decca also acquired what was considered one of the best engineering teams in the industry (Barfe, 2005). The building eventually housed three studios, where the bulk of Decca's releases were

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[5] Allowing for inflation, £1.2 million in 1929 is equivalent to over £68 million today.
[6] Allowing for inflation, £5.3 million in 1930 is equivalent to over £300 million today.
[7] The name 'Decca' originated from a portable gramophone called the 'Decca Dulcephone', patented in 1914 by musical instrument makers Barnett Samuel and Sons.

recorded prior to the company's takeover by Polygram in 1980, after which the studios were closed.

An Industrial Process

It was a necessity that a label owned a recording studio due to the structural organization of the recording industry during this period (1930s to early 1960s); the major labels were vertically integrated and owned and managed the majority of their supply chains, they also ran their own manufacturing and distribution operations. "Structurally the majors were vertically integrated multinationals, controlling every aspect of the production process "in-house"" (Hracs, 2012, p. 444). Significantly, prior to changes in record production practice in the 1960s, recording studios were perceived as an important stage in the process of manufacturing records, rather than the creative spaces they came to be considered in later years. The sound engineer Tony Platt sums this up succinctly when asked about the creative atmosphere in the recording studio sector in the early 1960s, "Generally speaking the studios were EMI or Decca-like, very much part of the manufacturing process, rather than part of the creative process" (Platt cited in Making Tracks, 2011). This attitude was a hangover from the era of acoustic recording, where the work of recording technicians was viewed as part of an industrial procedure (Burgess, 2014). Similarly, in the early days of the pop industry corporate A&R managers were seen to be overseeing elements of an industrial process (Thompson, 2008). [8] For example, when George Martin began work for EMI in 1950, tape machines were used as backup; wax discs that were kept at a constant temperature with heat lamps were the primary recording medium (Thompson, 2008). A lathe was used to cut the wax master disc from a live

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[8] In the 1950s producers were termed A&R managers (Artist and Repertoire), the term producer became commonplace once independent record producers entered the industry.

recording, white-coated engineers made sure that any discarded wax was vacuumed from the master disc and oversaw the operation of the cutting lathe. The lathe was a mechanical clockwork device running at a constant speed driven by a weighted pulley (Thompson, 2008). The wax master could not be played, but was examined visually by the engineers and producer to see if the cut was satisfactory and that the disc was free of imperfections. "Only a corporation could afford to run such a facility and consequently would have been reluctant to change the technology of its vested interests" (Thompson, 2008, p. 49). The corporate studios were relatively slow to introduce new technology, but when acetate masters were introduced in the early 1950s the production of a master disc was still a technical process relying on expensive specialized equipment and highly trained staff. Cutting a disc was a single opportunity, non-editable, real-time process (Burgess, 2014). An acetate disc was a perfectly flat circular sheet of aluminum, coated on both sides with a thin layer of vinyl. A recording on a master tape would be transmitted to the cutting head of a recording lathe. The heated cutting needle would cut into the plastic surface of the acetate on the lathe, which revolved at exactly the appropriate speed. As the long continuous groove was cut in to the vinyl, its waste was extracted by a vacuum pump (Philips Records, 2015). The knowledge required by studio engineers in this era was almost entirely technical; artistic and social skills became essential in the 1960s when the recording process became highly collaborative (Horning, 2013).

Even the formal attire of the engineers operating the mixing desk in the photograph below is illustrative of the industrial nature of recording. The laboratory-like status of the corporate studios was extended to the dress code expected of its technicians, who were required to wear white coats at all times, a practice which extended into the 1950s (Southall, 1982).
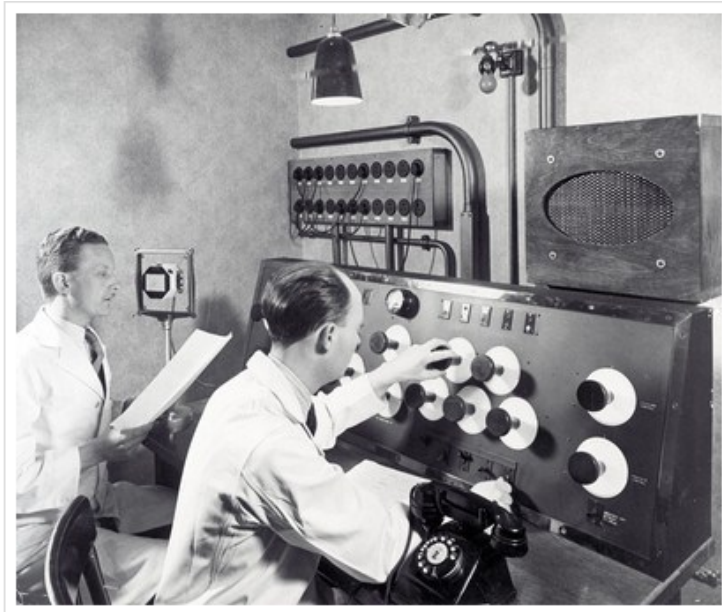
Abbey Road mixing desk 1940s (2015)

Until the 1960s the recording process for popular music in the UK was largely the perfunctory capture of performances. This was partly due to the culture of the corporate studios; recording practice was also restricted by the technology available in the period. These perceptions of practice feed into an ongoing development of the studio and its associated creative practice.

> Over the span of two decades, the recording studio became a site of technological and musical innovation and cultural change, a place where creative uses of technology and generational conflict played out as rules and standards were established and creatively destroyed. (Horning, 2013, p. 6)

Once recording technology developed further and the recording process became more collaborative the studio became perceived as a creative space, which in turn affected studio practice. The capturing of performances was part of the industrial manufacturing process, once studio techniques and studio personnel are seen as

contributing to the creative process then the discourses around the studio space shift, and the material conditions of the studio adapt to these differing perceptions.

Kealy's (1990) research on recording engineers theorizes the development of sound recording in popular music as passing through three stages; craft-union mode, entrepreneurial mode and art-mode. Kealy's (ibid) discussion is largely based on American studio practice; the British recording sector was some years behind the USA during the 1950s and early 1960s and in many ways worked differently. Despite this, Kealy's (ibid) framework offers a useful way of exploring the changes in British studio production and practice that occur in less than a decade from the late 1950s to mid-1960s. Essentially, over a relatively short period of time popular music recording shifted from a documentary of a sonic event recorded in a corporate studio, which Kealy (ibid) terms craft-union mode. In this mode the recording process would be organized and overseen by the labels' A&R supervisors and engineers who worked with arrangers and unionized session musicians. The A&R supervisor (later termed a producer) would comply with the contractual provisions of the collaborators, coordinate their work, keep the sessions on budget and on schedule, and select appropriate music to suit the intended audience. Kealy notes that, "The dictates of the corporations' accounting and marketing departments further structured the relationships among collaborators and decided the pace of their work" (Kealy, 1990. p. 211). The craft-union mode rationalized the production process and accompanied the major labels' investment in recording facilities. Following the craft-union mode was the emergence of what Kealy (1990) terms the entrepreneurial mode, which was defined by the collaborative relationships between independent producers, independent studios and independent labels; Kealy (ibid) dates this as emerging in the USA in 1949. From my research (both primary and secondary), it

became clear that in the UK this mode of production takes until the mid-1960s to become commonplace. The entrepreneurial mode relied on new technology such as tape recording, and an aesthetic evolved where the technologically manipulated studio recording itself was aesthetically valued, and was not just a simulation of a live performance. "The entrepreneurial mode is a more fluid and open collaboration which allows an interchange of skills and ideas among the musicians, technicians and music market entrepreneurs" (Kealy, 1990, p 213). Subsequent to the adoption of the entrepreneurial mode another system of production evolves, which Kealy (ibid) terms "art-mode". The art-mode was highly collaborative; representatives from the label were no longer a part of the production process and art-mode relied on multitrack technology. The collaborators most directly involved with creating the 'sound' of the music (engineers, composers and musicians) organized the sessions and took responsibility for the aesthetic decisions (Kealy, ibid). The art-mode developed in the UK from the late 1960s onwards, and the recording artists were the ultimate arbiters in the process of determining what the record should sound like. This mode created a demand for young engineers and producers who were attuned to the conventions of rock music (Kealy, ibid).

The Independent Studio Sector

Prior to the evolution of a sophisticated independent studio sector from the late 1950s onwards, there were a number of basic independent studio facilities that allowed the recording of an acetate disc. In some cases (such as Levy's and Star Sound) these eventually became professional studios. Foreman (2009) discusses a number of small studios that were cutting acetate discs from the late 1920s onwards. The most prolific of these facilities in the early 1930s was Cecil Watt's M.S.S. Recording Company

Ltd, and subsequently from the late 1930s, Levy's Sound Studios became the most widely used facility. When interviewed, the folk music producer Bill Leader (2013b) linked some of these early recording businesses to mobile Public Address system hire in the 1940s. He suggested that early PA businesses would also offer basic sound recording as an associated service:

> Well, there was always across, throughout the country, there was always places where someone had a van with a big horn on top, and a microphone, and he would go out to school sports days, and people's thingies and do what was then Public Address. And some of those were fairly advanced technically, and where I was living, before I went down to London, in Shipley just outside Bradford, there was fellow called Thistlethwaite, who had a van and a big Tannoy horn on top, if you had a sports day he'd be prepared to go there, and also he had a – and there were quite a few of these – a sort of home 'record your voice', you go in and say 'hello mum hello dad'. You'd get an acetate, so there was that around, it wasn't very high grade. (Leader, 2013b) [9]

This observation can be substantiated by the history of the R.G. Jones studio in Morden Manor, which operated from 1943 until 1969, after which the studio relocated to Wimbledon. The studio was opened as a new venture to complement the established R.G. Jones public address business (Harris & Burns, 2015). Bradley (2013, p. 35) notes that in the late 1940s and 1950s the R.G. Jones studio was used by Hummingbird Records, an independent UK-based Calypso label. The Hummingbird label primarily exported their recordings to the Caribbean, where the products were aimed at the local and tourist market. Until the late 1950s there were no recording facilities in the Caribbean.

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[9] Personal Communication (05/08/13)

Letterhead (Jones, n.d. a)

These small-scale recording businesses operated outside the mainstream music industry and recording music was often a secondary or coincidental aspect of their business. The R.G. Jones studio is an early example of the role that independent studios fulfilled from the late 1950s onwards, allowing independent producers and labels the opportunity to access studio facilities. Basic disc cutting facilities were operational for many years; in Manchester in the early 1950s the music equipment shop 'Johnny Roadhouse' featured a disc-cutting machine.

> John had an acetate direct cut thing and you'd make a demo disc. And there were singers that worked for the BBC, people who worked in the same band as John, the Northern Variety Orchestra; they used to do all their so-called demo discs there. What happened was you'd take it round to record companies, or to agents. (Ryan, 2010) [10]

In some cases, a disc served the same purpose as a demo tape did once tape or cassette technology became commonplace, as these basic recording facilities were used by musicians as well as for novelty purposes. The Manchester facility had a recording booth with a piano for accompaniment. "So it was an advantage if you were a singer and you wanted to get work, as people wouldn't go out and look at you, you'd take your acetate round" (Ryan, 2010).[11] A similar small direct to disc

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[10] Personal Communication (19/08/10)
[11] Personal Communication (19/08/10)

facility outside London, Phillips Sound Recording Services in Liverpool, has achieved some notoriety. In 1958, John Lennon's first group, the Quarrymen, (who later became The Beatles) recorded a disc there (Phillipsacetates, 2015). These businesses generally had little chance to develop as they lacked the supporting infrastructure of manufacturing and distribution. By the 1930s it was possible to buy a complete disc-recording package from M.S.S [12] and then subsequently from EMI (HMV). This technology would have offered small-scale recording businesses access to a simple recording setup enabling them to sustain a business in novelty recordings, recording radio broadcasts, or demo discs.
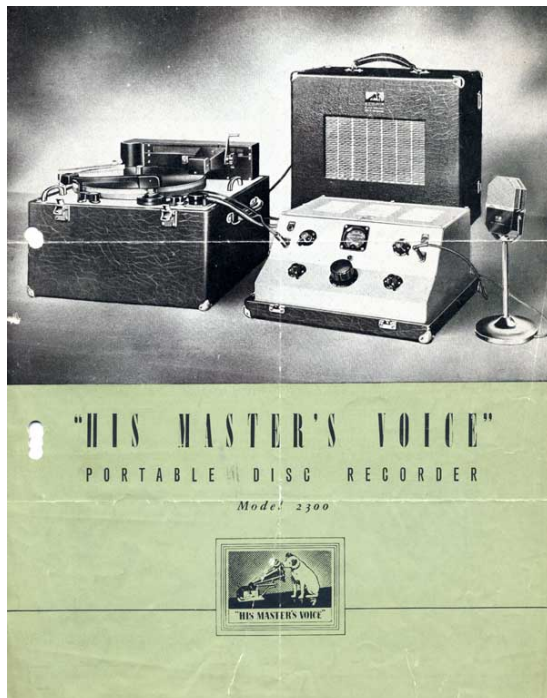
HMV Disc Recorder (1949)

It wasn't until tape recording technology became accessible in the 1950s that a significant independent studio sector emerged. Of the smaller studios operating in the 1930s and 1940s Levy's Sound Studios was the most notable, the studio was set up in Regent Street in central London in the 1930s by Morris and Jacques Levy, to

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[12] M.S.S. supplied a disc recorder to the BBC in 1934.

service their label Oriole Records (Harris & Burns, 2012). When Levy's opened in 1931 it was "announced in the September issue of *The Gramophone* ('at last a really first-class private recording studio has opened')" (Foreman, 2009, p. 144). Levy's studio was available for hire to the general public, as can be seen by the rates card below. [13]


Scale of charges for Levy's Sound Studios Limited, London, c.1935
(Levy's Sound Studios, 1935)

The studio moved to New Bond Street in 1937, where it remained even after the Levy company was taken over by CBS in 1964. In the 1950s it was a busy 'jobbing' studio where they spent much of their time producing 'copycat' versions of current hits for Woolworths' budget Embassy label (Harris & Burns, 2012). Levy's also

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[13] Allowing for inflation, a live-recorded disc for a solo artist or a trio cost the equivalent of £350 today.

undertook a considerable amount of work for music publishers, recording background music (subsequently termed library music or production music): "Early background music labels like De Wolfe, Paxton, Chappell, Boosey & Hawkes and KPM all used Levy's" (Johnson, n.d.).
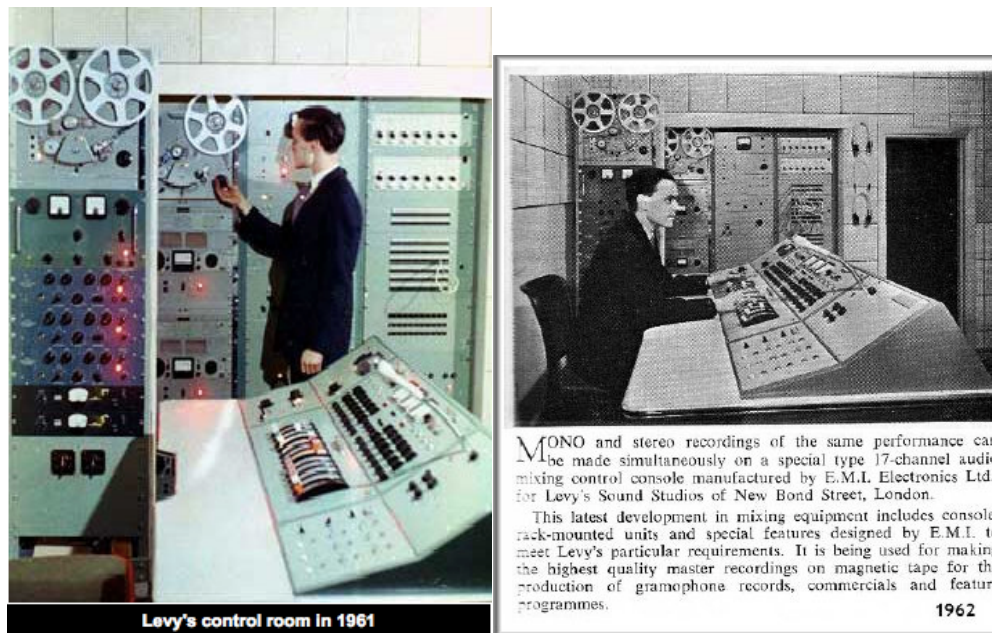
Levy's control room (1961, 1962)

By the late thirties the London recording community consisted of EMI, Decca, Levy's Sound Studios, Star Sound (Radio Luxembourg) and IBC (Radio Normandy). The radio studios (Star Sound and IBC) both became independent studios used for popular music recording, in IBC's case by the late '50s. Radio Normandy and Radio Luxembourg challenged the hegemony of the BBC, and both stations provided an outlet for pop records in the '50s. Star Sound (which subsequently became Audio International Studios) was opened in 1937 to record live programmes for Radio Luxembourg. It was one of the first commercial concerns in the UK to use tape machines, which it introduced in 1949. Star Sound initially concentrated on radio programmes and then subsequently moved into TV commercials (Harris & Burns,

2012). It eventually became a music-recording studio in the 1970s in its incarnation as Audio International Studios. The IBC (International Broadcasting Company) studios were initially set up to record radio programmes for the independent radio station Radio Normandy, but subsequently the studio became available for hire by producers, musicians and independent labels, and this gradually became IBC's main occupation (Harris & Burns, 2012). Initially, the studio cut direct-to-disc recordings, but by the late 1950s they were recording to mono quarter-inch tape. By 1958, IBC Studios had become London's most successful independent facility for recording popular music. "I was doing Ted Heath, big band stuff, and lots of records for Nixa (Pye). The place (IBC) was a busy session musician studio, recording the popular music of the day" (Grant, 2011). [14] The producer Shel Talmy considered that IBC was 'state of the art' by the early 1960s and observed that a number of notable engineers started their professional life there. For example, in addition to Keith Grant working for IBC as a young engineer, Glyn Johns started his career as a tape operator at IBC in 1959. The engineer Keith Grant's [15] perception of the studio scene in the late 1950s was that there were very few studios. When directly asked about the number of facilities he commented:

> Very few, IBC, I worked with Matt (Munro) a lot and he got me approached by IBC, they approached me as they were short of engineers and I went there after Regent Sound Studio. Bob Auger was doing mobile stuff; there literally were no studios. (Grant, 2011) [16]

Grant's perception that there were very few studios was shared by the engineer John Wood, "Lansdowne was right at the end of the '50s beginning of the '60s. There was IBC, Star Sound, another independent Advision, Levy's, then Olympic" (Wood,

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[14] Personal Communication (17/08/11)
[15] Grant was an engineer and studio manager at Olympic Studios from 1961 to 1987.
[16] Personal Communication (17/08/11)

2013). [17] Advision initially concentrated on jingles and voice-overs, before becoming a popular music studio in the 1960s (Harris & Burns, 2012). Wood (2011) observes that a source of regular work for small independent studios in the 1950s was provided by the advertising industry, as there was demand for recording 'jingles' for TV and radio advertising. As Wood notes, "Advertising started to do pretty well in this country in 1956. So suddenly advertising jingles started to become very popular, the smaller studios could earn a good rate doing it at the time" (Wood, 2011). [18]

These studios were joined by a few others in the 1950s, CTS (Cine Tele Sound Studios) opened in 1957 and was geared towards TV advertising and film scoring. The independent producer Denis Preston established Lansdowne Studios in 1957, the engineers Adrian Kerridge and Joe Meek advised Preston on technical matters. Preston was the first independent producer in Europe to found his own recording studio (Thompson, 2008). [19] Preston had overseen numerous jazz recordings in the 1950s, many of which were recorded at IBC. One of Lansdowne's first successes was Lonnie Donegan's 'Cumberland Gap, which was recorded and engineered in February 1957 by Joe Meek (Harris & Burns, 2012). The studio had a custom-built EMI console and EMI TR51 tape machines. To put the small scale of the studio sector in this period in context, when Olympic Studios opened in 1958 the idea that London needed any more studios seemed ridiculous to many in the industry.

> Yes, but when they started, when they had this in mind to look for some premises, people said 'you are mad, you are bloody off your heads' as you know Decca has got a studio in West Hampstead, EMI has got a studio in St Johns Wood. (Leader, 2013b) [20]

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[17] Personal Communication (23/02/13)
[18] Personal Communication (15/04/11)
[19] Preston's production company was Record Supervision Limited; he had extended licensing deals with Pye, then EMI.
[20] Personal Communication (21/02/13)

Another small studio operating by the late 1950s was Regent Sound Studio, which was located in Denmark Street, a centre for music publishers. Small studios associated with music publishing were a relatively new idea, Regent was set up by James Baring to service the publishers in the vicinity, some of which (e.g., Southern) subsequently set up their own facilities for their in-house composers (Thompson, 2008, p. 45). The engineer Keith Grant worked at the studio when he left school at sixteen and described Regent Sound Studio in its 1957 incarnation, "It was a demo studio, when I joined it was cutting straight to 78 discs, you literally lowered the needle on a cutter and they did their demo" (Grant, 2011). [21] The studio's clientele was primarily music publishers, who used the studio to make demo discs of songs to play to record companies and broadcasters.

> It was all publishers, to demonstrate what a song would sound like. They'd bring in a pianist and a singer or a little group, they'd perform it, you'd record it and put it on a 78. The publishers would give them to the BBC and suchlike, and to other recording artists. Grant (2011) [22]

In contrast to the American independent studio sector of the 1950s, these small studios did not significantly undermine the structure of the UK recording sector. The record industry was an oligopoly (although dominated by two companies) and the gradual introduction of new recording technology did not have the same impact as in the USA. New technologies alone do not cause a change in the field, as other factors have to be in place for disruptive change to occur. For example, Peterson & Anand (2004) note six facets of production that can shape the systems within which symbolic goods are produced. These are: technology, law and regulation, organization structure, occupational careers and the market. American independent

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[21] Personal Communication (17/08/11)
[22] Personal Communication (17/08/11)

studios could gain work from both radio stations and independent labels. However, independent labels were relatively undeveloped in the UK until the 1960s, and the UK radio industry was far smaller than in the US. Unlike the US, where there were many stations playing a wide range of music, UK radio was dominated by the BBC and Radio Luxembourg, and reception for Radio Luxembourg was often inconsistent. Hall (2014) observes that not until 1958 did one of the BBC stations relent to play rock and roll, and then for only two hours each Saturday. Releases from the two dominant UK labels were heavily promoted on Radio Luxembourg, whose playlist largely consisted of releases from EMI and Decca, who used the station as a promotional outlet (Hall, 2014). Oligopolistic concentration reduces innovation, and can result in unsated demand (Peterson & Berger, 1975). Until the 1960s, the major labels and the production methods of the corporate studios dominated the studio sector. Once the entrepreneurial mode was introduced in the 1960s and self-contained bands became the dominant production format, the hegemony of the major labels and their corporate studios was gradually undermined.

Recording Industry Overview

Decca and EMI profited substantially from the power base they had built up in the 1930s. The dominance of Decca and EMI over the UK record industry continued unchanged for some years, in 1956 Decca and EMI shared equally over 80% of the UK market for record sales (Southall, 2009). By the end of the 1950s the only significant new competitors were Philips, who had gained 12% of the UK market and Pye who had gained 6% of the UK market (Frith, 1987, p. 287). Both companies operated their own recording studios. Philips opened their studio in 1956; they initially installed an 8-input mono console and moved to stereo recording in 1958.

Pye opened their London studio in 1959 (Harris & Burns, n.d.). [23]All the UK-based major labels had significant business interests in consumer electronics manufacture and the recording divisions can be seen as an example of vertical integration within their parent companies. The entry of Pye and Philips into the market converted a duopoly into an oligopoly, but the record industry was still dominated by EMI and Decca, as can be seen by their 80% market share discussed above. In contrast, in America in the mid-1950s independent labels significantly undermined the market dominance of the major labels (Peterson, 1990). American record sales grew by 261% between 1955 and 1959, largely driven by successful independent label rock and roll releases (Peterson, 1990).

In addition to the labels catering for the general pop market, there were a number of small specialist labels trading in the UK in the late 1950s. These were releasing music in jazz, folk, spoken word, and other niche markets. These small labels relied on the emerging independent studio sector for access to studio facilities as the majors kept their recording facilities for their own exclusive use (Barfe, 2005). The exception here being the vertically integrated label Oriole Records (founded in 1925 before Decca or EMI), as Oriole had the use of Levy's Sound Studios, which was also part of the Levy brother's business, along with a record pressing plant. Alternatively, it was possible for a small label to obtain a basic recording system, for example, the folk label Topic Records invested in a simple transportable mono tape recorder in the mid-1950s to keep their production costs down. When interviewed, the producer Bill Leader noted the limited options available for buying recording equipment in the 1950s, and the lack of an established British recording equipment industry.

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[23] Pye were a British electronics manufacturer that purchased two smaller labels in the 1950s, to facilitate their entry into the record business. Philips Records was an offshoot of a Dutch company primarily focused on manufacturing electronics products.

> I started in '55, by '56 I was working for Topic Records pretty steadily on the staff. We couldn't afford studios, and thought that perhaps we didn't need to as they'd already decided that this folk music lark was the course to take. So we started to try and find some gear that we could put somewhere. So we ended up getting a tape machine made by M.S.S.,[24] the people who made acetate discs, down in Slough. And I think we were the only people that ever bought one as far as I remember, ever. It was a bloody great tank of a thing; made of sheet metal, it was transportable but sturdy. (Leader, 2013b) [25]

Recording equipment was not widely available in the 1950s and the affordable options were quite limited. Another factor in the relatively slow emergence of an independent studio sector was the fact that the barriers to entry to the record industry were considerable, which slowed the development of independent labels. Studios were extremely expensive to build, there were very few independent studios and these were expensive to hire, recording equipment was not widely available, and manufacturing and distribution were also problematic issues for smaller labels. Leader (2013b) commented on the problems faced by small labels in terms of access to record pressing facilities of a decent quality, "…. if you were pressing penny numbers in terms of quantity of pressings at that time the big boys didn't want to know you, and the small boys couldn't press to any reasonable standard". [26] Even in the general pop market in the first part of the 1950s sales were relatively low. Prior to the success of rock 'n' roll in the mid to late 1950s, popular music releases were often cover versions of American hits. Sales figures for 'home-grown' artists in the early 1950s could also be low, as George Martin observes, "You didn't sell many records either – if you sold fifteen hundred, that was about the break-even figure, and if you sold three thousand you were onto a big seller." (Martin cited in Tobler & Grundy, 1982, p. 108).

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[24] Cecil Watts owned M.S.S. and had been a pioneer of direct-to-disc recording in the UK.
[25] Personal Communication (21/02/2013)
[26] Personal Communication (21/02/2013)

Although somewhat later than in America, in the 1950s 7-inch 45-rpm singles and 12-inch 33⅓-rpm long-player albums were introduced to the UK market. Singles were introduced in 1952, initially for classical recordings, but by 1953 the format became associated with pop music, microgroove 33-rpm albums were also introduced in 1952.[27] These technical innovations coincided with a developing interest in popular music (particularly rock 'n' roll) by an emerging youth market which drove increased record sales. Consequently, there were significant changes in the buying habits of British music consumers in the 1950s. Popular music sales grew rapidly and "Between 1956 and 1958 sales of the new LPs rose from 1.7 million to over 2 million but the biggest boom came in the sales of 45-rpm singles which shot up from just 1.3 million to 7 million" (Southall, 2009, p. 27). Initially, a considerable amount of these sales were American artists' material, licensed for release in the UK by EMI and Decca. Pye and Philips also licensed numerous releases from America. A respondent referred to Lonnie Donegan as a notable milestone in the evolution of UK popular music, skiffle was a significant influence on a generation of musicians. "I was doing pop stuff at IBC, Lonnie Donegan and suchlike, that was the start of the pop music and IBC did quite a lot of it" (Grant, 2011).[28] Unusually for UK performers in the 1950s, Donegan had some success in the USA. In terms of original popular music, British artist managers such as Larry Parnes developed their own versions of American teen idols; these artists were recorded in the corporate studios using session musicians and arrangers. None of the new generation of UK pop artists that Parnes mentored (Adam Faith, Billy Fury, Marty Wilde, Tommy Steele, etc.) sold significantly in America, this was essentially a national phenomenon (Hall,

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[27] The 10-inch album format lived on in the UK for some years, as albums by Lonnie Donegan (1956) and Billy Fury (1960) were released in that format. Despite the introduction of 45-rpm singles, 78-rpm discs were also manufactured until 1960 in the UK.

[28] Personal Communication (17/08/11)

2014). The loss or uncertainty of key licensing deals with American labels provided a spur for EMI to develop British popular music talent in the rock 'n' roll idiom (Southall, 2009). Decca also pursued this business strategy, an example being the signing of Tommy Steele in 1955, Steele was considered the first homegrown rock 'n' roll influenced pop star in this period. EMI had considerable success with Cliff Richard, Helen Shapiro and Adam Faith in the late 1950s (Southall, ibid). These three singers (and Richard's backing group The Shadows) were at the forefront of the boom in British popular music artists and between them they accounted for over fifty hit singles between 1958 and 1962. By the end of 1960 Richard alone accounted for sales of 5.5 million and EMI's share of the UK popular music market stood at 40% (Southall, ibid). By 1962 UK album sales reached 17 million and 45-rpm singles sold over 50 million copies (Southall, 2009, p. 30). As can be seen by contrasting these figures with the record sales of 1958 (2 million albums and 7 million singles), the popular music market had grown rapidly and was becoming very lucrative. Young consumers were driving the increased sales, "at root this was a phenomenon related to the new spending power created by the new technological high-wage society" (Marwick, 2003, p. 97). This growth in the market was partly due to the exposure American rock and roll artists and UK pop performers received on the BBC television programme 6.5 Special (produced by Jack Good), which was introduced in 1957 (Rogan, 1988).

Despite the increase in record sales, from 1956 through 1958, British acts comprised only twenty three percent of the best selling UK singles (Hall, 2014). British artists did better from 1959 through to 1962, but still only made up fifty two percent of the best selling UK singles (Hall, 2014). At the time there was still a perceived discrepancy between the quality of recordings that were produced in the UK and the

USA. This is partly due to the stratified and structurally rigid working practices within UK studios, and partly due to the equipment used in the UK, which was technically some years behind the American studios at this point. For example, Atlantic Records were using an 8-track tape recorder in 1958, ten years before Abbey Road started to record to 8-track machines. American session players were more comfortable recording the popular music of the period than their UK counterparts. Toynbee (2000, p. 89) notes that the UK artists attempting to emulate the sound of American records were hampered as "they had neither the technical means, nor the accumulated culture and expertise on which the big, transatlantic productions were premised". The American imports that had proved commercially successful in the UK, especially in terms of R&B, rock 'n' roll and jazz, were recorded in specialist studios with engineers and producers who had developed genre-specific working practices, such as releases from prominent labels including Sun, Chess, and Atlantic Records. It was rare for a British artist to have a hit in America, and UK covers of American hits were not considered to be the equal of the products from American artists or studios, as the prominent UK producer Mickie Most suggests below.

> There was no production involved in those days. Mostly, they'd get a song that was going up the American charts, get somebody to send a copy of the record over, and cover it, and nine times out of ten, the English cover was dreadful, because the American originals were mostly much better. (Most cited in Tobler & Grundy, 1982, p. 125)

This situation changed dramatically with the success of the UK 'beat boom' bands in the 1960s. All of the British major labels had invested in homegrown talent by the early 1960s and reaped considerable financial rewards in the 1960s as a consequence of this artist development. Some of this revenue was re-invested in studio technology, and UK pop artists subsequently attempted to break any technologically inscribed barriers (Toynbee, 2000).

Proprietary Systems and Methods

Another key factor that shaped the particular characteristics of the UK studio sector in this period was that for the first 40 years of electrical recording the studios operated in virtual isolation from one another. The major label's business interests in electronics manufacture meant that they had the capability and resources necessary to develop their own audio equipment. In fact, this was a necessity, as there was not a professional recording equipment sector of any note for some years in the UK, partly as there was little demand for equipment with so few studios operating. Decca, Pye and EMI were all renowned for the quality of their in-house recording equipment. EMI invested heavily in R&D (research and development) and an example of this is Alan Blumlein's innovations in stereo recording and reproduction in the 1930s, which were not adopted until the late 1950s (Barfe, 2005). A key motivation for EMI to fund the development of recording equipment was that in the early days of electrical recording the equipment required to make a master disc had to be licensed from the American company Western Electric (Westrex), as they owned many of the patents on the available technology. This cost overhead spurred EMI to fund an R&D department set up for Blumlein and two assistants to design new equipment to avoid the large payments made to Western Electric (Barfe, 2005). The royalties paid to Western Electric were considerable, EMI paid over half a million pounds to Western Electric before Blumlein's system was adopted in the mid-1930s (Barfe, 2005). Decca were also active in terms of R&D, In the 1940s Decca introduced a new custom-built microphone the FR-1 and a moving coil disc cutter system that extended the frequency range that could be recorded from 10,000 cycles to 15,000 cycles (Barfe, 2005). This technology was initially developed to produce test recordings of submarines for military training purposes, but was soon in use on

popular music recordings. As Barfe notes, "Haddy's system became known as 'Full Frequency Range Recording' or FFRR" (Barfe, 2005, p. 148). This leap in recording quality helped Decca to establish itself in the American market (Barfe, 2005).

An examination of the technical resources of the major label studios in the 1950s reveals a considerable amount of custom-built technology, although microphones and tape machines were usually bought from an established manufacturer (Harris & Burns, 2012). EMI manufactured microphones, studio mixing desks, tape recorders, and outboard processing equipment [29] at their manufacturing plant in Hayes, Middlesex. EMI operated a number of studios outside the UK, so not all the equipment they manufactured was intended for use at Abbey Road. Selling equipment wasn't EMI's primary focus, but they did sell consoles and tape recorders to other UK studios and to the BBC. EMI's BTR 1 (British Tape Recorder) tape recorder was installed at Abbey Road in 1948, but Decca also acquired a BTR 1 (Barfe, 2005). This machine and its successor the BTR 2 eventually became a standard machine in many of the independent studios (Harris & Burns, 2012). Decca were also known for technical innovation and made their own sophisticated studio mixing desks and outboard equipment; Pye and Philips also initially developed their own studio equipment before a professional audio sector emerged (Harris & Burns, 2012). There was also a culture of modifying other manufacturer's equipment at both Decca and EMI's studios.

> Everything was tweaked by the backroom guys. …none of the equipment was stock. There was always something done to make it better – make it Decca; put the Decca imprint on it. (Gray, 1984)

Kehew and Ryan (2006) observe that the art and science of recording was still evolving and what are now seen as common techniques were often yet to be

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[29] External audio processing units that extend the capabilities of a mixing desk.

invented. Due to the absence of established and predictable standards, studios experimented with combinations of equipment and techniques to find the best results in the recording spaces they were utilizing. These proprietary systems and methods became closely guarded resources, specific to each studio.

> That meant that engineers at each studio developed engineering techniques based on the particular equipment they were using–techniques that may or may not have been developed elsewhere–and those techniques were considered to be company "secrets". (Cleveland, 2001, p. 18)

The diversity of equipment and approach resulted in each studio having an identifiable sound, or sonic signature. The acoustic spaces in which the recordings were made also had a significant affect on the sound of the final product. Staff rarely changed employment from one major label studio to another, which meant that each studio's recording techniques were unlikely to become common knowledge. "Technology was carefully guarded, as was a set of tacit skills and competences developed by recording engineers, such as the placing of microphones in relation to the instruments being recorded" (Leyshon, 2009, p. 1319). Cunningham (1998) considers the rivalry between engineers at Decca and EMI's Abbey Road Studios stretched back to before World War Two, and both studios went to great lengths to protect their technical trade secrets. "Equipment was house-made and we were not about to tell people on the outside what we were doing to create a particular sound," (Varnals cited in Cunningham, 1998, p. 99). According to Horning (2004, p. 709), microphone placement techniques "were considered in large recording companies to be proprietary information". Cleveland (2001, p. 18) considers, "that there was an unwritten law-and in the case of Decca and EMI perhaps an actual arrangement by management-that made it extremely difficult for engineers to switch studios".

Consequently, studio employees often exhibited a passionate allegiance to their own "lodge." Ex-Decca staff engineer Gordon Perry confirms this observation:

> Of course, in those days the technique was a closely guarded secret and, in fact, there was a 'no poaching' agreement between EMI and Decca. It was an informal agreement, which said that when a Decca or EMI technician was let go the other company would not hire them, because they had their own little secrets. That continued well into the '70s and '80s even though their studios were located within a mile of each other! (Perry cited in Gray, 1984)

Leyshon (2009) notes that distinctive employment cultures emerged within each corporate studio. The producers and engineers were salaried employees and their regular employment was guaranteed, as at least until the late 1960s Decca and EMI's studios were available only to the artists signed to each label. This contractual requirement generally locked the artists on each label into particular studios and guaranteed work: "As a result, there were few knowledge spillovers between studios, as both staff and artists tended to be confined to the same space over relatively long periods of time" (Leyshon, 2009, p. 1321).

This situation changed when the independent studio sector developed further in the late 1960s, as technical knowledge started to diffuse more widely as the number of studio practitioners increased. Staff and musicians moved around the independent studios more freely, sharing knowledge and techniques, and in some cases moved from a major label studio to the independent sector. For example, the Decca engineers Bill Price and John Punter worked at Air Studios when it first opened: "Bill Price and John Punter had trained at Decca Records' West Hampstead studios, so tended to follow the techniques they'd developed there" (Michie, n.d.). The Abbey Road engineer Geoff Emerick moved to the Beatles' Apple Studio and also worked at Air Studios, sharing techniques he'd learnt at EMI's studio with other engineers (Michie, n.d.; Emerick & Massey, 2006). Once the majority of

engineering staff became freelance, idiosyncrasies in individual studio practice became less common.

UK Studios Lag Behind America

There were a number of factors that meant that UK studios were somewhat behind American studios in terms of technology and practice. Within the UK there was only a small professional audio industry, there were restrictions on importing goods from abroad, and the label-owned studios were generally not focused on innovation in terms of recording techniques and the associated technology. The small number of studios in the UK meant that it took some time for an indigenous professional audio industry to develop, as there was little demand for equipment. Leader (2013b) considers one reason that the British pro-audio industry was behind the American industry was the fact that in the UK there was only one national radio station, the BBC. Broadcast technology has considerable commonality with music recording technology, and manufacturers of high-end recording equipment were aiming to sell equipment to the radio and television industries as well as the recording industry. In America, the Federal Communication Commission (FCC) relaxed the restrictions on radio licenses in 1947, in four years the number of stations doubled in number (Peterson, 1990). Consequently, radio stations drove the market for recording equipment in the USA in a way that the BBC did not in the UK.

> In America every one horse town had a radio station, every two-horse town had two radio stations. They were all around, and these radio stations were buying equipment, modest, but buying it. So you had an equipment industry. It didn't exist here. Leader (2013b) [30]

The proliferation of American independent radio stations created an opportunity for independent labels to develop long in advance of the UK's independent sector, as a

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[30] Personal Communication (21/02/2013)

wider range of music was available to consumers on air, which drove demand. Thompson (2008) notes that the profitability of the American media markets had encouraged manufacturers like Ampex and RCA to invest heavily into developing recording technology. Consequently, audio manufacturing in America evolved long before the UK sector emerged, as can be seen by Horning's (2013) comment below. "To keep up with demand, recording equipment manufacturers grew considerably during the 1930s" (Horning, 2013, p. 53). In the US developments in audio technology benefitted the music industry as well as the radio, television and film industries the equipment was often aimed at. The engineer Tom Dowd noted that whilst working for Atlantic in the early 1950s they would sometimes record artists in a radio station: "Those things were often done at radio stations because in those days, that was the equipment everybody was accustomed to using." (Dowd cited in Grundy & Tobler, 1982, p. 28). By the mid-1950s American studios were purchasing equipment in such volumes (the independent studio sector started earlier in the USA), "that they often established international industry standards" (Thompson, 2008, p. 4). The radio industry in America also generated considerable work for independent studios, as there was some demand for recording transcription discs for broadcast, which is another factor that enabled the American studio sector to develop faster than in the UK.

American recording equipment and techniques were often seen as offering a standard to aspire to; partly as the sound of American popular music was something that British producers and engineers wished to emulate. George Martin also notes that when rock 'n' roll started UK studio staff "found that American recording techniques were very much in advance of ours by the time 1955 came along" (Martin cited in Tobler & Grundy, 1982, p. 108). The UK's recording industry (in terms of popular

music recording), "generally reacted to the musical tastes and technological approaches set by Americans" (Thompson, 2008, p. 5). This may explain why some British groups (notably The Who and The Rolling Stones) were eager to record in American studios in the 1960s whenever they had an opportunity whilst on tour. Geoff Frost, one of the founders of the independent studio Sound Techniques confirms Thompson's observations, and visited American studios himself in 1964 before setting up Sound Techniques.

> I got on a plane to Nashville to look at the American studios, to find out why they got so much better sounds than the English studios. There was an incredible difference in the sound. (Frost cited in Frost, 2008)

A key factor that shaped the technology available in UK recording studios in the 1950s was the import restrictions that existed after the Second World War. Britain suffered a sustained financial crisis in the postwar years, which resulted in import restrictions that made the importation of foreign recording equipment problematic. The government regulated the import of goods through the Board of Trade, importers would have to apply for licenses to import foreign goods, and due to the war debt owed to America this was particularly pertinent to dollar imports. Leyshon (2007, p. 178) notes, "Four main types of licensing methods were operated by the Board of Trade-the open general, the open individual, the block, and the specific license". This bureaucratic procedure presented an obstacle that was rarely circumvented by studios. These restrictions stayed in place until 1959, when the government relaxed the ban on American imports. This situation was confirmed by one of my respondents when they discussed the problems faced by would-be purchasers of tape recorders in the mid-1950s. "But there weren't many around, because at that time of course, we didn't have the benefit of American expertise, because we had a dollar

shortage, you couldn't import anything" (Leader, 2013b). [31] Even when import restrictions were relaxed there were still reciprocal import duties levied on certain American goods in response to protectionist measures in the USA: "The import duties made Ampex and other USA made recorders at the least twice the cost of similar UK built machines, in some cases more" (Chalmers, 2007). It seems that in some cases German products were still stigmatized by associations with the Second World War, even in the early 1960s.

> Telefunken suffered from being a German company and jingoism tends to linger more readily in institutions than out in the field, it was at the time considered politically correct to buy Revox tape recorders even though they were made in Germany, because the Studer/Revox company was originally Swiss they were considered OK. (Chalmers, 2007)

Another respondent's comment illustrates the problems faced by studios trying to source foreign manufactured equipment: "We had the very first four-track Ampex tape recorder in the country, we also had the very first EMT echo plate, and it just cost a fortune. You had to import it, as there was no dealer" (Grant, 2011). [32] This combination of economic and bureaucratic obstacles contributed to the development of competitive domestic recording technologies, initially by the record companies. Once import restrictions on foreign-manufactured goods were lifted in 1959 American tape recorders [33] and European tape recorders [34] became a more attainable option for independent studios, these manufacturers also tended to bring innovative products to market faster than EMI. It also became much easier to source imported outboard signal processing equipment and microphones. The issues explored above slowed the development of an independent recording studio sector in the UK;

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[31] Personal Communication (21/02/13)
[32] Personal Communication (17/08/11)
[33] (3M, MCI, Ampex, Scully, Stevens)
[34] (Studer, Lyrec, Telefunken)

whereas in America the mid-1950's boom in rock 'n' roll was facilitated by an emerging independent studio sector that had no such issues sourcing recording equipment. Another factor that held back the introduction of multitrack technology in the UK was the Musicians Union's regulations on overdubbing, which were not relaxed until the 1960s: "The Musicians Union forbade overdubbing, fearing it would put musicians out of work" (Kehew & Ryan, 2006, p. 216). Prior to the emergence of a professional audio manufacturing sector in the 1960s there were relatively few British manufacturers manufacturing audio recording products.

1950s Studio Technology

Key innovations in studio technology in the 1950s were the introduction of stereo recording, the adoption of tape recording (and the consequent phasing out of direct-to-disc recording), and developments in mixing console design. Studio equipment in this period was based on valve technology. As has been explored above, the major record labels manufactured the majority of studio equipment used in their own facilities; the few independent studios either manufactured their own equipment or relied on purchasing from EMI. For example, the early independent studio Lansdowne used a 12-channel EMI console that was built to engineer Joe Meek's specifications at a cost of £4,500 [35] in 1957, and they also used EMI tape machines (Harris & Burns, 2012). EMI built tape machines from 1948 onwards, but it was some years before tape supplanted direct-to-disc recording as tape was initially used only as a backup. It took until 1953 before Abbey Road considered tape recording equal in quality to a direct cut master (Ryan & Kehew, 2006). The advantages offered by tape recording in terms of ease of editing and re-recording meant the

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[35] Allowing for inflation this sum is the equivalent of almost £100,000 today.

larger studios adopted it as the new recording medium once any quality issues had been addressed. Ryan and Kehew (2006) note that although it was relatively rare for EMI to sell its studio-related products to non-EMI affiliated companies, the EMI-manufactured BTR2 tape machine was sold to the BBC in large numbers, and also to Decca who had previously used Philips tape machines. "Other studios in the UK also bought and used BTRs, and many of the BBC machines also found their way into private studios as well" (Ryan and Kehew, 2006, p. 200). Tape recording gradually diffused more widely when the BBC updated their resources and sold older technology. Initially, tape recording was monophonic, when stereo recording was introduced in the UK in the late 1950s equipment had to be specifically developed to accommodate this development. However, pop music recording didn't initially take advantage of stereo recording technology: "In the late 1950s, virtually *all* pop sessions were recorded straight to mono, little more was required since pop music was relatively simple and free from artifice" (Kehew & Ryan, 2006, p. 212). In terms of multitrack recording, Abbey Rd owned and made use of four-track tape machines from 1959 onwards, although the technology was initially not considered necessary on pop sessions. In the UK, the introduction of innovations in recording technology was slowed by a combination of import restrictions, reticence on the part of the major label studios to introduce new technology, the perception that popular music recording did not need advanced technology, union regulation, and the relatively small size of the UK audio manufacturing sector, whose products were not technically sophisticated in comparison with American equipment. As there were so few studios, and a limited broadcast industry, there was very little demand for studio equipment. The few products made by independent manufacturers were designed for use by hobbyists, for public address purposes, or for industrial use, although in some

cases these products were used in professional studios. Theberge (2004) considers that multitrack recording and its associated practices are inseparable from the simultaneous evolution of mixing consoles, consequently developments in console technology will be addressed throughout the thesis. The thesis will now examine developments in the mixing console as significant design innovations were introduced as the multitrack era commenced.

Mixing Consoles

In the 1950s, mixing console technology developed considerably as a consequence of the introduction of innovations in sound recording. The studio is often referred to as a musical instrument, and in an analogue recording studio the console is the primary interface to the rest of the studio equipment. Langley (2004) states that mixing consoles can be divided into four main categories each requiring their own design topology, these are broadcast, live sound, music recording and post-production (film dubbing). There are also some other specialized applications, such as newsgathering, location recording, dialogue replacement and edit suite mixing. The focus in this thesis will be on consoles designed for music recording. Langley (2004) defines the mixing console as "an electronic device for combining, routing, and changing the level, tone, and/or dynamics of audio signals. The modified signals are summed to produce the combined output signals." Early consoles were very basic, and featured relatively few channels and outputs, little or no equalization and used rotary or quadrant faders. The technically unsophisticated EMI desk below has two 'scenes' which were level settings for five microphones; one scene on the left and one on the right. The engineer would fade from one pre-set scene to the other using the rotary centre fader control. This allowed transitions between two microphone setups; linear

faders were not yet in use. Below each of the five level controls are on/off switches, with corresponding lamps above to indicate the on/off setting for each input. There was no equalization (EQ), and no pan controls as the desk was mono (Kehew, 2015).

Apart from EMI, only a few manufacturers such as Marconi and Vortexion offered 'standard product' mixers in the UK in the 1950s (Langley, 2004).
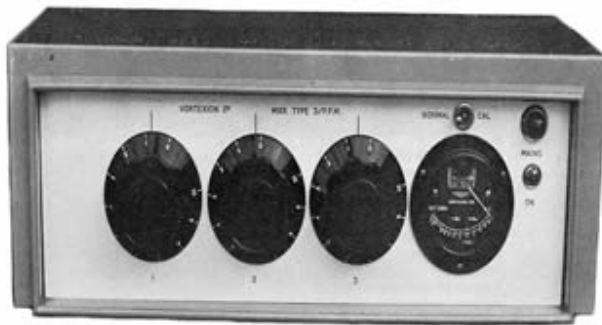

An early Vortexion mixer from around 1950. (Martini, 2008)

Abbey Road mixing desk 1940s (2015)

Marconi's 1950s consoles were more complex than the simple Vortexion or EMI mixers above and were aimed at the broadcast industry; the Marconi console below

did not feature EQ on each channel, and as a mono desk there was no pan control. Early consoles offered the engineers little control apart from the adjustment of signal level.
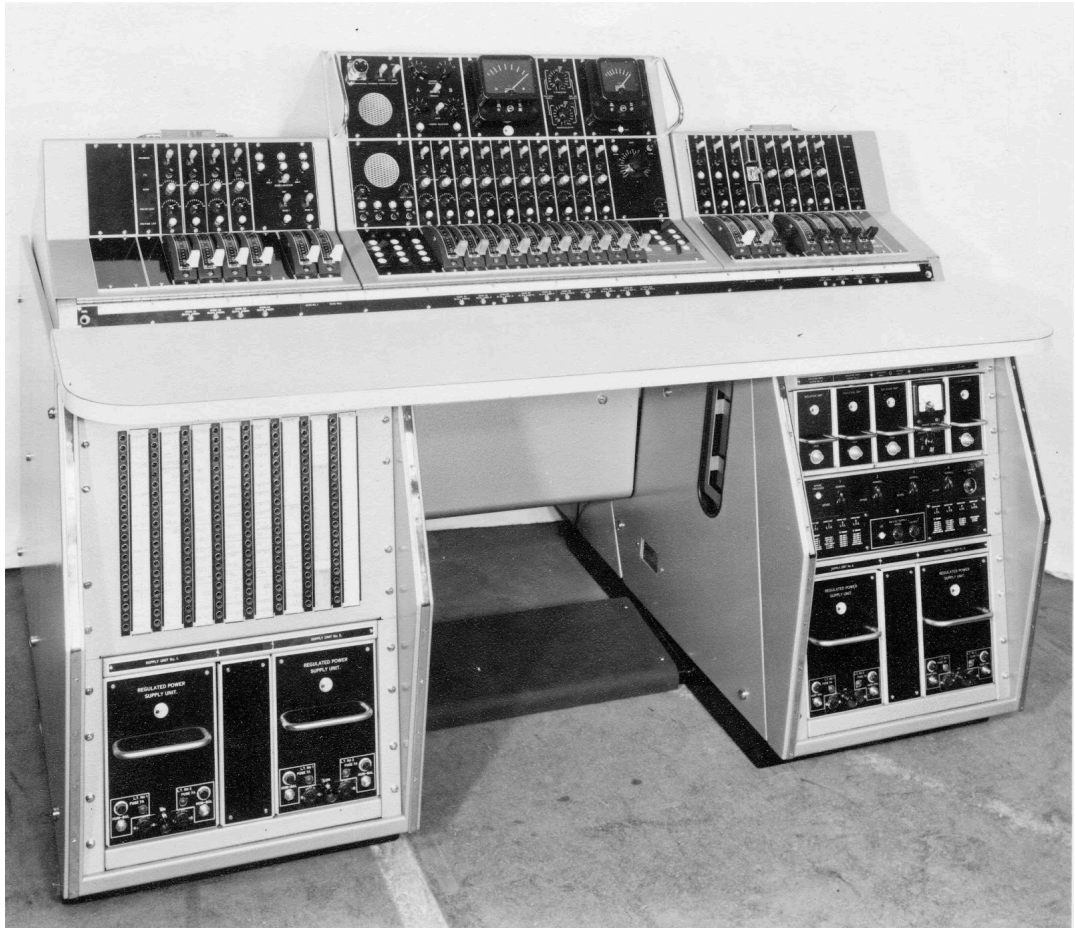
Marconi Broadcast Mixing Console (2015)

As developments in tape recording made more tracks available, consoles became larger and more complex: "Of all the components in the recording chain, the control console was the last to be produced on a large scale and the most frequently customized" (Horning, 2013, p. 117). Mixing desks were the last major item of recording equipment to be commercially manufactured, and prior to the development of transistorized equipment, consoles were built using valve technology (Horning, 2013).

This technology had its limitations due to the heat generated by the valves, the high voltage needed within the circuitry and the resulting size and weight of the equipment (particularly in a complex design), for example, the EMI REDD desks weighed over 350kg. Early mixing desks would only offer limited equalization and this was sometimes in the form of a plug-in cassette, some EMI REDD consoles allowed the cassette to be changed specifically for use in either pop or classical sessions. A problem associated with the stepped quadrant faders used in this period was that some electrical noise was introduced when the fader was operated. Subsequently, as desk design evolved and the desks grew in complexity the quadrant (or in some cases rotary) fader was replaced by the linear fader. When stereo recording became commonplace M-S (sum and difference circuits) were introduced and panpots were added which allowed the positioning of individual sounds in the stereo image. Swettenham (1982) notes that up to this point a mixing desk was a passive device connected to racks of valve amplification, every amplifier input and output was accessible via a patch bay. Swettenham (1982) notes that although there were self-contained consoles in American broadcast practice, in European design (such as EMI's REDD desks, or the Marconi console above) consoles featured 'amplifier cassettes' in the pedestals and at the rear of the console, and passive 'control cassettes' in the operating surface.
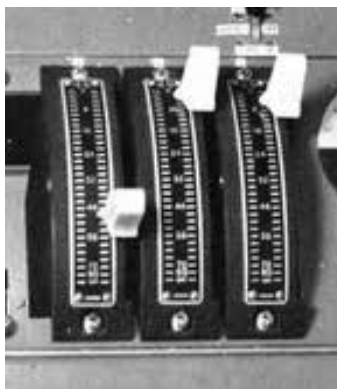
Quadrant faders. (Phaedrus Audio, 2012)

The major labels innovated using their in-house expertise, or in EMI's case that of their affiliates; although the equipment manufactured in the UK at EMI's Hayes facility was considered of good quality it was relatively antiquated by the mid-'50s. It required the incorporation of innovations from EMI's European affiliate EMI Electrola to advance the console technology used in Abbey Road (Kehew & Ryan, 2009). The Record Engineering Development Department (REDD) was a design team set up and headed by Abbey Road Technical Engineer Len Page in 1955, primarily to develop mixing consoles that could be used to make stereo recordings. At the end of 1958 the department launched its REDD.17 console, based on the work of Peter Burkowitz from EMI Electrola in Cologne, who devised the control surface (Phaedrus Audio, 2012). This console included EQ on each channel, pan controls, and a bank of faders, and it was a considerable improvement on earlier console technology. However, from a technological point of view, the Burkowitz consoles and the subsequent REDD consoles largely derived from earlier German consoles made by Telefunken and Siemens. (Phaedrus Audio, 2012). EMI used Telefunken microphone preamplifiers in the early REDD mixers, the origin of the EMI equalizers also lies in the German console, only the faders were different as a quadrant fader was used in the REDD consoles. These mixing desks were originally designed as stereo consoles for classical music recording but were later used for EMI's popular music recordings by artists such as The Beatles (Kehew & Ryan, 2009).

REDD 17 Desk (Sound on Sound, 2013)

With the introduction of stereo mixing and later developments in multitracking, recording practices changed considerably and the control room became the focal point of the studio. Driving this development was the greater complexity of the mixing console, which changed in less than thirty years from a simple device with rotary faders (such as the simple Vortexion or EMI mixers pictured above) that summed a few microphone signals, to a large computer-controlled control surface, in some cases of over five metres in length. This evolution of console design was more than a simple change in scale and complexity, but also a change in function. Theberge (2004, p. 770) considers that these developments "signal a shift in the function of the console from an audio 'mixer' to that of a signal processor and

communications device within the studio". Developments in console technology in the late 1950s offered studio engineers' greater options in terms of manipulating audio signals with EQ and stereo positioning. Key developments in audio in the 1950s period were the introduction of tape recording, the shift from mono to stereo, and then the introduction of multitrack tape recorders (Abbey Road first bought 4-track machines in 1959), each technical development significantly impacted on mixing console design, as consoles had to be constantly redesigned to take advantage of the incremental innovations in recording. We will continue to examine developments in console technology throughout the thesis.

Conclusion

This chapter has summarized the early studio sector in the UK, and explored some of the factors that shaped its development. It has argued that the early UK studios were the result of the interplay between the technology available in the UK sector, the corporate concepts and practices associated with major label audio production, and the structure and financial success of the recording industry. The UK record industry was effectively a duopoly until the entry of two other major labels in the mid-1950s, and the market for popular music was relatively small prior to the rock 'n' roll era. The major labels dominated the recording studio sector in the UK, even in the late 1950s when technologically advanced independent studios started to enter the market, as it took some years for their impact to affect the corporate studios. One significant factor that held back the development of the independent studio sector in the UK was the limited availability of recording equipment; in contrast, partly due to the much larger radio industry, America had developed a vibrant independent studio sector by the mid-1950s. Import restrictions also slowed the introduction of new

technology into the UK, until they were relaxed at the cusp of the 1960s. A combination of technological developments and significantly increased record sales for popular music enabled the studio sector to change rapidly in the 1960s. The corporate studio with its A&R directors, arrangers, and unionized session musicians became an unsuitable recording environment as the craft-union mode of production was gradually superseded in the 1960s. Job roles in the studio became very different, recording practices became highly collaborative, and popular music recording became more complex and innovative. Stylistic and technical developments (such as multitrack recorders) also precipitated significant changes in studio design and practices. From these developments the studio sector expands rapidly in the 1960s and a professional audio industry develops to service the rapidly growing studio sector. Different configurations of studios service different clienteles (such as major or independent labels, signed or unsigned artists), and may also be designed to accommodate specific musical genres. The configurations of studios also adapt to changes in the financial circumstances of record labels and developments in popular culture. The corporate label-owned studio suited an era when the labels tightly controlled production; the recordings were live and often featured a substantial number of musicians, which necessitated a large recording space. It was common practice for company A&R directors to select material and produce the artists; professional arrangers scored the backing music, which was then performed by unionized session musicians who were booked by session fixers. This craft-union level of control was gradually undermined by the fiscal success of rock music from the mid-1950s onwards, which in combination with the evolution of independent labels and independent production led to the rapid expansion of the independent studio sector in the 1960s. These studios were largely geared towards recording rock

bands, and not all the independent studios had a large live room suitable for large numbers of musicians. The self-contained ensembles that became the common format for pop music were smaller than in the heyday of the session musician, and they embraced the possibilities of multitracking and overdubbing that were facilitated by technological development. So that, arguably "in an important sense multitrack recording restored a degree of control to musicians" (Toynbee, 2000, p. 90). From the late 1960s onwards the recording studio became an integral part of the creative process, whereas in the 1950s and early 1960s musicians had very little input into the recording process. Multitracking facilitated greater creative experimentation and musicians started to consider the studio a creative space in which to develop their material; recording became more than just capturing a performance. The creative space and technology of the studio became integral to the rock recording aesthetic. The thesis will now examine changes in production practice in the 1960s and the rise of the independent producer and independent studios, as the sector moves from craft-union mode to entrepreneurial mode

Chapter 2

The Studio Sector Develops in the 1960s

Introduction

At the start of the 1960s, EMI and Decca owned the principal studios and pressing plants, and they had developed a rigid system for exploiting musicians and their music (Thompson, 2008; Oldham, 2000; Southall, 2009). In this chapter I will argue that certain key individuals had a significant effect on changing the working practices of the recording industry in the 1960s, as the transition from the craft-union mode to entrepreneurial mode in the UK was initiated by the work of a small number of independent producers (Kealy, 1990). The shift to entrepreneurial mode occurs later in the UK than in Kealy's (ibid) discussion of the American recording industry. It will also argue that the emergence of these figures was part of a convergence of historical factors relating to the recording studio and pro-audio sectors in the UK, changes in the aesthetics of popular music and a subsequent shift in the character of the market. A small number of independent studios also played a major part in this paradigm shift, as by the early 1960s there was a viable independent studio sector that was used by the entrepreneurial producers. These studios were often equipped with more up to date recording technology than the corporate studios and offered a more accommodating working environment than the corporate studios. The adoption of multitrack technology also had a significant impact on the development of rock music in this period. As noted by Frith (1983), from 1967 onwards recording became increasingly important to rock musicians. The record industry began to care about albums as a medium and musicians started to experiment more in the studio (Frith, 1983). Rock music relies on recording technology and "recordings are the "primary texts" of this music" (Gracyck, 1996, p. 21). A small number of independent studios

became involved in mixing console manufacture, their products and those of a few other audio companies led to the development of a UK professional-audio manufacturing sector by the end of the 1960s, long after an equivalent sector had emerged in the US. The emergence of an audio equipment industry meant that it was no longer necessary for studios to build their own mixing consoles, or to rely on purchasing equipment from EMI. British console manufacturers subsequently became world leaders in mixing console innovation. The development of an indigenous technology industry had a significant impact on the growth of the studio sector, and also impacted on the sound of recordings made in the UK. The relaxation of import regulations in 1959 made it considerably more straightforward to source studio equipment, which also helped the studio sector develop. Sales for popular music increased significantly in this decade, and the self-contained group became the dominant configuration for pop performers. This combination of factors shaped the material and industrial conditions of the recording industry in the 1960s and reconfigured record production and the studio sector.

In the 1960s studio production underwent a transition from craft-union mode to entrepreneurial mode, the beginnings of art-mode also occurred in the late 1960s (Kealy, 1990). The transition from the rigidity of the corporate studio to collaborative studio practice happened over a relatively short period, between six and eight years from the start of the '60s. This had fundamental effects on the production process. Job roles in craft-union mode were demarcated; and musicians were not allowed to touch the recording equipment. Engineers in this period did not share their knowledge of the recording process with musicians. In contrast, entrepreneurial mode was more collaborative than the formal and impersonal practices of the corporate studios. As Kealy describes: "In such collaborations the sound mixer acts

more like a service worker who must please his clients without benefit of appeal to a set of craft standards enforceable through his union" (Kealy, 1990, p. 213). Unionized working practices determined the demarcation of job roles, the lengths of recording sessions, and regulated the employment conditions of session musicians. The corporate studios had their own technical standards and working practices that staff were instructed to adhere to. As an example of the level of institutional regulation in the corporate studios, restrictions were imposed on the recording staff at Abbey Rd in terms of which microphones they were allowed on specific instruments and where the microphones could be placed (Ryan & Kehew, 2006). Independent producers and independent studios were integral to entrepreneurial mode, and they tended to be more attuned to the cultural and social changes that occur in the 1960s than their corporate equivalents. Independent studios also offered a working environment that facilitated independent production and collaborative working practice. The aesthetic of recording changed considerably in the 1960s: "During the 1960s, the studio became an instrument in its own right, which musicians and producer-engineering teams exploited to create new sounds, rather than simply trying to capture them" (Horning, 2004, p. 704). This shift in the 1960s from capturing a performance to creating an engineered performance was significant, as from this period onwards the definitive musical event in popular music becomes the studio recording (Horning, 2004).

Production of Culture Perspective

The production of culture perspective offers a useful framework to examine changes in the recording sector in the 1960s, both from the label perspective and that of the recording studio. The perspective notes that changes in technology, law and

regulation, industry structure, organization structure, occupational careers and the market can shape cultural products (Peterson & Anand, 2004). Peterson (1990) uses the six-facet model to examine the growth of rock music in America in the 1950s, due to different structural circumstances in the UK the industry changes later than in the US. However, equally significant changes to the market for popular music occur in the UK in the 1960s, which can be summarized using the six-facet model. In terms of technology, the introduction of multitrack tape machines in the 1960s had a major impact on studio practice, so much so that "the production of popular music was completely transformed by the establishment of multitrack tape recording as the norm in studio production" (Theberge, 1997, p. 215). Mixing consoles were introduced that were designed to work with the new (to the UK) multitrack tape machines, and the recording and mixing process starts to take advantage of the possibilities offered by multitracking. Tape recording also allowed extensive editing and the compilation of a completed track from segments of separate performances, and some producers embraced the possibilities of tape editing as a compositional device. UK manufactured studio technology becomes more widely available in the 1960s, as a manufacturing sector develops in tandem with the growth of the studio sector. In terms of law and regulation, the relaxation of import regulations meant that foreign-manufactured recording equipment became more widely available, which partially facilitated the emergence of the independent studio sector. It also meant that more American-manufactured equipment was used in both corporate and independent studios. Once self-contained bands became the main format in popular music, the power of the Musician's Union over studio sessions began to wane. Also of note in terms of law and regulation, a combination of illegal pirate radio stations and Radio Luxembourg (which broadcasted to the UK as well as Europe) enabled

popular music to gain far greater exposure than was available from state authorized broadcasting in the mid-sixties. Pirate radio stations satisfied the growing demand for pop and rock music from 1964 to 1967; something the BBC was unable to do in this period, as the BBC played relatively little pop music. Pirate radio stations became so popular that by 1966 the total daily audience for pirate radio and Radio Luxembourg was over 24 million (Crisell, 1994). The BBC subsequently introduced Radio 1 in 1967 to counter the popularity of offshore pirate radio stations such as Radio London and Radio Caroline. The organizational structure of the major labels changed in the 1960s, as independent producers who licensed their work to the labels replaced the labels' A&R supervisors. Corporate producers gradually began to leave the major labels and operate as freelance workers. The A&R role shifted to sourcing new talent and overseeing artists' careers, by the end of the '60s the A&R job role was no longer focused on selecting material and actively running studio sessions. Independent studios offered an alternative working environment to the corporate studios, which eventually undermined the need for vertical integration in every production area. By the late '60s many artists on major labels undertook their recording sessions in independent studios. In terms of industry structure, as independent labels entered the market in greater numbers in the 1960s, the oligopolistic structure of the record industry was undermined, although this took until the late '60s to have a significant impact.

> A large part of the musical expansion that took place in the late 1960s and early 1970s was due to a new wave of independent labels, all carving out healthy reputations for themselves at the expense of the majors. (Barfe, 2005, p. 259).

In some cases independent labels acted as a test market for the major labels, so although it may appear that independent labels were able to undermine the dominance of major labels, the reality is that there is often a symbiotic relationship

between large and small labels (Hesmondhalgh, 1996). As a result of these factors, occupational careers changed within the sector as independent producers become the norm, and by the end of the 1960s freelance careers for engineers became a possibility. In terms of the market for popular music, during the 1960s there was a rapid increase in popular music sales, so much so that in 1962 "the British record market was valued at £20 million and album sales reached 17 million while sales of 45 rpm singles peaked at over 50 Million" (Southall, 2009, p. 30). Accurate British Phonographic Industry (BPI) data is available from 1964, and shows that once the long-playing album started to become an important format for popular music, singles sales began to decline, album sales overtook singles sales in 1969, and between 1964 and 1969 UK album sales almost doubled.

Annual Totals SINGLES UNITS (000s) - TRADE DELIVERIES

	7"	12"	Cass	CD	Total
1964					64,000
1965					56,000
1966					46,000
1967					46,000
1968					44,000
1969					41,000

(Crutchley, 2014)

Annual Totals ALBUMS UNITS (000s) - TRADE DELIVERIES

	LP	8-Track*	Cass	CD	Total
1964	24,000				24,000
1965	27,000				27,000
1966	28,000				28,000
1967	30,000	100			30,100
1968	39,000	200			39,200
1969	45,000	300			45,300

(Crutchley, 2014)

Not only did UK sales increase considerably, but British acts also started to sell significantly on an international level, which had been rare in the 1950s. From 1963 onwards 'beat boom' bands such as The Beatles achieved considerable worldwide success, generating substantial revenue for the British record industry (Hall, 2014). For example, by 1967 worldwide sales of Beatles' recordings were over 200 million (Southall, 2009, p . 32). The Dave Clark Five, Herman's Hermits and The Animals all had number one records in America, and a number of other UK acts also achieved significant success in the American pop market (Southall, 2009). The success was so marked that former EMI managing director Ken East reflected on the impact of the Beatles and the Rolling Stones on the record industry: "After the Beatles, British music took over the world" (East cited in Oldham, 2000, p. 174). Using the six-facet model to summarise the key changes in the period makes explicit the convergences that led to significant change in the recording industry.

Contrasting Production Practice

I will now explore some of the restrictions of craft-union mode and outline the key differences between the roles and practices of corporate producers and independent producers. As the entrepreneurial mode took over from craft-union mode in the 1960s the role of producers changed significantly and session musicians and arrangers became less integral to the recording process (Kealy, 1990; Thompson, 2008). Independent producers had a significant impact on the way records were made, and their business practices changed the way producers were compensated for their work. Staff producers were paid a salary, whereas independent producers

usually owned the recording copyright and received license income from sales.[36] This arrangement significantly reduced the degree of risk the label that licensed the producer's work for release was exposed to, as the independent producer was responsible for finding artists, selecting material, overseeing the recording sessions and paying for studio time. Prior to the emergence of the entrepreneurial mode, each major label employed A&R managers and studio engineers (Kealy, 1990). Once the entrepreneurial mode became prevalent production staff became freelance. Thompson (2008) notes studio production crews worked in clearly differentiated roles in the early 1960s. As noted by Warner (2003), the Romantic idea of the unique individual artist is undermined by the reality of popular music production, which is almost invariably the result of considerable teamwork; this was evident in craft-union mode and also in entrepreneurial mode and art-mode (Kealy, 1990). Examples of corporate producers include Norrie Paramor and George Martin who worked for EMI as salaried employees; Dick Rowe fulfilled a similar role at Decca. Paramor and Martin were both accomplished musicians and arrangers, and would have considerable musical input into the material they produced. The working method in craft-union mode was for the A&R manager to select material (by liaising with a publisher), show it to an artist, and then to select an arranger to score the musical parts, the arranger would use a contractor (sometimes termed a session fixer) to hire the session musicians necessary. A corporate producers' job role was in essence to produce commercially successful material for their employer. Although the corporate producer had no financial interest in their work, ultimately, a run of failure could result in the loss of their job (Thompson, 2008). The label's engineers would operate the technical equipment; there was little experimentation with studio technology due

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[36] Early independent producers licensed their recordings to the majors; in later years the labels financed the recording process and remunerated producers with an upfront fee per track and a share of the artists' royalty points.

to the rigidity of recording practices in the corporate studios. The time constraints of three-hour unionized sessions further discouraged any studio experimentation, the three-hour session (20 minutes of recorded music was the maximum allowed in this period) was a Musicians Union (MU) stipulation and any extra studio time required from the musicians incurred further expense based on the rates set by the MU. Consequently, union regulations were often restrictive in practice. Solo artists backed by session musicians were common in the 1950s and early 1960s, and even when groups became the dominant popular music format in the 1960s they were often augmented or supplanted by session musicians; either due to issues of competence, or to ensure the sessions went smoothly and quickly (Grant, 2011). [37]

The craft-union mode was autocratic and the artists had little input into song selection or musical arrangement (Kealy, 1990). For example, the producer Mickie Most recollected that in the late 1950s artists would be told what to record by their A&R manager, who would then work out the appropriate key with an arranger. The singer typically had no input into their repertoire or style, and once they were in the studio the singer's band (if they had one) would often be replaced by session musicians (Thompson, 2008). Most gained some experience recording for Decca as an artist prior to becoming a producer. His comments below illustrate the lack of input into the recording process that was common in craft-union mode.

> We made some ghastly records, but we had no control over them. Somebody used to tell you to learn some song, although they didn't say what key it was in, or anything like that, so you'd learn it, and go along to the studio, and there'd be a few musicians there who were about ninety-years-old trying to play this music. We'd say, "It doesn't really sound right", and they'd say that it didn't matter, and just tell us to just sing, so you'd go out there and sing, and they'd say "OK goodbye". You never heard a playback. (Most cited in Tobler & Grundy, 1982, p. 125)

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[37] Personal Communication (17/08/11)

The working relationships in corporate sessions were usually formal and impersonal as can be seen by Abbey Road engineer Geoff Emerick's comments below.

> Things were definitely more relaxed when George Martin wasn't around. There was always a certain protocol when he was at a session: we in the control room felt that we had to be on our best behaviour, and even the Beatles seemed at bit constrained by his presence at times. (Emerick & Massey, 2006, p. 121)

In practice, the craft-union mode featured a lack of input into the recording and mixing process from the artist (Kealy, 1990). This is illustrated by the fact that The Beatles reportedly weren't initially played finished mixes prior to their release. "Incredibly, prior to *Revolver*, mixes weren't even given to them to approve beforehand–the first time they'd hear the final version was when the record would come out, or when they'd hear themselves on the radio" (Emerick & Massey, 2006, p. 130). Most had a similar experience when he was a recording artist for Decca: "You don't hear a record until it is pressed. If you don't like it there's nothing you can do about it" (Most cited in Thompson, 2008, p. 82). The musicians' opinion of the recording was of no consequence in craft-union mode as the A&R supervisor was responsible for any aesthetic judgments. The pop musicians of the early 1960s also had little knowledge of the recording process and of the studio equipment. Keith Hopwood was a founder member of Herman's Hermits and when interviewed commented on his experience of recording in the early 1960s: "It was a total mystery, you went down to London, and you were in the studio and didn't know what the hell anything was" (Hopwood, 2011). [38] In the UK, the transition to entrepreneurial mode didn't necessarily mean that artists became more involved with aesthetic decisions and the recording process. For example, Mickie Most produced Herman's Hermits and other acts in an autocratic fashion. The main difference in

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[38] Personal Communication (05/08/13)

approach between corporate producers and the independents was the business relationships forged between the independent producers and the labels.

The dominance of the MU in terms of studio practice declined when self-contained groups started to play their own material. This transition changed the length of studio recording sessions as the three-hour unionized session became outmoded, sessions could last as long as necessary. The main corporate studios were closely monitored by the MU, and they adhered to the MU rules more closely than the emerging independent studios. Thompson (2008, p. 141) discusses some common 'rule bending' techniques that producers would resort to in the 1960s, such as not putting the red light on when recording a take, so that an orchestral part could be surreptitiously doubled. An MU stipulation in the early 1960s was that a vocal had to be recorded at the same time as an orchestral take. Many session musicians were doing three sessions a day, if a singer couldn't perform to an acceptable standard it would cause the session to go into overtime, which would affect the musicians' other sessions (Thompson, 2008). As a consequence, producers would often fake a vocal performance by not actually recording the vocalist with the session players, and would then unofficially get the singer back in the studio at night to record the vocal parts when the session musicians weren't around (Thompson 2008). In some instances, to save money, musical parts would be created by tape editing rather than keeping the session musicians working until they had performed a perfect take. As well as MU stipulations there were other union regulations that affected engineering staff, as they were in some cases regulated by the ACTT (Association of Cinematograph, Television and Allied Technicians, the film and engineers' union). However, it seems that even Pye studios were deliberately contravening union regulations by 1964. Whereas most British studios of that era adhered to a strict

timetable — with sessions running from 10:00 am to 1:00 pm, 2:00 pm to 5:00 pm and 7:00 pm to 10:00 pm — Pye's engineers often worked into the night. This contravention of union regulations allowed the engineers to finish a mix and meet the deadline for delivering the finished product to the pressing plant a few hours later (Buskin, 2012a). The ex-Pye engineer Ray Prickett comments: "I got blacklisted at a very early stage in the business, Pye was actually a non-union studio and it was meant to be that way" (Prickett cited in Buskin, 2012a). Craft-union mode was more reliant on unionized musicians and engineers than entrepreneurial mode, which usually featured self-contained bands that were not union members. The following quote is from the independent Olympic Studios' head engineer Keith Grant, who commented on his experiences of coping with union regulations in the early 1960s:

> Only session musicians were bound by the three-hour rule. And even that was open to discussion. If you booked an orchestra through a contractor then it was hard and fast to the rules. But, you could ring up a musician and say I need you to double track and this that and the other, how about this much? The unions all had their heads in the sands including the MU, but because we (Olympic) were doing well and weren't a large company, the unions were a bit fluid with us. (Grant, 2011) [39]

The ex-Olympic engineer Phill Brown also confirms that union regulations were often ignored in the independent sector:

> At the time the Musicians' Union stipulated a maximum continuous work period of 3 hours for musicians during recording sessions, after which there had to be a break – also, the ACTT had strict rules for overtime pay. However, Olympic was not an ACTT union studio and did a large amount of work for the rock world, usually at night when everything was looser. Not being union controlled, the sessions almost invariably exceeded the prescribed time limit many times over. (Brown, 2010)

Brown (2010) observed that it was common practice for the engineers and bands

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[39] Personal Communication (17/08/11)

working at Olympic to work for 15 to 18 hours; at weekends there were often 24-hour sessions. Another factor in the transition to the entrepreneurial mode of production was that rock bands were potentially cheaper to record than a large ensemble of session players: "The pop groups who invaded the studios in the mid-sixties could be quite cost efficient if they were proficient enough to record their own material" (Thompson, 2008, p. 135). Although the pop and rock band's sessions may have used more studio time, they did not incur any costs for arrangers or session players. As a result of the change from craft-union mode to entrepreneurial mode the record labels ceased to employ staff producers by the late 1960s (Kealy, 1990). This could be viewed as a shift from a Fordist model of production. Shapiro et al. (1996, p. 186) date post-Fordism in the music industry to the 1960s when independent producers emerged and groups started to record their own songs. Outsourcing aspects of the A&R role and the actual recording process is an example of what Storper & Christopherson (1987) term flexible specialization. Hesmondhalgh (1996) notes that flexible specialization refers to a strategy of industrial restructuring that involves a shift back to forms of skilled crafting that were that supposedly displaced by the methods of mass production introduced by Henry Ford. Hesmondhalgh (ibid) observes that there is a tendency to romanticize the relationship between specialized practitioners and large firms, as the large firms are generally still in a position of power. In the case of the music industry, the record labels were still firmly in control of marketing, manufacturing and distribution.

Before the advent of independent producers and other entrepreneurs the British pop music industry was highly stratified. Managers looked after artist's careers, agents concentrated on booking artists into venues, publishers published music and sold songs to artists and record labels, labels recorded, manufactured, distributed and

promoted the recordings (Oldham, 2000). It was rare for a manager to have any involvement in publishing, agency work or record production. In the mid-1950s Larry Parnes was one of the first entrepreneurial managers to start his own publishing company, and his business practices started to change the way the British pop music industry operated. He would sign artists such as Tommy Steele, Marty Wilde or Billy Fury, they would then be assigned material written or co-written by Lionel Bart who was signed to Parnes's publishing company, Parnes would then sell the package to EMI or Decca who would record the artist and release the material (Oldham, 2000). Independent producers took this business model a stage further in the 1960s, taking control of the recording process and then licensing the recordings to the major labels. This was the onset of entrepreneurial mode in the UK; in America these entrepreneurs (Sam Phillips is a prime example) may have opened their own studio. Due to the barriers to entry to the studio business (cost, availability of equipment), the UK independent pop producers of the 1960s (with the exception of Joe Meek) utilized the resources of the few independent facilities operating in London. [40] Independent producers were responsible for their recordings from start to end, and unlike a label's corporate producer they had to fund (or seek finance for) their sessions whether they were financially successful or not. A corporate producer would not personally suffer financially if a release failed to be successful (Thompson, 2008). As the independent producer stood to profit considerably from the success of their recordings they often sought to maintain total control over their product. In contrast, a corporate producer worked for a fixed wage. George Martin eventually left EMI in 1965 and became independent as he felt that he was not sufficiently rewarded for his work with The Beatles: "I was on a salary of £3,200 a

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[40] Joe Meek is the exception as he opened his own facility in 1960.

year, no car and nothing else. When the Beatles came along I was making a fortune for EMI" (Martin cited in Doyle, 2007). George Martin was one of the first staff producers to leave a major label and work independently (in 1965); he subsequently set up Air Studios with other ex-major label staff from EMI, Columbia and Decca.

> I wasn't the first independent producer – we'd already had people like Andrew Oldham with the Stones, and Mickie Most, of course – but I think I was the first rebel, the first staff producer to go out into the world. (Martin cited in Tobler & Grundy, 1982, p. 117)

As Burgess (2014) notes, producers are a core part of the operation of the recorded music industry as "Without intermediation of the technical, musical, and financial aspects, combined with an understanding of the end purpose of the recording, there would be no useful product to sell" (Burgess, 2014, p.13). By the mid-1960s the role of the producer was recognized as integral to the commercial production of popular music, George Martin realized he had gained sufficient leverage from his success with The Beatles to demand better terms from EMI as an independent producer. This represents a significant shift in the power relations of the record industry, as producers become recognized as creative entrepreneurs who were entitled to royalties from the music they produced.

Early Independent Producers

The first significant wave of successful independent producers of popular music in the UK was heralded by the success of Joe Meek, Mickie Most, Andrew Loog Oldham and Shel Talmy. These producers were key agents within the UK recording industry who fundamentally affect practice in the 1960s and they paved the way for the producers that followed them. Their dispersion of the entrepreneurial model served to accelerate the growth of the independent studio sector. Oldham (2000)

considers that independent producers supplied the creative spark in the 1960s. Culturally, the young independent producers were more in tune with the music scene than the older A&R managers, and as Thompson argues, "The industry had begun to accept the idea that young independents had a flexibility and cultural sympathy that older A&R managers might not" (Thompson, 2008, p. 83). Shapiro et al. (1992) consider that it was a cultural phenomenon that caused these changes in economic relations; countercultural musicians and associated entrepreneurs (producers, managers, independent labels etc.) challenged the vertically structured industry. One of my respondents confirms that there were very few independent productions made in the 1950s and that this mode of production didn't really become a significant part of the UK industry until the early 1960s. "No, there wasn't a lot of band related work because there weren't a lot of independent productions being made. It wasn't really until, I suppose, '62/63 that you saw many records being made independently at all" (Wood, 2013). [41] Due to the financial risks the early UK independent producers were taking, the first wave of independent producers in the early 1960s ran their sessions in a broadly similar fashion to the corporate producers. They often picked the material, used session players and took charge of aesthetic decisions. The most radical differences between corporate producers and the early UK independent producers were in their business relationships with the labels and their awareness of musical developments. Independent producers were to a degree constrained by their financial relationship with the artists they recorded; hence the autocratic approach. Greater levels of studio collaboration and experimentation occur once the labels started to finance the sessions again, rewarding producers with upfront fees and royalty points. When this shift in the financing of recording projects occurred,

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[41] Personal Communication (23/02/13)

producers were expected to adhere to a budget, and they would be liable for any additional studio expenses if a project went over budget. But, they were not financing the whole project, which eased the financial pressure on producers and contributed to a culture of studio experimentation. It nevertheless took until the late '60s for musicians to gradually gain some agency in the recording process. An overview of the innovations introduced by key independent UK producers now follows, as it will be illustrative of their working methods and their motivations for working outside the established craft-union system of production. Each producer was influential to subsequent practitioners; although each individual had an idiosyncratic approach to their recording work they had a broadly similar approach to business practices.

Aesthetic and Technical Innovation

The first wave of independent producers introduced some recording practices that were not found in the corporate studios where there was a strict protocol governing engineering practices. These innovative techniques became integral to popular music recording and production and were quickly adopted by other practitioners in the audio engineering community. Due to strict regulations in the corporate studios, independent producers developed these aesthetic and technical innovations during their work in independent studios. In terms of sonic innovation, Joe Meek and Shel Talmy were influential in extending the possibilities of studio practice. Even by 1957 when he was still employed as an engineer, Meek had developed an innovative and experimental approach to recording, and he had started to tell producers what he thought they should do in their sessions, which was against conventional studio protocol: "Joe couldn't abide working under what he considered to be the artistically and personally restrictive conditions present in major British recording studios in the

late 1950s, and he opted to establish himself as an independent" (Cleveland, 2001, p. xi). Meek was subsequently sacked from his post at Lansdowne Studios and became an independent producer, this was at least in part due to his allegedly confrontational personality. "Kerridge sacked him as he was too experimental and professionally he was supposed to be a very difficult bloke" (Thompson, 2011). [42] Meek encountered problems when using other people's studios, largely due to his unconventional approach to recording. In 1960 he found a financial backer and set up his own studio in a flat on Holloway Road in London. [43] "Meek described the recording space as being, "The size of an average bedroom; no larger"" (Cleveland, 2014, p. 16). Meek utilized every available space in the flat, recording in the bathroom and on the staircase (Burgess, 2014). Meek was the first British producer to record and mix commercially successful material in a domestic environment, rather than utilizing a conventional studio. This in itself was a significant paradigm shift in popular music recording. Meek was lacking in conventional musical skills and he would rely on the session musicians he worked with to develop his basic musical ideas, a collaborative approach: "Joe used to leave it to ourselves to get the right kind of performance going" (Cattini cited in Cunningham, 1998, p. 93). Meek pushed the accepted parameters of sound recording and mixing in ways that were prohibited in the corporate studios. He is considered the first engineer to have placed microphones directly in front of, close to, and sometimes inside sound sources (Cleveland, 2001, 2014). He often ran every sound through compressors; which were used as a tonal effect as much as a form of level control. Meek routinely ran his mixer input and tape levels into the red for sonic effect; again something that would be frowned upon in EMI or Decca's studios. Meek also used reverb, and delay heavily in his quest for an

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[42] Personal Communication (17/08/2011)
[43] Meek had already used his previous flat in Arundel Gardens as a studio.

innovative sound (Cunningham, 1998). He sometimes added homemade sound effects to his productions, and often sped everything up to add excitement. He also took track bouncing to extreme lengths using multiple tape machines to build complex sonic collages, as Burgess documents "Meek developed a distinctive lo-fi sonic signature reliant on heavy compression and reverb, optimizing his productions for listening on a transistor radio" (Burgess, 2014, p. 89). The British record producer Mickie Most commented on how Meek's practices and methods were perceived by the mainstream industry.

> The record industry probably thought it was a prank. At the time, record companies were very, very disciplined. Studio engineers used to wear white jackets like doctors. That's how disciplined recording was, and they took it all rather seriously. And here's this guy making these records-and selling millions-in his kitchen. (Most cited in Cleveland, 2001, p. 110)

The significance of Meek's innovation is only apparent when viewed in the context of the period he worked in. Much of what he did that seemed radical at the time has been so thoroughly integrated into the practices of the recording community that it is now commonplace (Cleveland, 2001).

Although not as technically competent as Meek, Shel Talmy was also influential in terms of introducing new (to the UK) recording techniques. Initially Talmy used Decca's West Hampstead studio for sessions, but he soon came to prefer using independent studios such as Olympic and IBC, where he developed a relationship with the engineer Glyn Johns: "He was probably my first major client, and when I turned freelance, he was one of the people who rang up and suggested it" (Johns cited in Grundy & Tobler, 1982, p. 147). Talmy continued to use independent facilities with his later work for the major label Pye Records. "We wanted to get away from Pye Studios, where [the execs] would have been breathing down our

necks" (Talmy cited in Buskin, 2009). In common with Meek, Talmy tried to produce 'loud-sounding' recordings, so that when they were played against other producers' work they would stand out. He achieved this by using parallel compression techniques and multi mic'ing the drum kit (Buskin, 2009). Parallel compression is achieved by mixing an unprocessed 'dry', or lightly compressed signal with a heavily compressed version of the same signal. This preserves the transients of the original signal but has the effect of thickening the overall sound and increasing the perceived volume. The standard technique for recording drum kits in the corporate studios in the early 1960s was for engineers to use one or two microphones. Using a microphone to close mic each drum was unheard of in the UK at this point. When Talmy instructed an engineer to close mic each component of the drum kit he was told that this would cause problematic phase issues, as the signals from multiple microphone could potentially introduce comb filtering (Buskin, 2009). Talmy had already successfully experimented with this technique in the USA, the resulting UK recordings proved influential. Multi mic'ing drums became commonplace in London's studios within a few months of Talmy introducing the technique (Buskin, 2009). In common with Oldham, Talmy was focused on developing a creative atmosphere in the studio and extracting an exciting performance from the bands he worked with, this was a development in terms of the producer's role and became a characteristic of rock production. This approach was still relatively unusual, "Producers such as Jimmy Miller or Shel Talmy were 'vibe' merchants" (Brown, 2011). Although Talmy had some limited technical knowledge he relied heavily on the engineers he worked with, as did Most and Oldham; in contrast, Meek was the most technically oriented of the early independent producers. A focus on encouraging vibrant performances from the artist(s) was one of the

strategies of the independent producers that differentiated them from the corporate producers, who were less attuned to the nuances of popular music. However, despite the innovations of the early independent producers in many ways they operated like the corporate producers they supplanted. Meek, Talmy and Most ran their sessions in an autocratic fashion, often choosing material, and using session players and arrangers if necessary. When interviewed, Keith Hopwood of Herman's Hermits commented on his experiences of working with Most:

> Get in there, play that, OK play it again, OK right. So it was a while before you got to understand the process, before you could suggest anything, or take a part in it. We were very young anyway and had a very hands-on producer (Mickie Most) who knew exactly what he wanted. (Hopwood, 2011) [44]

Most used the independent studio sector for his work, but his influence on later practitioners was greater in terms of his business practice rather than any specific technical or aesthetic innovation. Most liked to work quickly and when multitracking was introduced the time taken to record and mix a track increased considerably, which he found frustrating. He noted that 'House of the Rising Sun' only took fifteen minutes to record, and that no amount of retakes and editing would have improved it or made it more successful (Grundy & Tobler, 1982). Most's primary focus was on the choice of material, not on studio techniques. Oldham operated slightly differently to the other independent producers, as he would seek input from both engineers and session musicians, as he had no experience as a musician or engineer. Consequently, Oldham became popular with the session players he worked with, as he would allow them to contribute ideas and he made sure the sessions were enjoyable, demonstrating a more collaborative approach: "So many sessions were run-of-the-

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[44] Personal Communication (05/08/13)

mill, banal, mundane, boring, you couldn't wait to get out of them. But Andrew's sessions were always fun and they were always interesting, he'd always want to try something different" (Jones cited in Oldham, 2000, p. 325). Oldham's main production contribution was to ensure a compelling performance from his artists, something that corporate producers less attuned to popular music often overlooked. In common with the other independent producers, Oldham relied on the independent studio sector. Oldham's first production session was with the Rolling Stones in Olympic in 1963, subsequently he worked in Kingsway before settling on Regent Sound Studios for a substantial amount of his early production work (Oldham, 2000). In the early 1960s Regent charged £5 an hour, which went up to £7.50 an hour in the mid-sixties (Thompson, 2008). [45] Oldham found the studio suited the sound he wanted for the Rolling Stones, as it was relatively small there was little isolation between the instruments, which gave him an unpolished but powerful sound he thought was appropriate for the band (Oldham, 2000). As Oldham was technically inexperienced, rather than suggesting particular studio techniques or the use of specific items of technology, he would ask engineers to imitate the sound of other recordings, these were often American recordings (Thompson, 2008). Consequently, unlike his contemporaries, Oldham played records to his engineers as a way of communicating the sound he wanted to recreate in his recordings. Regent offered an ideal place to start his production career, as he did not have members of the recording establishment looking over his shoulder and it was cheaper than the other independent studios of the period (Oldham, 2000). Oldham's other motivation was the brief experience of corporate studios that he had gained working in PR for bands such as The Beatles: "I had no truck with the swimming pool atmosphere of 'Okay

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[45] According to the Bank of England inflation calculator, £7.50 in 1965 is the equivalent of £123 nowadays.

boys you can hear a playback, it's great…" (Oldham, 2000, p. 204). Oldham's primary influences on later producers were his willingness to collaborate with session musicians and technical staff, and his focus on performance and atmosphere in the studio. His complete lack of technical and musical skills was relatively unusual, and his success redefined the skillset necessary to work as a producer. As can be seen by the above discussion, the majority of the independent producers questioned some of the accepted studio practices of the period, and they all preferred to work in the independent studio sector. Their production methods and focus on performance became influential on subsequent pop music production. Recording techniques in the corporate studios were proprietary, whereas in the independent sector ideas and innovations would diffuse more widely; independent producers worked in a range of facilities, which inevitably meant that their working methods were disseminated amongst the recording community.

Business Innovation

The first UK entrepreneurial producers were responsible for introducing the US production model to the UK. These producers arrived at the entrepreneurial model in a variety of ways. Meek started his own label 'Triumph' to release his productions, and only licensed material to the majors through necessity when the label hit financial difficulties. In Talmy's case, as an American, he was quite familiar with developments in the US industry and saw opportunities in the UK industry, reportedly viewing "the derivative British popular music industry as ripe for innovation" (Thompson, 2008, p. 91). Oldham's introduction to the entrepreneurial model was a result of his friendship with Phil Spector, as Oldham had undertaken PR work for Spector in the UK. Spector had explained the advantages of owning the

rights to recordings and licensing material to major labels to Oldham (Oldham, 2000). Most made the transition from a recording musician to production after noting the success of Talmy and Meek. By 1963 Meek and Talmy were producing hit records, and Most felt he had more to offer as a producer than as a performer (Grundy & Tobler, 1982). One of the potential problems faced by these innovators was licensing their independently made productions to the major labels, as access could be problematic. Another early independent producer Tony Meehan commented that he "found it very difficult to get into these huge monolithic, colonial kind of organisations that were run like something from the British Empire, from the top down" (Meehan cited in Oldham, 2000, p. 136). The stratified class system of British society was embodied in the corporate structure of the majors, which also slowed the introduction of entrepreneurial mode. Former EMI managing director Ken East considered that the major labels at the time were run like the civil service in terms of staff and attitude (Oldham, 2000).

Talmy's initial productions were for Decca, but after the company declined his suggestion to release material by Georgie Fame and Manfred Mann, he took the next group he found (The Kinks) to Pye. Talmy persuaded Louis Benjamin at Pye to offer the band a contract, in this deal Talmy received royalties based on The Kinks' record sales and was responsible for the recording expenses. However, despite this arrangement Talmy didn't own the copyright in the recordings. The initial Kinks' recordings were made in Pye's studio and are in mono, as Talmy was personally responsible for the production costs and Pye charged more for stereo recording (Buskin, 2009). When Talmy subsequently worked with The Who he signed the band to his own production company and secured contracts with Decca Records in the US and its UK subsidiary Brunswick. With The Who's releases, Buskin (20090 observes

that Talmy paid for the recording sessions upfront and owned the copyright in the recordings, and this "move proved to be highly profitable in light of the band's first three singles, all released in 1965" (Buskin, 2009). This was the entrepreneurial model popular with American producers, owning the recording copyright and licensing the material to major labels was potentially far more profitable.

Most followed this example and licensed his productions to the majors, both in the UK and America, which he visited regularly to set up deals. "I just signed the groups to myself and I financed them, offering them a royalty and a deal, then it was up to me to make this deal work" (Buskin, 2003). Most had some considerable success in the mid-'60s from proactively looking for acts to record, as a respondent reiterated. "He went to see The Animals, and that was the first band he found, and then us *(Herman's Hermits)* in '64." (Hopwood, 2011). [46] In common with the business practices of the other independent producers Oldham leased his Rolling Stones productions to Decca and owned the master rights. Oldham then followed Meek's example (and that of numerous American producers), and started his own label in 1965. Oldham's Immediate Records was one of the first independent labels in the UK. In the 1960s, pioneering independent labels such as Immediate, Page One Records, Triumph Records and Track Records paved the way for the later independents. Although Oldham had considerable success in the 1960s, his business dealings were not exemplary. In contrast, Most went on to successfully run the Rak record label, publishing company, management company and studio complex for many years, demonstrating to subsequent practitioners the benefits of fully engaging with the entrepreneurial production model. The business practices of the early independent producers were highly influential to subsequent generations of

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[46] Personal Communication (05/08/13)

producers.

After the initial success of independent producers in the 1960s, record labels gradually stopped employing staff producers and the labels adapted to the new paradigm by funding the studio time necessary to make a record, and offering independent producers a fee to produce the artist and a share of the artists' royalty points. This was a less threatening situation for the labels, as they still owned the copyrights to the recordings, unlike the entrepreneurial business model where the producers license their recordings and own the recording copyright (Kealy, 1990). This arrangement was marginally more beneficial for the musicians as the royalty rate they would receive would be higher than that offered by the entrepreneurial producers. The initial wave of independent producers in the early 1960s were responsible for changing the organizational structure of the labels in terms of the producer's role and responsibilities, and for increasing the financial rewards available for record producers. The success of these individuals radically reshaped the role of the producer in the UK recording industry, and their example meant that corporate producers started to leave the labels and become freelance workers from the mid-1960s onwards. As Frith (1981) and Hesmondhalgh (1996) note, this was only a superficial loosening of control by the major labels as the labels still controlled manufacturing and distribution, the power structure of the recording industry was not radically altered by the introduction of flexible specialization. Nevertheless, the rise of independent production and the widespread adoption of entrepreneurial mode was a major factor in the expansion and success of the independent studio sector that occurs in the 1960s (Kealy, 1990).

The Rise of Independent Studios

Significantly, the entrepreneurial producers discussed above all used the emerging independent studio sector for their productions. The success of British popular music at home and abroad increased the profits of the UK record industry, which in turn helped the recording studio sector to expand, as there was more work once the labels reinvested in new artists. The additional business from both major and independent labels encouraged the British studios to invest in new technology and to develop technical expertise, which meant that by the late 1960s they were no longer trailing behind their American counterparts. The American engineer Tom Dowd visited the UK in the mid-1960s and was surprised by the relatively primitive equipment in use at Abbey Road (The Language of Music, 2003). In contrast, the independent studios were often equipped with newer technology than the corporate studios. The success of 'British Invasion' artists also encouraged a lot of young musicians to form bands, which Olympic's head engineer noted as a factor in the financial viability of the independent studio sector. "There were a lot more bands, it was all funded by third parties. All the money that came in the front door was charged by the hour, there were no deals" (Grant, 2011). [47] The producer Joe Boyd comments on the rapid growth of the music scene in the 1960s, "You could almost describe it as a feeding frenzy — bands were appearing and getting signed a week later." (Boyd cited in Inglis, 2006). In the 1960s technology developed rapidly and multitrack tape recorders became commonplace, although the adoption of multitracking in the UK was some years behind the US. Technological innovation was driven rapidly by the demands of the expanding studio industry and its practitioners. Burgess (2014) observes the creativity of the beat boom artists combined with the experimentation of

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[47] Personal Communication (17/08/11)

producers and engineers, which resulted in new and innovative production techniques that took full advantage of the new studio technology: "The creative culture shifted significantly through the sixties and into the seventies" (Burgess, 2014, p. 98). Kealy (1990) notes that after gaining some experience in the recording studio musicians became less inclined to follow the directions of A&R staff or entrepreneurial producers. "Especially when they realized that the use of middlemen substantially reduced their profits" (Kealy, 1990, p. 215). Entrepreneurial producers often exploited the artists they worked with by signing them to exploitative contracts. For example, the entrepreneurial producer Shel Talmy had contracted The Who to a six-year production deal offering the band a 2.5% royalty rate (Motion, 1987). [48] Kealy (ibid) observes that art-mode collaboration was defined by the exclusion of middlemen representing the record labels, and the exclusion of entrepreneurial producers. An independent producer collaborating with the artist was a new mode of production; in some instances artists would produce themselves whilst working closely with engineers and possibly arrangers. However, what Kealy (1990) terms art-mode takes some years to become a common production arrangement. Throughout the 1960s artists became more involved with the choice of material they recorded and the production of their work, and the transition to a set of practices broadly similar to Kealy's (ibid) art-mode occurs in the late 1960s. The recording process started to take far longer in the multitrack era; this was obviously beneficial to the independent studios' financial viability, as an album project would generate more income for the studio the longer it took to complete. The emerging independent studios were at the vanguard of Kealy's (1990) art-mode as they offered a less formal and more creative working environment. The independent studio sector in the 1960s

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[48] The band's management subsequently negotiated a 10% royalty with Decca after splitting with Talmy.

offered a transitional stage before artists started to build their own studio facilities and consider self-production. Despite these changes in production practice, even in 1967 the established power base of two dominant record labels with in-house studios and producers was still holding sway, although this was gradually being undermined by independent producers, labels and studios. In a discussion of how the producer Joe Boyd lost the opportunity to continue working with the Pink Floyd when they signed to EMI (Boyd produced their first single), he explained:

> It was an interesting cusp period, because Decca and EMI were the dominant labels and they had their own studios and they had in-house producers, and that was the way they liked it. And in a way, the success of George Martin and the Beatles reinforced them in the idea that this was the model. (Boyd cited in Inglis, 2006)

The considerable success of The Beatles seems to have encouraged the majors to persist with the corporate A&R system for some time, Norman Smith was made head of A&R at EMI once George Martin left and he produced some of the early Pink Floyd material instead of Boyd.

The sixties saw a significant increase in the number of recording studios. The existing studios were joined by Advision in the early 1960s, which was aimed at the emerging TV voiceover and jingle market, a small studio had been operating on the site since the 1950s (Wood, 2011). [49] A considerable amount of popular music was subsequently recorded at Advision despite its initial focus on media work (Harris & Burns, 2012). Other significant new studios were Recorded Sound Studios, and Kingsway, which had originally been set up by an advertising agency before being taken over by De Lane Lea who owned a number of facilities that serviced the film and advertising industry (Wood, 2011). [50] Kingsway became a major studio for the

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[49] Personal Communication (15/04/11)
[50] Personal Communication (15/04/11)

emerging 1960's rock scene. The music publisher Chappell also ran a studio, which by 1967 was technically sophisticated and available for hire to external clients (Harris & Burns, 2012). Sound Techniques opened in 1965, Trident Studios in 1967, and Morgan Studios in 1967. Thompson (2008) lists fourteen professional recording studios that were operating in London in the 1960s; this includes most of the studios mentioned previously in the thesis and Joe Meek's RGM Sound. Thompson (ibid) includes the most well known studios in the period, but the list is by no means exhaustive as further research reveals some omissions, for example Morgan Studios, Chalk Farm Studios, Pye and RG Jones. Studios began to be opened outside London in this period, such as Rockfield in Wales (opened in 1963) and Strawberry in Stockport (initially known as Inter City Studios and opened in 1967). Although the recording sector was mainly based in London, there were recording studios offering basic recording services in a number of UK towns and cities by the mid-1960s, but by no means every town or city had a professional studio at this point. A Manchester respondent recalled travelling to Huddersfield and Birmingham in the mid-1960s, as there was no suitable recording facility in the Manchester area prior to Inter-City studios opening in Stockport in 1967 (Wadsworth, 2007).

> Here's one for you, in Huddersfield, you've heard of Matamp? That became Orange Amplifiers, they were made by a guy called Mat who had a sweet tobacconist in Huddersfield. In a back room he had recording equipment, this is mid '60s, Victor Brox etc. recorded in there. And as I remember, the sweet tobacconist shop was open, Mat used to turn the closed sign round, then we all piled our gear into his back room and he'd do the session. This is the mid '60s. At the same time, similar to that there was a guy Jimmy Powell in Birmingham, Jimmy Powell and the Five Dimensions. He had a his own set up in the mid-sixties, we were going all that way to record stuff as there wasn't anything up here. (Mitchell, 2010) [51]

In contrast to the situation outlined in the quote above, by the end of the 1960s there

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[51] Personal Communication (29/04/10)

were functional studios in the major cities around the UK, although all the large-scale professional facilities were located in London, which was the centre of the UK music business.

Independent Studio Culture

The increased influence of the independent studio sector was due to a combination of cultural and technical innovations. Olympic, Trident and Sound Techniques were particularly influential studios, they became associated (directly or indirectly) with mixing desk manufacture, and they acted as training centres for a considerable number of engineers, producers, and technical staff. Numerous successful releases were recorded in the independent studios, some of which defined the sound of British popular music of the era. The expansion of the independent sector occurred in tandem with the growth of the record industry in this period. The independent studio sector provided independent producers with a working environment in this period of growth. However, engineers went freelance just after the first wave of independent producers emerged and they too relied heavily on these facilities. "Glyn Johns discovered that one of his first real problems as a freelance engineer was to bypass the existing system (freelance engineers were hitherto unheard of) and to find studios in which he was allowed to work" (Grundy & Tobler, 1982, p. 147). The number of independent studios that would allow freelancers to work was limited; interestingly, Pye allowed freelance staff to work in their facility (Cunningham, 1998). The studio 'culture' in the newer independent studios was also more in tune with the working methods (and lifestyles) of the musicians and producers. The following quote is from the producer Gus Dudgeon who used Trident Studios for a number of his early productions: "I had been having trouble finding studios that I liked to work in and

even some of the independent ones had a kind of corporate feel to them. I wanted to escape from the starchy, Decca-type environments" (Dudgeon cited in Cunningham, 1998, p. 104).

For both bands and producers the independent sector offered a more client-focused environment than the corporate studios. Leyshon (2009) discusses the 'service ethic' that developed in the studio sector, where a client's needs are put first or valorized. This service ethic "became apparent as early as the 1970s and corresponded with the rise of independent studios" (Watson, 2015, p. 35). The service culture that developed in independent studios was actually a characteristic of the independent studio sector from the mid-1960s. Horning (2013) observes although technical skills were paramount for engineers, once recording became more collaborative new skills were needed, including people skills. The creative process requires effective collaboration between the producer and engineer, and between the production team and the musicians (Warner, 2003, p. 18). Musicians valued the environment in the independent studios as they were more attuned to their needs and musical tastes. The independent studios tolerated the musicians playing at the volume they would when performing live, which would meet with disapproval at a corporate studio (Buskin, 2009). As Horning reflects, "The preference for outside recording studios had to do with more than their permissive atmosphere about riding faders or taking drugs, it also stemmed from a desire for a looser atmosphere and a shared musical aesthetic" (Horning, 2013, p. 200). The independent studios of the 1960s often employed young trainee engineers (termed tape operators) who were fans of rock music, as can be seen from the statement below from the engineer Andy Johns who started work at Olympic Studios in 1967.

> I was lucky to start off at Olympic because it was extremely popular with rock 'n' roll bands. In the course of a week there would be sessions with Joe Cocker, Jimi Hendrix, Manfred Mann, Mick Jagger producing something. (Johns cited in Stevenson, 2004)

The engineer Phill Brown's visited Olympic Studios when he was fourteen, as his brother Terry was an engineer there. Allowing a teenager to watch a session seems an unlikely scenario in a corporate studio. Brown started work there two years later at the age of sixteen.

> One Sunday in 1965, I was at the studio when The Yardbirds were there to record a single…. Suddenly, all I wanted to do was to be in that environment and record music all day. I was convinced that it would be brilliant fun and far better than "working" for a living. (Brown, 2010, p. viii)

A key feature of the independent studios was their more amenable atmosphere, by creating the right atmosphere the producer or engineer can help musicians to relax and produce a better performance. Watson terms this skill the ability to "elicit emotional musical performances" (Watson, 2015, p. 2905). Nervousness, tension and a lack of confidence can prevent performers delivering a good studio performance, especially if they are unfamiliar with the studio environment. Watson (2012) refers to the emotional support and encouragement required to facilitate the creative process as 'emotional labour' and "This management of emotions is often referred to, by producers and engineers' as creating the right 'vibe'" (Watson, 2012, p. 2904). Watson (ibid) argues that recording studios are emotional spaces, central to which is the work of engineers and producers, who attempt to create an environment free of the everyday social and feeling rules that normally shape an individual's emotional landscape. This necessitates the development of trust, both emotive trust and capacity trust (trust in the producer or engineer's technical competence). A productive studio

session is not just about the technical practices associated with recording; it is essential that producers and engineers develop good relationships with the musicians they work with. This focus on the 'vibe' of the musicians in the studio can be seen in the quote below from the engineer Andy Johns who trained at Olympic:

> In those days no one really taught you to do anything – the only lessons you really got were making the musicians happy. A lot of the situations I was in, there was no producer – there was the band and there was me. And my job was just to keep them happy. (Johns cited in Stevenson, 2004)

These relationships often must be developed in a short and intense period of work (Watson, 2015). The producer and engineers must also be tolerant of client behaviour, particularly in terms of alcohol or drug consumption, as the consumption of alcohol and drugs may facilitate the right 'vibe' (Watson, ibid).

> This 'vibe is considered to be a combination of a relaxed atmosphere and an open and creative relationship between the producer/engineer and artist, thereby making the process of recording enjoyable, and encouraging musicians and recording artists to give their 'best' performance. (Watson, 2015, p. 2911)

The more formal relationships of craft-union mode were no longer appropriate when entrepreneurial mode and then art-mode emerge, studios like Olympic, Trident and Sound Techniques focused more on fostering a creative 'vibe' than the major-label facilities. The more autocratic relationships evident in the major studios were also out of step with the changes in social relations and attitudes to authority that occurred in the 1960s (Thompson, 2008). However, the cultural disparity between major label studios and the independent studios seems to have continued for some time, as one respondent commented "There was certain corporate mentality when you were in large studios, even in the late '70s and '80s. There was certainly a formality about

places like Abbey Road." (Wood, 2013) [52] Possibly the most influential independent studio of the period was Olympic, which was established in 1957 by Angus McKenzie and the engineer/technician Dick Swettenham (Grant, 2011). [53] The first incarnation of the studio was in London's West End. Keith Grant joined the staff as an engineer in 1958; he started his career at Regent Sound before moving to IBC for a year prior to joining Olympic. Grant left IBC under acrimonious circumstances and made a point of taking his clients with him (Grant, 2011). [54] In the independent sector, building lasting personal relationships with clients was a facet of the service culture in the sector. Grant was appointed manager of the facility after a couple of years of working there, partly because of the number of clients who came specifically to work with him. Olympic had a wide range of clients, including independent producers, pop bands, advertising jingle work, TV and film work. Grant commented on the range of clients when interviewed:

> The whole lot, I set my heart on taking all my clients from IBC, which I did, they weren't all publishers by then, Decca, Pye all that crowd, Tony Hatch was a mate. A lot of Pye stuff, George Martin was in as a regular, Joe Meek was in all the time. (Grant, 2011) [55]

In 1964 McKenzie was informed that the lease on the studio would not be renewed, Olympic had to relocate as the studio was going to be demolished. At this point in time "Olympic had made its way to the forefront of the independent studios and was the busiest and most popular" (Grant cited in Jopson, 2009, p. 39). A sizeable derelict television studio belonging to Guild TV, in Barnes, was eventually selected by Grant as a suitable recording space, and was purchased by Olympic. The new and

[52] Personal Communication (23/02/13)
[53] Personal Communication (17/08/11)
[54] Personal Communication (17/08/11)
[55] Personal Communication (17/08/11)

substantially larger facility was partly designed by Grant's father Robertson Grant, an architect (Grant, 2011). [56] When Olympic relocated, Studio Two became unexpectedly popular with rock bands. "We opened Studio Two up as a wing to Studio One probably in '68 but we never, for one second, imagined that the groups would want to go in it" (Grant cited in Frost, 2012). The new Studio Two décor was designed by Mick Jagger, which illustrates the close relationship the studio had developed with the popular musicians of the period. The atmosphere of Olympic endeared the studio to the musicians that used the facility, who often socialized there when they weren't working: "They used the place as a floating nightclub base. From one o'clock in the morning there could be anybody in there. They'd just turn up to hang out and then get involved in each other's sessions" (Grant cited in Frost, 2012). The independent studios offered a far more amenable environment than the corporate studios, possibly due to the industrial origins of the corporate studios.

> There weren't really any amenities at Abbey Road... In contrast, when they went into Olympic or Trident, there would be large control rooms with plush leather sofas and comfortable chairs to sit in, all accented by low lighting and a modern décor. (Emerick & Massey, 2006, p. 199)

When interviewed, Grant noted that some of Olympic's business came directly as a result of the atmosphere and facilities at Olympic, as it offered a contrast to the working environment in the major label studios. Grant offered a specific example, "A lot of the Philips artists hated the Philips studio, absolutely loathed the Philips studio, it was a difficult room to sing in and work in, so Dusty would do anything to get out of recording in Philips" (Grant, 2011). [57] When asked if Olympic was a different environment to a corporate studio, Grant (2011) [58] commented, "We were

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[56] Personal Communication (17/08/11)
[57] Personal Communication (17/08/11)
[58] Personal Communication (17/08/11)

hooligans, absolute hooligans". [59] Artists much preferred the looser atmosphere; despite this contrast to a corporate facility Olympic was professionally run and featured state of the art equipment. The hierarchical structure of the corporate studio was replaced by a more cooperative approach. "We were all equal and nobody was actually in charge. You knew what you had to do and you did it. The arrangement worked and it was fabulous. It was absolute, hysterical fun, and the bands loved it." (Grant cited in Frost, 2012).

The recording studio business was potentially lucrative in this era, as the hourly rate that could be charged was high compared to the modern era (see footnotes for inflation adjusted figures). "£20 an hour we used to charge for Studio 1 in the early '60s" (Grant, 2011). [60] [61]The profitability of recording studios in the 1960s was confirmed by John Wood, "well yes, it was a profitable business, no two ways about it." (Wood, 2013) [62] Olympic's significant contribution to popular music and recording studio practice occurred in the 1960s and early 1970s, when there were still relatively few recording studios.

The Sound Techniques Studio was set up in a converted dairy in Chelsea, London by Geoff Frost and John Wood and opened for business in 1965. Both engineers had previously worked at Levy's Sound Studios. In his role as Chief Engineer at Levy's, Frost had taken the lead technical role building and maintaining the studio's equipment, as well as engineering sessions. Wood had worked as a mastering engineer for Decca Records prior to his move to Levy's. Their decision to start their own venture was partly due to the fact that they wanted to be their own bosses and

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[59] Personal Communication (17/08/11)
[60] According to the Bank of England inflation calculator, the equivalent of £354 an hour at today's prices.
[61] Personal Communication (17/08/11)
[62] Personal Communication (23/02/13)

partly because Morris Levy had just sold his business (label, studio and manufacturing plant) to the American label CBS Records, leaving the pair unsure about their employment prospects (Wood, 2013). [63] Again, the ambience and culture of the studio was in contrast to that of the corporate studios of the time. "The atmosphere of Sound Techniques is something many of those who recorded there have talked about. It was laid-back and relaxed, with neither the clinical hospital-like feel of some studios, nor the indulgences of the rock-star lifestyle" (Frost, 2008). The musician Dave Pegg commented, "It was much funkier than places like CBS or Abbey Road, the bigger studios that people had spent lots of money on" (Pegg cited in Frost, 2008). In common with Olympic there was an informal relationship between the studio's staff and the clients as the musician Simon Nicol recounts below.

> It was a very social business too — I suppose in other places you might have ploughed a natural division between the band and the staff, but when we did take a break to go to the pub, we all went out together! (Nicol cited in Frost, 2008)

The studio initially struggled before picking up work recording 'elevator music'. Subsequently, they gained Elektra Records as a client, which then led to Elektra's office manager Joe Boyd becoming familiar with the studio. Boyd went on to become a successful producer and had a long working relationship with John Wood as his preferred engineer. "The way they worked was in no way your typical engineer/producer relationship — they worked in partnership" (Frost, 2008). Boyd set up his own independent production company Witchseason Productions, and licensed his output initially to Polydor, then subsequently to Island Records. In common with Olympic and other studios in the mid-60s sessions were often quite brief as the three-hour MU dictated format still held sway: "When we started Sound

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[63] Personal Communication (23/02/13)

Techniques we would be doing three sessions maybe four sessions in a day. In those days you'd two titles in three hours for a pop session" (Wood 2013). [64] Relatively unusually for a British studio, Wood built up a pool of session musicians from the folk-rock bands that he recorded, these were used on a considerable number of records and functioned as a house band. This was similar to the way American independent label studios such as Chess, Motown or Stax operated. This also helped to give their recordings an individual identity. Wood avoided the 'usual suspects' from the session musicians available at the time. "The regular session musicians that you got in the '60s, or the early '60s anyway, were very jaded — they really were quite snooty, a lot of them, and so I never really got them in" (Wood cited in Frost, 2008). Wood moved into record production when Boyd became less active as a producer; Sound Techniques operated successfully from 1965 to 1974.

In 1967 the brothers Norman and Barry Sheffield set up Trident Studios in Soho, initially as the in-house studio for the Centredisc label. The studio had its first hit record in 1968 with a Manfred Mann track, and subsequently went on to establish itself as one of the top studios in the world (Harris & Burns, 2012). Trident was launched during a surge in growth of independent studios; the Sheffield brothers converted the building into a multi-level recording complex. The studio was technically advanced, and also featured a powerful monitoring system, with two large Tannoy Lockwood cabinets each side. This monitoring system was also an important selling point to the young clients in rock bands as many studios (including Abbey Road), still relied on less powerful monitoring systems. Again, addressing the client's needs and desires was a facet of the independent sector, and was overlooked by the corporate studios. Trident Studios started a production company to develop

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[64] Personal Communication (23/02/13)

artists (notably the band Queen) who would then be sold on to a label; this created an innovative revenue stream for the studio other than solely relying on paying clients. Although the studio was successful and influential in the late 1960s, its heyday came in the 1970s. "Trident was the quintessential rock studio" (Frindle, 2005). The status of Olympic and Trident in the late 1960s is clear from Emerick's comments below on the completion of the building of Apple Studios in 1971:

> I was quite satisfied that we had indeed built a world-class studio. The proof would come when we opened our doors to clients, but I was confident that Apple would stand up to the very best of our competition: Trident, Olympic, EMI and even AIR. (Emerick & Massey, 2006, p. 328)

In the early 1960s Emerick was unaware that there was an independent studio sector, yet by the early 1970s he acknowledges that Trident and Olympic are at the forefront of recording practice in the UK, based on their work in the 1960s.

As with all the successful studios in the era before multitracking completely changed the fundamental approach to recording, the individual quirks of a particular recording space gave each studio a unique sound, or in other words, "a record sounded the way it did because of the musicians and the room in which it was recorded" (Varnals cited in Cunningham, 1998, p. 99). The live rooms of studios contributed to the sounds they produced as the natural leakage between microphones would allow the room's character to impact on the recordings. The idiosyncratic variations between studios were a continuation from the era of acoustical recording where there weren't fixed standards and engineering practices were based on experimentation (Horning, 2013). In this era each studio was very different, both in terms of design and the studio technology. When asked if Olympic was in competition with Abbey Road, Grant replied, "I don't think so, because all the studios in London were very different" (Grant cited in Jopson, 2012, p. 39). The variety of mixing desks and ancillary

equipment in each studio, different engineering practices, and the idiosyncrasies of the recording spaces meant that the studios of the 1960s sounded very different. Confirming Grant's comments above on the early studios all having their own individual sonic identity, the combination of equipment, engineers, session musicians and the idiosyncratic acoustic space used as a recording area combined to give the recordings made at Sound Techniques an individual character, "people have referred to it as the John Wood sound or the Sound Techniques sound" (Frost, 2008).

There were significant differences between the financial arrangements of corporate and independent studios. As can be seen from the independent studios' clientele mentioned above, they attracted a wide range of clients, which was necessary, as they did not have the backing of a large corporation and a guaranteed supply of work. The corporate studios were part of a vertically integrated system and didn't need to run at a profit. Leyshon (2009) notes that only artists signed to the parent company's label could use the corporate studios, and that the corporate studios were often not used to full capacity. Unlike the independent studios they were not run as profitable businesses in their own right. One of Leyshon's (ibid) respondents observed that Studio 1 at Abbey Road was often unused and available for other activities; the respondent noted that staff would play badminton in the studio or even service their cars in the recording area, this pattern of use continued for some time. Abbey Road was not run as a stand-alone business until 1979, when it was made available to non-EMI artists and independent producers (Leyshon, ibid). In the independent sector a studio was by necessity run as a commercial business, which required a wide range of customers, repeat business and the forging of close relationships between staff and customers. Again, the service ethic that defined studio culture in later years had its origins in the independent sector, as these

businesses were reliant on satisfying their clients and gaining repeat business on merit, unlike the label-owned studios.

Centres for Technological innovation

As the independent studios were institutionally more flexible, they responded to technical developments more quickly than the corporate studios, they were also significant centres of technological innovation. Trident, Olympic and Sound Techniques developed their own mixing consoles, and manufacturing businesses were subsequently established which commercially exploited their in-house technology. In the case of Sound Techniques and Trident these businesses were an offshoot of the studio's core business of recording. After designing a number of innovative consoles for Olympic, the studio's technical director Dick Swettenham left to set up his own console manufacturing business Helios in 1969. These companies and other market entrants laid the foundation from which the UK's professional audio sector developed. Although some independent studios had purchased EMI consoles in the late '50s, the innovative consoles introduced by the independent studios supplanted EMI's products. Olympic and Trident also proved to be significant training environments for a considerable number of technicians and engineers, who then went on start other studios, or to become significant figures in the industry. There was a considerable diffusion of tacit knowledge and technical expertise from the independent studios, as unlike the major label studios there were no restrictions on staff leaving and working in other studios, or any ownership of proprietary techniques. For example, an innovative recording technique developed by the engineer Glyn Johns (and subsequently named after him) whilst he was working at Olympic made its way around the recording community when the session

drummer Dave Mattacks described it to other engineers: "Dave Mattacks had come down to the studio one day for a session following some work at Olympic and showed us how he'd been recorded there" (Tsangarides cited in Buskin, 2012b).

Leyshon (2009) notes that the introduction of freelance work (for both engineers and producers) and the growth of the independent sector facilitated the diffusion of tacit knowledge. Horning (2004, p. 707) defines tacit knowledge as "the unarticulated, implicit knowledge gained from practical experience". Once electrical recording was introduced the appropriate use of microphones (both selection and placement) became one of the most important tacit skills that engineers needed to develop. As stereo recording and then multitrack recording was introduced the tacit skills required become more complex. The introduction of stereo recording and then multitracking required engineers to develop what Horning (2004) terms 'aural thinking': "It entailed a whole new way of listening to and 'envisioning' not only how the instruments should be miked, but how the overall sound should be planned or designed" (Horning, ibid, p. 714). The mental architecture of the sound engineer undergoes continuous change as multitracking evolves (Horning, ibid). Multitracking changed the job role of the engineer; "the demands and opportunities of multi-tracking rendered the recording engineer also a member of the creative team" (Horning, 2004, p. 715). The level of technical and tacit knowledge necessary to undertake the engineers' role changed throughout the 1960s, as the role shifted from craftsman to artist (Kealy, 1990). In both corporate and independent studios an engineer's training was usually in the form of an apprenticeship system, where a young person learned from watching and assisting a more experienced older practitioner. Most engineers extol the virtues of hands-on training as tacit skills are learned 'on the job' (Horning, 2004). The engineer Phill Brown clarifies this point:

> When I began work at the bottom of the studio hierarchy as a tape operator, I discovered that there was an informal system of apprenticeship in the recording industry. I was expected to learn by watching and listening while I made tea and performed other mundane tasks around the studio. (Brown, 2010, p. iii)

Once a substantial recording community develops in the 1960s it can be viewed as a community of practice, one in which ideas and techniques become widely shared. As Wenger details, "Communities of practice are not self-contained entities. They develop in larger contexts – historical, social, cultural, institutional – with specific resources and constraint" (Wenger, 1998, p. 79).

Engineers in the early 1960s were, by necessity, technologically knowledgeable; engineering staff had significant input in terms of advancing mixing console design, and even built studio equipment. When Olympic first opened they based the studio around a valve-mixing desk that had been purchased from a small studio in Fulham called 'Olympia'.[65] The studio's technical director Dick Swettenham then designed a transistorized mixing desk (apparently the first transistorized mixing desk) for the studio in 1960; this was installed alongside one of the first 4-track tape recorders in the UK (Grant, 2011). [66]

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[65] According to one of my respondents the first Olympic console was a modified BBC mixing desk.

[66] Personal Communication (17/08/11)

Early Swettenham Olympic mixing desk (n.d.)

When Olympic moved to the Barnes site in 1966, Keith Grant designed the new studio's acoustics, with assistance from the acoustician Russell Pettinger (in this period specialist recording studio design companies were yet to evolve). Olympic's Technical Director Dick Swettenham was given the task of designing a new mixing desk for the new studio, as "Part of running a studio in the '60s and '70s involved designing and building the equipment yourself" (Grant cited in Jopson, 2009, p. 42).

Olympic wrap-around desk (n.d.)

Swettenham designed a new 24-input 'wrap-around' console. In this era, electronic products such as mixing consoles were hand-wired and featured discrete components. [67] This mixing desk was highly innovative both in terms of its ergonomics and its technical performance. The desk was a result of considerable input from Olympic's engineers, this is an example of the co-construction of technology. One of the first approaches to draw attention to users was the SCOT approach. Pinch and Bijker (1984), in defining the SCOT approach, conceived of

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[67] A discrete circuit is an electronic circuit built out of discrete components, such as resistors, transistors, etc., instead of a single integrated circuit.

users as a social group that played a key part in the construction of a technology. When interviewed, Keith Grant claimed some input into the ergonomic design of the Olympic desk. "I did the ergonomics, the shape, which was a revolutionary shape, the wrap-around there were no other desks like that around, and he and I worked on what it sounded like, what the EQ sounded like" (Grant, 2011). [68] Grant (ibid) noted that Swettenham would produce a circuit and through extensive listening and experimentation the design would be gradually finalized, effectively a collaborative effort with the studio's engineers. [69] As well as considerable feedback from Olympic's engineers into Swettenham's early console design, his work was informed by his own empirical understanding of the engineer's role. Swettenham observes that he was "very certain that if he had not sat in the mixing chair for some years he would have been unlikely to produce a notable console" (Swettenham, 1982, p. 46). Within two years of the new Olympic studio opening in 1966, a remix room (which would later become Studio Three) and a second studio had been added to the complex, both were fitted with 'Olympic' desks hand-built by Swettenham and his team in their basement workshop (Grant, 2011). [70] The volume of the rock bands in Studio Two subsequently caused some disruption to orchestral sessions in Studio One, Grant's father was consulted and Studio Two was rebuilt and the whole structure was 'floated' to decouple it acoustically from the surrounding structure. This was a highly innovative studio design for the period. "It was very impressive, particularly in those days, because that sort of acoustic architecture hadn't really come into its own in any way'"(Grant cited in Frost, 2012).

Olympic worked as a co-operative in terms of sharing technical innovations and recording techniques. Any new production or engineering technique that was

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[68] Personal Communication (17/08/11)
[69] Personal Communication (17/08/11)
[70] Personal Communication (17/08/11)

discovered would be shared with all the staff. For example, engineer George Chkiantz discovered how to create tape flanging in 1967 on a Small Faces track (Itchycoo Park); he shared the technique with the other engineers the next day (Grant, 2011). [71] As well as being a centre for technical innovation, Olympic acted as a training ground for several generations of technicians, engineers and producers. This was particularly significant from the late 1960s onwards as the staff went on to set up or run other studios, or start pro-audio businesses. Ex-Olympic technical staff set up the mixing desk firms Helios (Dick Swettenham), Cadac (Clive Green) and Raindirk (Cyril Jones). Ex-Olympic engineer Roger Quested set up the loudspeaker firm Quested Monitors. Some of the technical staff went on to build other independent studios; for example, the ex-Olympic engineer Terry Brown was involved in setting up Morgan Studios in 1967, and the inception of both Island and Rak Studios involved significant input from ex-Olympic staff: "Jo Yu helped build Island Studios, Basing Street during 1969; and Hugh Tennant built RAK Studios for producer Mickie Most in the early 1970s" (Brown, 2010, p. 2). In the case of the console manufacturer Helios, Swettenham was head hunted by Chris Blackwell as he wished to start a studio for Island Records, Blackwell funded the start of the Helios business so that he could source mixing desks for his own facility of a similar quality to those at Olympic.

> Dick was approached by Chris Blackwell and others, to set up a company building desks, as Chris Blackwell wanted to replicate Olympic, which is what he then tried to do at Basing St, which was a copy of Olympic. In as many ways as you possibly could, he even took the staff. (Grant, 2011) [72]

After Swettenham left Olympic, Cyril Jones took over the responsibility of building their consoles, and built the console for Studio Three. Grant effectively mentored a

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[71] Personal Communication (17/08/11)
[72] Personal Communication (17/08/11)

'who's who' of the British recording industry at Olympic Studios. "Most tellingly, Grant is frequently name-checked by at least three generations of top producers and engineers" (Jopson, 2009, p. 38). Effectively, Olympic Studios functioned as a training centre for the UK independent studio sector, both in terms of engineers and technical staff; a number of the engineers subsequently became successful producers. Brown (2010, p. iii) commented that it was a privilege to train as a tape operator under "such engineers as Keith Grant, Glyn Johns and Eddie Kramer".

There is evidence that techniques developed in the US were being learned by UK engineers, and these informed both practice and studio design. Sound Techniques was informed by ideas one of the founders had picked up by visiting studios in America, notably Bradley's Barn in Nashville. Frost and Wood oversaw the conversion of the studio and were also responsible for its acoustics. As a means of funding the venture Frost built the first Sound Techniques mixing desk, which they sold to finance the building of the mixing desk for their own studio (Frost, 2011a).

The first desk Sound Techniques manufactured (n.d.)

There was no grand design to move into equipment manufacturing, but Frost and Wood simply did not have the finance necessary to purchase a desk from anyone else in 1964.

> At that time most people either had to build their own stuff or adapt something else. Olympic originally adapted a BBC desk for their first desk. We made ours. In those days there was a fruitful supply of components in Lyle St in the West End of London, which had more than half a dozen shops all selling surplus components and equipment as a result of military surplus. (Wood, 2013) [73]

The original Sound Techniques 'Chelsea' mixer (n.d.)

The above image is the original Sound Techniques 'Chelsea' mixer built by Frost and Wood, this mixing desk generated considerable interest from other studios and Frost concentrated on manufacturing mixing desks for other studios from this point onwards, whilst Wood ran the studio, although Wood had some input into the design of the consoles. Again, the design of the console was directly based on input from users; in this case initially Frost & Wood themselves, who were both engineers, subsequently further input from potential clients influenced their console design. The mixing desks that Frost designed for Sound Techniques would also help characterise the sound of the records made in the studio and the recordings made at the other studios they supplied. Trident and De Lane Lea bought a succession of Sound Techniques mixers over the years, as did Sunset Sound and Elektra Studios in California. "We sold some in America and we sold a desk to the original Kingsway

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[73] Personal Communication (23/02/13)

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Studios where they recorded The Animals and Hendrix" (Wood, 2013). [74] With

regard to other studio equipment, they were limited by their budget, so they opted to

build as much as they could themselves. They could not afford complete Ampex

tape machines, so they managed to negotiate a deal in which they bought just the

heads and transports, leaving Frost to build the electronics for three machines — one

two-track, one four-track and one mono — which they housed in second-hand

consoles purchased at the BBC's redundant equipment stores in Chiswick (Wood,

2013): [75] "Yes, we just decided to use Ampex. In fact we built the electronics

ourselves to save money. We got the deck and built the rest" (Wood, 2013). [76] Frost

also built four monitor speakers using a design from electronics bible the 'Audio

Encyclopedia'. Many of the early studios built their own consoles and other studio

equipment, as a DIY approach was often a necessity in this period. As Wood notes,

"Apart from tape machines nobody in the UK really made equipment for recording

studio applications" (Wood, 2013). [77] There wasn't sufficient demand for recording

consoles for an equipment industry to fully develop until after the mid-1960s. There

wasn't a wide range of outboard processing equipment available in this period either,

although Sound Techniques initially purchased an EMI Limiter and Altec

compressors. "Nobody was really making anything in Britain which particularly

worked for recording studios. Pultec and Altec and Fairchild were all American

companies" (Wood, 2013). [78] Wood obtained the studio's Fairchild compressors

from an auction after Joe Meek died: "I never bought a new Fairchild, the two

Fairchilds I had were ex-Joe Meek. I bought them at the disposal sale after he shot

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[74] Personal Communication (23/02/13)
[75] Personal Communication (23/02/13)
[76] Personal Communication (23/02/13)
[77] Personal Communication (23/02/13)
[78] Personal Communication (23/02/13)

the landlady" (Wood, 2013). [79] The studio was updated steadily as multitracking became the norm: "We had a 3M eight-track, then we moved to a 16-track Studer, then to a 24-track Studer' (Wood, 2013). [80] As the amount of tape tracks expanded so did the complexity of the mixing desks they manufactured. The studio's impact was both musical and technical; the Sound Techniques consoles were available when it was still difficult to source a console. If an independent studio lacked the expertise to build a console, purchasing a Sound Techniques desk was an option. Consequently, the studio had a significant impact on the studio scene of the 1960s and early 1970s. A number of engineers also trained there; again, in common with Olympic some of these went on to find success working in other studios as either engineers or producers.

When Trident Studios opened, the facility was based around a Sound Techniques mixing desk, and when they built a dedicated mix room, they added another desk from Sound Techniques. Trident was technically very advanced from its inception, as "In 1968, it possessed a significant amount of cachet and boasted more modern facilities than Abbey Road" (Kehew and Ryan, 2006, p. 332). The corporate studios were outmoded in comparison to the successful independent facilities, George Martin comments that the EMI facilities at Abbey Road in the 1960s were "not particularly well equipped technically, and things were primitive" (Martin cited in Tobler & Grundy, 1982, p. 108). The Sheffield brothers visited America to buy the Ampex eight-track machine they initially installed, this was the most popular eight-track machine used in American studios (Kehew & Ryan, 2006). This machine was to become a significant selling point for Trident, as they could rightfully claim to be "the first eight-track studio in London". (Kehew and Ryan, 2006, p. 333). The

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[79] Personal Communication (23/02/13)
[80] Personal Communication (23/02/13)

prospect of using an eight-track recorder when Abbey Road was still using 4-track machines lured The Beatles to Trident in 1968 and they recorded there a number of times in 1968 and 1969. [81] The association with The Beatles helped Trident to attract further business (Kehew & Ryan, 2006). In 1969, the studio installed a 3M 16-track tape recorder, "making them once again the first in the UK with the latest format" (Kehew and Ryan, 2006, p. 336). They also installed the first Dolby noise-reduction system in the UK, this system reduced tape hiss and became commonplace in studios a few years later. Apparently space was a problem in the relatively small control room at Trident, to accommodate the possibilities offered by the new 16-track tape machine the studio needed an expanded mixing desk of concise dimensions (Harris & Burns, 2012). After consulting various manufacturers to consider available products two of the studio's technical staff (Malcolm Toft and Barry Porter) decided to build their own console. After a year of experimentation Toft and Porter came up with the Trident A-range mixing desk. This was a result of considerable input from the studio's engineers, in a similar process to that of Olympic, the technical staff and recording engineers collaborated closely to arrive at a console that sounded satisfactory to the engineers (Harris & Burns, 2012). Users, especially those with an input into the products, can be seen as "agents of technological change." (Oudshoorn & Pinch, 2003). As the console was being designed, other studios and producers heard about what was at the time a cutting edge item of technology, and placed orders for their own consoles, in total thirteen A-Range consoles were eventually manufactured. Consequently, Toft and Porter went into business as console manufacturers. "In 1971 Malcolm Toft played a key role in setting up Trident Audio Developments (TAD), an offshoot of Trident Studios established to build and market

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[81] Abbey Road had obtained 3M eight-track machines by 1968, but were still evaluating and modifying them.

professional studio recording consoles, most notably the infamous Trident Series 80B, among many others" (Robjohns, 2008). The manufacturing company ran successfully for some years and developed and sold a range of consoles. A number of well-known engineers and producers are associated with Trident, notably Ken Scott (who left Abbey Road to work there) and Roy Thomas Baker, who made the transition from engineer to producer whilst at Trident.
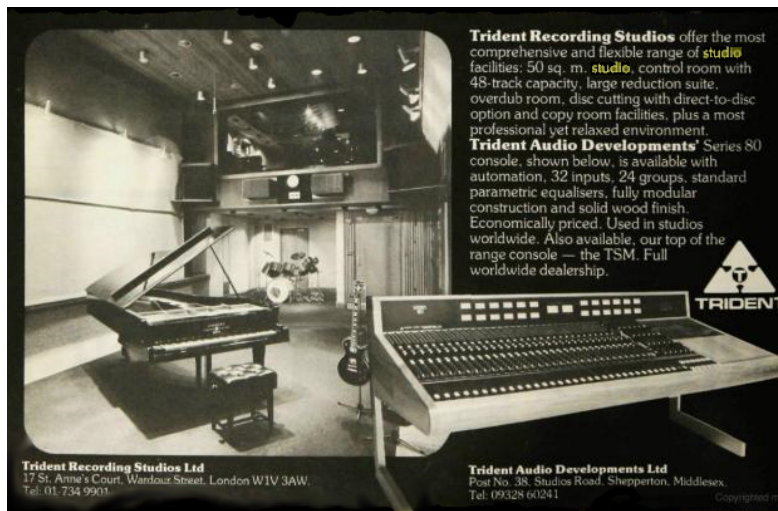
Trident advert (n.d.)

Technological Innovation In The 1960s

I will now summarise the key innovations in the recording technology of the 1960s and its impact on studios and practice. As noted earlier, the studio sector has a symbiotic relationship with the record industry; but as Watson (2015) observes, the history and evolution of the recording studio is also shaped by technological developments. So, on one level the growth of the studio sector was driven by increased revenue from popular music sales, but technology of the era also shaped the growth of the sector and influenced production methods. Burgess (2014, p xiii) observes, "Music production exists because of recording technology". Developments in recording technology incrementally offered producers and engineers more options and greater control over recorded sound. Multitrack recording had a significant

impact on production practices and UK studios progressed from 4-track to 16-track during the 1960s. In America, 8-track recorders were introduced in 1957 with Atlantic Records being the first label to purchase an Ampex 5258 machine in 1958 (Burgess, 2014). British studios were some years behind in adopting multitrack technology and the groundbreaking Beatles' album Sgt. Pepper's Lonely Hearts Club Band was recorded using two 4-track machines in 1966 and 1967 at Abbey Road. The 8-track tape recorder became the standard studio tape machine in the UK in the late 1960s, and was supplanted at the end of the decade by 16-track recorders. As Johns attests, "In 67-69 it went from 4-track to 8-track, then by '71 everyone had 16-track." (Johns cited in Stevenson, 2004).

Trident Studios were at the forefront in terms of introducing the latest technology; for many years the track count of a studio determined its status, consequently owning the latest technology helped to position a studio in the market. The producer Mike Chapman noted that the rapid change in recording technology presented challenges to studio practitioners in terms of adapting to the possibilities offered by higher track counts. "I can remember studios going from four-track to eight-track to sixteen-track almost overnight, and as a producer, you have to be aware of the changes, because otherwise you can get left behind very quickly" (Chapman cited in Grundy & Tobler, 1982, p. 200). As well as the technical challenges, the conceptual nature of recording was radically altered by multitracking. Multitrack technology allowed for individual instruments to be recorded separately, a process that becomes known as overdubbing. The recorded tracks were then "combined, electronically enhanced, and balanced during the "mixdown" session" (Theberge, 1997, p. 215). Theberge (ibid) views this process as a rationalization of the group performance and social/musical exchange between the musicians. The performance became temporally fragmented as overdubs

could occur some time after the backing tracks were recorded, and recordings were spatially fragmented as overdubs could occur in any studio with a compatible multitrack machine. Multitrack technology radically altered the composition and recording of popular music, as Theberge observes, "Pop songs were no longer simply composed, performed, and then recorded. More and more, the studio became a compositional tool in its own right" (Theberge, 1997, p. 215). As noted by Frith (1990) by the end of the 1960s the studio was effectively the most important rock instrument. "The release of the 'The Beatles' 'Sergeant Pepper' LP in 1967 symbolised the moment when rock musicians began to claim to be making complex artworks" (Frith, 1990, p. 271). Despite being made using 4-track technology, the extensive use of overdubbing, track bouncing, editing, and the general studio experimentation on Sgt. Pepper (and the Beach Boys 1966 album Pet Sounds) set a benchmark for the possibilities of the multitrack studio. With the introduction of multitracking and other advances in studio technology, the roles of the engineer and producer became more significant, as the technology facilitated greater control over the overall musical texture (Theberge, 1997). Multitrack recording offered the engineer and producer considerably more control, and musicians' performances became less important than the manipulation of individual tracks of recorded sound material. Brian Eno (cited in Theberge, 1997) observed that recording became an additive process after multitracking was introduced, and that in-studio composition started to become commonplace.

> You can begin to think in terms of putting something on, putting something else on, trying this on top of it, and so on, then taking some of the original things off, or taking a mixture of things off, and seeing what you are left with-actually constructing a piece in the studio. (Eno cited in Theberge, 1997, p. 215)

Theberge (1997) notes that Eno's comments make explicit that fact the technology of sound recording had become productive, not simply reproductive as in the case of direct-to-disc or simple tape recording.

The multitrack tape recorder consequently played a major role in the reorganization of the production of popular music. After multitracking was introduced the design of new studios reflected the need for greater separation and control over the reverberation of the recording space. Isolation booths for instruments or performers became commonplace to attempt to control and isolate the sound from each instrument or performer. Performers had to adapt to the constraints of spatial and temporal separation as they were used to playing together at once (Theberge, 1997). Multitracking is also associated with the rise of the entrepreneurial independent producer (Kealy, 1990). Kealy (ibid) considers that multitracking gave the rock musicians greater control over the recording process, as they could be involved in mixing the final version of their work. When recording to mono or two-track the final mix was accomplished at the time of the performance, consequently the musicians had little input into the final mix. Initially, the compositional opportunities offered by multitrack recorders were the prerogative of the producer, whose aesthetic judgement prevailed in the studio (Theberge, 1997). The producer in both entrepreneurial mode and art-mode acts as an intermediary between the artist and the marketplace (Kealy, 1990; Hennion, 1989). Hennion (1989) considers that the studio became the 'laboratory' of the producer, a site where experiments, trial-and-error tests and evaluations take place. Hennion (1989) makes a correlation between the isolation of the musicians from each other in the soundproofed studio environment, and the isolation of the studio from the outside world, and refers to the studio space as an artificial universe designed to avoid distraction from the outside world. In this

environment the producer represents the general public or target audience, as a key intermediary the role of the producer is never passive (Hennion, 1989): "In essence, their authority is based on the assumption that they will deliver hits because they listen with the ears of the consumer" (Theberge, 1997, p. 217).

The producer's control of aesthetic decisions was in some cases resented by musicians and engineers. Theberge (1997) observes that this led to engineers and musicians seeking greater control over the production process. This power struggle led to artists gaining greater control and artistic freedom, the eventual realisation of Kealy's (1990) art-mode. This quest for agency led to "the early artist-owned studios of the 1970s; and this step was the first and perhaps the most decisive one toward the idea of the "home studio" of the '80s" (Theberge, 1997, p. 219). Studio technology and practice developed rapidly from the mid-1960s onwards and the UK sector was successfully competing for business with American studios by the start of the 1970s. UK studios were no longer hindered by import restrictions or problems sourcing equipment. British producers and engineers had stopped attempting to copy American production and engineering techniques by the late 1960s and the UK studio sector began to develop an international reputation (Billboard, 1971c).

> Everything was there – all the technical knowledge and the best equipment, coming from both England and Germany – we had it all, so why were we wasting our time and getting bogged down trying to copy the Americans? And that was when we started to get our own sound, which was a complete turnaround, because then the Americans said, "What are they doing over in Europe? We must all go to England to record. (Thomas Baker cited in Grundy & Tobler, 1982, p. 211)

This development was a combination of the growth of the studio sector in this period, the standard of UK studio equipment and the expertise of the engineers and producers who had developed their own techniques to record and mix popular music.

The following discussion will now examine developments in console technology in the period.

Mixing Console Technology

Mixing console technology developed considerably in the 1960s alongside the introduction of multitrack tape recorders, and there was general shift from valve technology to transistor technology in both tape machines and consoles. As discussed above, key independent studios were involved in developing console technology. As Arthur (2009) notes, technology is rarely the sole work of an individual, in practice, groups of inventors will have envisaged the principles behind a technology at roughly the same time and made attempts at working versions. Console designers incorporated ideas from a variety of earlier designs, and built on the work of other technologists, such as the development of the vacuum tube and then the transistor, which were the building blocks of electronic devices. Arthur (2009) notes a key characteristic of modern technologies is that they can be combined and configured endlessly for fresh purposes. The core elements of a console, pre-amp, EQ, faders, panpots, busses, dynamic control etc., were continually reconfigured and incrementally improved. Although EMI had introduced the REDD console in 1958, which for the time was relatively advanced, simple consoles with rotary faders were still in use in the early 1960s as can be seen in the image below of an engineer working in Pye Studios in 1963.

Pye Studios 1963 (2012)

A significant development in mixing desk design was the transistor (or solid-state) console Dick Swettenham developed for Olympic Studios in 1961. This console was a bridge between earlier console architecture and later designs and was developed prior to Rupert Neve's first transistor designs. The amplifier cassettes plugged into the rear of the console and were controlled on the front panel; there was equalization on each channel and a quadrant fader. [82] Routing was to four busses (to accommodate a four track recorder) signal metering was achieved using BBC-type PPM (Peak Programme Meter) meters. The desk allowed for a send to an external reverb unit and for a simple foldback mix to the studio for performers, controls for external valve compressors were integrated into the control surface of the console. At this point in the early 1960s four-track recording had just arrived in the UK and it was common to monitor using four speakers, a convention that was abandoned when eight-track recording was introduced (Swettenham, 1982). British console designers responded to the possibilities offered by multitrack tape and to the requirements of

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[82] Linear faders were subsequently introduced later in the 1960s.

engineers and producers. Interestingly, when recording was predominantly live the engineer was often operating the console whilst standing, which meant that early consoles were often higher than in later year, as Price commented, "You would definitely be on the balls of your feet at all times whilst recording. Not sitting back in a comfy armchair." (Price cited in Michie, 2000).

EMI introduced the solid state TG 12345 console in 1968; this was designed to work with 8-track tape machines and featured EQ on every channel and a compressor/limiter on each channel (Ryan and Kehew, 2006). This console was the result of liaison between the Abbey Road staff and engineers from EMI's Central Research Laboratories. EMI were relatively late in introducing solid-state technology and more complex consoles; technical staff working in independent studios had already developed innovative mixing desks specifically designed for recording multitracked popular music. Popular music recording and mixing started to drive audio engineering innovation in the 1960s, notably as the aesthetic of recording changed from documenting an event to creating an audio illusion. This transformation of the aesthetic of recording was a significant change, and was at least in part influenced by technological developments. "By the mid-1960s, most popular recording had rejected any notion of fidelity to live ensemble performances in favor of studio creations or, what one producer called, "the sound that never was"" (Horning, 2013, p. 172). When eight-track recording was introduced, desks began to feature a 'track monitor mix system'. "Each track, buss or tape, then acquired a fader, slide or rotary, a pan position switch or pot, and a mute/solo switch" (Swettenham, ibid). This allowed the engineer to solo individual tracks without affecting the recorded signal. Innovation of this nature was the result of Swettenham's (and other designer's) familiarity with the needs of engineers, and

requests by engineers and producers for specific features, again demonstrating the role of users in technological innovation.

EMI TG12345 (2014)

It was realized that a monitor mix acted as a preview of the final mixdown (minus any EQ and processing that may occur). So, console design was modified to help facilitate the producer's impression of the final mix, reverb sends were added to the track monitor channels, and switching was added that brought the corresponding reverb returns back into the monitor system only. Each development in tape recording from 4- to 8-, 16- and then 24-track required an update to the mixing console to accommodate the extra tape tracks and also to allow the playback of a rough mix. "To be able to hear it as if it was a final mix made those mixers very, very, complicated." (Palladino cited in Horning, 2013, p. 203). The input modules were generally placed to the left of the master section, and the group or monitor modules usually placed to the right of the master section. Interestingly, this shows that desk design was now facilitating hands-on control by both the engineer and the producer. The layout of consoles was particularly important in terms of the console's ease of use, "as mixing became a more integral part of the recording process, the

layout of a console's knobs and faders could help or hinder an engineer's job" (Milner, 2009, p. 166). Meanwhile, demand had grown for more complicated equalization, up until the early 1970s the norm was for treble and bass shelving EQ with a switchable mid-range peak allowing the choice of one of a few manufacturer-determined frequencies (Swettenham, 1982). Unless there was a significant issue with the audio signal this was deemed an adequate configuration. Swettenham developed a more advanced EQ for Olympic Studios in 1964 through extended listening tests with the studio's engineers.

> He *[Swettenham]* would produce a circuit and I'd listen to it, he'd change it and I'd listen to it again, we'd go backwards and forwards until we'd got something that he liked to make and I liked the sound of. (Grant, 2011) [83]

Grant's input into the development of the console's EQ demonstrates that users can be said to share a technological frame with the equipment's designers (Oudshoorn & Pinch, 2003). This design was then modified further to allow the engineer even more precise control. More frequency steps were added to the mid range EQ until the limits of the switches available were reached. Swettenham (1982) notes that each manufacturer had a 'pet' list of centre frequencies, as a larger amount of choice of frequencies became available it became difficult to represent them graphically on the desk. As a consequence the sweep frequency or parametric equalizer was developed, this allowed the centre frequency of the EQ range to be selected by the engineer rather than the manufacturer (Swettenham, 1982). Variable sharpness of peaks ('Q') was added to the sweep EQ, which gave the engineer the opportunity to select the ideal EQ curve for any situation. This meant more knobs on the channel, and was usually achieved with a dual concentric knob, where the Q and boost or cut was on different rings (Swettenham, 1982). The mechanically detented potentiometer was

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[83] Personal Communication (17/08/11)

introduced, as settings could then be reproduced as the user could feel the knob click through the possible choices. To summarise the development in console design in the 1960s, transistor technology was introduced, and mixing consoles became incrementally more complex to accommodate the requests of producers and engineers to add more features and increase their control over the sound of recordings. Consoles also grew in size to accommodate the extra channels and facilities that multitrack recording and monitoring a rough mix required. As Arthur (2009) observes, technologies tend to become much more complex as they mature. It can be argued that the technological innovations introduced in the 1960s had a considerable impact on the music of the era. Arthur (2009) considers that technology is not just the product of an era, but can create the era. Multitrack technology facilitated the production of the album-oriented rock music that emerged in the 1960s: "Rock invention, then, is inseparable from both the use of technology and from musicians' attempts to control their own sounds" (Frith, 1986, p. 273). Rock music relied on recording technology for its creation, and the studio effectively became a meta-instrument in the 1960s.Indeed Gracyck argues, "Rock's primary materials are often the available recording and playback equipment" (Gracyck, 1996, p. 75). Technological innovation in this period impacted on the introduction of the entrepreneurial mode of production and subsequently the emergence of art-mode (Kealy, 1990).

Technology Manufacturers

A number of new studios opened in the 1960s and the introduction of multitracking meant that mixing consoles had to be replaced each time tape recorders with higher track counts were introduced. As a consequence of the increased demand for studio

equipment, a professional audio sector gradually developed in the UK to service the emerging demand. The album format was by the mid-60s the dominant delivery medium and, post 'Pet Sounds' and 'Sgt. Pepper', studio experimentation became a key part of the recording process (Horning, 2013). The focus on experimentation with recording techniques and innovative audio processing also drove the emergence of a growing market for studio equipment, as studios needed to maintain technical currency. As explored above, the major label studios manufactured equipment and would in some cases sell it to third parties; key independent studios also became involved in manufacture, and there were a small number of firms operating on the periphery of professional audio manufacturing prior to the 1960s. Of the independent studios that became involved in manufacture, only Sound Techniques made a notable impact on the studio scene of the 1960s, as their consoles were bought by a number of other London studios from 1965 onwards. Trident's consoles became commercially available in the early 1970s, and Helios (ex Olympic) only started trading in 1969 at the end of the decade. Despite growth in the sector and the introduction of multitracking, there was still a limited demand for mixing consoles and ancillary studio equipment due to the relatively small size of the sector. Consequently, the UK's professional audio sector developed quite slowly in the 1960s, much more rapid growth occurred in the next decade.

One of the most successful new entrants to the market was Rupert Neve's company. The growth of the studio sector in London intersected with the start of Neve's console business and provided Neve with potential customers. "Studios, certainly in the London area, a number of studios grew up competing with each other for quality and studio usefulness" (Neve cited in Rupert Neve Designs, 2014d). His initial designs were valve-based and his first studio client in the early 1960s was Recorded

Sound Studio in London (a 10 into 2 mixer), the order necessitated incorporating features Neve was unfamiliar with, such as foldback sends and reverberation sends. Neve's customers started to ask for features that could not be accommodated in a tube mixer, as the circuits would be too bulky, so Neve began experimenting with designing and building a transistor-based circuit (Rupert Neve Designs, 2014b). Neve manufactured his first solid-state (transistorized) console in 1964 for Philips Records. Neve's original commission from Philips had been to build some pre-amplifier/equalizer modules (Rupert Neve Designs, 2014b). The studio had the option to source a desk from the parent company in Holland but the quoted price was considerable and the desk would apparently take two years to build. The quotes the Philips studio had received to build a console ranged from £1,500 to £12,000. [84] Ron Godwin (chief engineer at Philips) asked Neve to tell him which bid to accept from the various quotes he had received for a new console, Neve suggested his company could build the console, and then quoted a sum of £4,300, with no actual idea of what it would cost him to make the desk (Neve cited in HorsPhaseMagazine, 2013). [85] A significant problem faced by early console manufacturers was sourcing suitable components. The order for the Philips console was complicated by difficulties in sourcing enough transistors from Texas Instruments, who were initially reluctant to sell what was then a cutting edge product to a small company operating in an emerging industry. The transistors were also relatively expensive at two pounds and ten shillings each (£45 at today's prices); much of Texas Industry's output at this point was apparently manufactured to fulfill government orders and the demands of the aerospace industry (Neve cited in Rupert Neve Designs, 2014b). Neve also had to liaise closely with the UK fader manufacturer Penny and Giles to develop an

[84] The quote Philips received of £12,000 is the equivalent of over £217,000 nowadays, allowing for inflation.

[85] £4,300 in 1964 is the equivalent of over £77,000 today when adjusted for inflation.

affordable linear fader, as sourcing the alternative option of German-made EMT (Elektromesstecknik) faders through an importer was prohibitively expensive. This process was instigated to develop a product that was superior to the quadrant faders that were commonly used in the UK at the time (Neve cited in Rupert Neve Designs, 2014c).

Philips 8 Channel Neve Studio Mixer

Neve console for Philips Studio.

In the early days of the company all of Neve's consoles were custom-built using a wide variety of components, which caused issues in terms of manufacturing the consoles profitably as each was individually unique. Consequently, the modules used in the desk became standardized (1073, 1063, 1066 modules). Neve still worked closely with each client to design a custom product but the consoles were now built to order around standard modules.

> I think one of the reasons we succeeded where many others didn't succeed was we didn't just say yes, yes, yes, to everything they asked for. We discussed at considerable depth what it is they were trying to do, and it made them focus on aspects of recording they had taken for granted. (Neve cited in Rupert Neve Designs, 2014d).

Consoles in this period were usually custom-built and hand-wired, which significantly added to their cost and made their manufacture time-intensive.

Helios entered the console market when Swettenham left Olympic Studios in 1969 and set up the company to manufacture his designs, initially after an approach from Chris Blackwell, who needed consoles for his proposed Island Records recording complex, Basing Street (Grant, 2011). [86] The original Helios desks were based on the Olympic console designs until Swettenham added integrated circuits in later iterations. "Once Dick started Helios, they were his designs, his updates, but they were all based on the Olympic desk" (Grant, 2011). [87]. Helios manufactured consoles from 1969 to 1979. Another console manufacturing company that entered the market in the late-1960s was Cadac. In 1967 Clive Green (an ex-Olympic Studios technician) worked with Adrian Kerridge at Lansdowne Studios to replace all the valve components of an old EMI desk with solid-state technology and the pair also modified the desk for 8-track recording. The engineer Terry Brown (also ex-Olympic) had been employed to set up a new London studio Morgan. Brown initially wanted to buy the designs for the new desk that Green and Kerridge had built for Lansdowne. Green suggested that it would be a better idea if he built the desk and with two other partners started the company Cadac. When Morgan opened in 1967 it featured the first Cadac console. By 1969 Morgan had expanded and purchased a second Cadac console designed to work with a 16-track tape machine.

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[86] Personal Communication (17/08/11)
[87] Personal Communication (17/08/11)
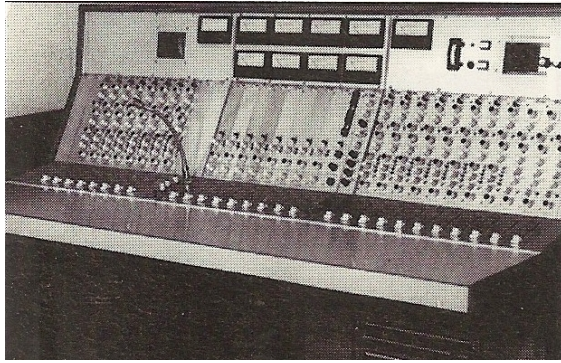
Cadac console 1968

Allen and Heath commenced trading in 1969 and the company was initially set up to exploit the skills of Andrew Bereza, who had been building small mixers for musicians and producers (Cooper, 2003a). The other partners were Ivor Taylor and Andrew Stirling who subsequently contributed to a number of other British audio companies. Another UK manufacturer that commenced trading in this period was Audio & Design (Recording). The company started in the mid-1960s and became a leading British manufacturer of audio signal-processing equipment for the music and broadcast industries. The company acquired a reputation for high-quality dynamics processors, equalizers and other outboard processors, which mostly featured discrete transistor-based circuitry (Robjohns, 2014b). Audio & Design were the first UK professional audio company to concentrate on manufacturing studio outboard equipment and their products were sometimes integrated into Helios consoles. So, by the end of the 1960s there were a number of UK console manufacturers and one company manufacturing outboard equipment. The companies discussed above contributed to the expansion of the studio sector in the 1960s, as it was no longer necessary for a studio to have the in-house expertise to design and build a console and other studio equipment. From the base established in the 1960s both the studio sector and the manufacturing sector expanded considerably through

the 1970s. The emerging manufacturing sector contributed to the domain of audio engineering, as a range of new audio technologies become available in this era. Arthur (2009) notes that when new technologies spread through an economy, old structures (corporate producers, corporate studios, in–house equipment manufacturing) fall apart and new ones take their place (entrepreneurial producers, independent studios and labels, independent manufacturing).

Conclusion

I have argued that the emergence of independent producers and greater numbers of independent studios in the 1960s facilitates the shift from the craft-union mode to the entrepreneurial mode, and then subsequently to the art-mode in the late 1960s (Kealy, 1990). A fully realized art-mode becomes more prevalent in the 1970s once musicians routinely gained some input into the production of their music, and bands started to open their own studios. The shift from craft-union mode was a significant change in production practice and one that was closely related to changes in popular music, as self-contained bands predominated in the 1960s music scene. The introduction of multitrack technology also had an impact on the recording process and studio roles; studio technology clearly impacts on practice. Increased sales of popular music in the 1960s drove the expansion of the studio sector, primarily as labels had more money to spend on developing new artists and funding album projects. Recording projects also start to take much longer to complete as the aesthetic of recording changes from documenting a performance to creating an engineered performance, which had the effect of increasing revenue in the sector (Horning, 2004). The expansion of the studio sector created the conditions that allowed a professional audio sector to emerge. Once there were greater numbers of

studios, manufacturing businesses specifically aimed at professional studios became financially viable. By making mixing consoles more widely available, console manufacturers such as Sound Techniques, Cadac and Neve facilitated the further expansion of the studio sector. It becomes more straightforward to open a studio once the essential equipment is widely available, as it was no longer essential that studio staff have the expertise necessary to build complex technical items. By the end of the 1960s, once more studio equipment is available it becomes less essential to "understand how the equipment worked inside and out" (Horning, 2004, p. 721). The introduction and diffusion of new technology facilitates entrepreneurial mode, shapes the rock aesthetic and it also starts to reshape the vertically integrated structure of the recording industry (Kealy, 1990). A community of practice forms once there is a greater number of studios; tacit and technical knowledge spreads from the independent studios, which acted as training centres for the expanding studio sector. The independent studios explored above were particularly influential in terms of establishing a UK studio culture geared towards collaboration and a service ethic. The independent studios offered a working environment that was more in tune with the rock musicians of the period, and they were also innovative in their approach to recording practice. They were also very influential in terms of technological innovation; technology and practice coalesced in the 1960s and 1970s into what became termed the 'British Sound'. The audio equipment designer Rupert Neve observed that the expanding pop music scene in London offered his company an opportunity to develop and prosper, clearly the growth of the market for popular music drove the expansion of both the independent studio sector and the pro-audio sector. By the end of the 1960s significant changes have occurred in terms of technology, the market, industry structure, organizational structure, occupational

careers, and also in law and regulation. This was a decade of significant change to every aspect of the recording industry. Further developments in the market, the recording industry, technology and practice will be explored in the following chapter on the sector in the 1970s.

Chapter 3

The Studio Sector In The 1970s

Introduction

A recurring argument in this thesis is how the relationship between the market for popular music, and the aesthetics of production, impact on the success of the studio sector and the pro-audio sector. This chapter continues this line of argument by examining the ways in which these factors coalesced in the 1970s. It argues that the decade constituted a consolidation and continuation of the major trends that transformed the recorded music sector in the 1960s. The history of technological change is a constant theme throughout the thesis, specifically as recording technology impacts on practice. As Arthur (2009) notes, novel technologies arise from combinations of existing technologies, and "If we want to know how they relate to each other, and how they originate and subsequently evolve, we need to open them up and look at their inside anatomies" (Arthur, 2009, p. 14). To understand what drives technological innovation and change requires discussion of the core technologies. This chapter will consequently continue to explore the development of mixing consoles and recording technology.

There were a number of significant developments in the studio sector in the 1970s. The sector expanded considerably, and the worldwide success of British popular music in the 1960s attracted clients from America and Europe to work in London studios from the late 1960s onwards. This influx of foreign artists established the UK as an international recording centre in the 1970s. Thompson (2008, p. 142) notes, "the phenomenal international success of British artists in the sixties made British studios the destination for musicians and producers from all over the world" The UK

sector was technically advanced by the early 1970s and in some cases studios incorporated new technology in advance of American studios. Kealy (1990) notes it was during this period that sound engineers began to be recognized as 'artists' in their own right and freelance employment for engineers became increasingly common.

The pro-audio sector expanded considerably in this decade and a number of new companies entered the market, UK pro-audio products began to sell in significant numbers worldwide. This industrial growth was also related to the success of British popular music, as UK studio technology became inextricably associated with the recordings of many of the successful rock bands of the 1960s and 1970s. A combination of technology and practice coalesced into what became termed the 'British Sound', which can be partially attributed to the design (and consequently the sound) of specific mixing consoles. In this decade mixing consoles from Neve and then SSL (Solid State Logic) become a standard product in many studios around the world. This widespread adoption of specific technological items combined with a gradual standardization of studio design and led to the emergence of the homogenous international multitrack studio (Theberge, 2004). Eventually there became little difference in technology or acoustic design between a British, American or European studio, this homogeneity commenced in the late 1970s. At the upper end of the studio market there was an expectation that every studio would have a 24-track machine and a large format console, and a selection of outboard equipment and microphones by well-known manufacturers. This commonality of acoustic design and equipment, allowed engineers and producers to change studios with little difficulty, as they no longer had to adapt to the idiosyncrasies of different equipment or acoustic spaces. This phenomenon of technical standardization started to occur in the latter part of the

decade and continued through the 1980s. Kealy's (1990) art-mode became full realized in the 1970s, and bands began to build their own studios, many of which were run commercially.

The studio sector stratified as it expanded; as studios updated their equipment older technology became available on the secondhand market and numerous smaller studios opened offering demo facilities and cheaper recording. Manufacturers also targeted the differentiated market segments with products aimed at high-end, mid and entry level facilities. Independent labels became a significant part of the UK recording industry in the 1970s, and in the punk era they often utilized the smaller studio facilities that were now to be found across the UK. Home recording started to become popular in the 1970s, and a small-scale industry developed to service the emerging market. The development of a market for home recording in this decade was a significant shift in the relationship between musicians and recording technology. From the 1970s onwards home recording began to impact on the professional sector. The chapter will argue that although the studio sector changed throughout the 1970s, in many ways the developments are less drastic than the changes of the 1960s. There was a consolidation of the radical changes in the market, organizational structure, occupational careers, and technology that had occurred in the 1960s. This manifested itself in two main ways. Firstly, both the studio sector and record industry itself matured and prospered during this period. Secondly, as a consequence of the rapid expansion of the studio sector there was a considerable growth in technology manufacture throughout the decade. In order to unpack these issues in more detail the chapter will now examine the market for popular music in the period, before going on to examine the studio sector in the 1970s, technology and innovation and the growth of the pro audio sector.

The Market

A brief examination of the increased sales of records in this decade is illustrative of an overall expansion in the recorded music sector during the period. This factor is significant in that a proportion of the revenue generated from record sales was then reinvested in the form of recording budgets, with clear benefits to the studio sector. This income subsequently filtered down to technology manufacturers as studios reinvested their income and updated their facilities. The labels' business model has shifted nowadays, but in this era large numbers of artists were signed, many of which were rock bands. However, it was (and still is) notoriously difficult for labels to accurately predict which acts will be successful; and the majority of artists that gained a recording deal did not succeed. Nevertheless, they were granted (and spent) a recording budget, revenue that was increasingly spent in the expanding independent studio sector. Effectively, the considerable success of a minority of artists paid for the failures of the majority and indirectly funded the expansion of the studio and technology manufacturing sectors. As Frith (ibid) observes, pop music is aimed at a large market, and rock music can be termed a pop genre; despite any notions of art, sincerity or authenticity, rock music is produced commercially for a mass market. Rock music was the dominant international genre throughout the 1970s and drove increased record sales, both in the domestic market and internationally, moreover, "In the 1970s, growth of the recording market continued to increase worldwide" (Tschmuck, 2006, p. 135). As can be seen from the BPI data below, singles sales drop throughout the 1960s, then increase steadily throughout the 1970s, by 1979 they have more than doubled compared to sales in 1970. Album sales peak in 1975, but despite some decline, at the end of the decade they are still almost double the sales figure of 1970. The sales peak in 1975 seems counterintuitive, as the

UK suffered a significant economic recession between 1973 and 1975. Horning states, "Between 1969 and 1973, the sheer number of studios and audio equipment manufacturers soared along with booming record sales" (Horning, 2013, p. 210). Although this observation is based on the American recording industry, exactly the same phenomenon was happening in the UK in the same period. As well as the considerable growth in UK record sales, the global boom in record sales benefitted labels, studios and technology manufacturers; this was a continuation of the growth in the sector that occurred in the 1960s. "The record industry, really, had exploded in the late 1960s on a worldwide basis and continued to do so right through the 1970s" (Winwood cited in Barfe, 2005, p. 260).

Annual Totals SINGLES UNITS (000s) - TRADE DELIVERIES					
	7"	12"	Cass	CD	Total
1964					64,000
1965					56,000
1966					46,000
1967					46,000
1968					44,000
1969					41,000
1970					41,000
1971					43,000
1972					46,200
1973					54,600
1974					62,700
1975					56,900
1976					56,924
1977					62,143
1978					88,847
1979					89,085

(Crutchley, 2014)

Annual Totals ALBUMS UNITS (000s) - TRADE DELIVERIES					
	LP	8-Track*	Cass	CD	Total
1964	24,000				24,000
1965	27,000				27,000
1966	28,000				28,000
1967	30,000	100			30,100
1968	39,000	200			39,200
1969	45,000	300			45,300
1970	49,000	1,000			50,000
1971	52,000	4,000			56,000
1972	59,300	3,200	4,900		67,400
1973	81,000	5,700	9,800		96,500
1974	89,500	6,200	14,000		109,700
1975	91,600	3,700	16,500		111,800
1976	83,794	2,246	15,967		102,007
1977	81,673	1,112	18,530		101,315
1978	86,060	584	20,604		107,248
1979	74,536	73	23,454		98,063

(Crutchley, 2014)

The independent label sector became particularly relevant in this decade and was a development in terms of industry structure. One of my respondents commented on the impact of the independent label sector on the sales of records and the growth of the studio sector. He considered that "the explosion of studios went hand in hand with the explosion in record sales, which went hand in hand with the explosion of independent labels" (Thompson, 2011). [88] The growth of UK independent labels in the 1960s was some years behind similar developments in the American record business and, as in America, this was facilitated by the independent studio sector. By the early 1970s the independent sector had become a significant part of the UK music business with B&C, Transatlantic, Purple Records, Dandelion, Island, Bronze, Chrysalis, Charisma, Rak, Blue Horizon, Fly, DJM, Penny Farthing, Threshold, Virgin and MAM all achieving success (Billboard, 1971d). As a contemporary business commentary noted: "The rapid growth of the independent record companies

[88] Personal Communication (17/08/2011).

in the United Kingdom has been one of the most interesting and productive aspects of the British record industry in the last decade" (Billboard, 1971d). These independent labels (except for the labels with their own facilities) were a key source of work for the studio sector, which when combined with major label work and foreign recording artists recording in the UK enabled the sector to expand and prosper throughout the 1970s. The independent labels may not have had the impact that Peterson and Berger (1975) observed in their research on the American recording industry, but they stimulated the UK recording industry and introduced a number of younger entrepreneurs to the industry. This influx of youth was evident to industry observers: "The aggressive, determined approach by the independents has added a much-needed stimulus to the industry, bringing in its wake new and imaginative ideas from what has been, in the main, a youthful band of company executives and producers" (Billboard, 1971d). Strachan (2003) notes that labels such as Island, Charisma, Virgin and Chrysalis were founded by young entrepreneurs of a similar age and outlook to the artists they signed.

Some independent labels opened their own facilities, Island opened Island Studios in 1970 (featuring two studios) and Virgin opened the residential studio The Manor in 1971 before opening the Townhouse complex later in the decade. The Manor was the second residential studio based in the countryside in the UK (Rockfield in Wales was the first). Mickie Most opened the Rak complex in 1976, again to complement his label Rak, which he'd founded in 1969. Chrysalis Records purchased Wessex Studios in 1975 and made it a sister studio to Air Studios in Oxford St, as they already owned a share of the Air Studios' business. Even though there were a considerable number of studio facilities available, these independent labels perceived that it was necessary to own their own studio facilities. This strategy had financial

benefits, as the labels could charge their signed artists for recording time in their facilities and they could also hire their facilities out commercially if they had free studio time.

Later in the decade there was a considerable expansion of the independent label sector based around the DIY aesthetic of punk rock. Numerous independent labels started up from 1976 onwards, and it also became a common practice for bands to self-release material on their own independent labels. Labels such as Stiff Records, Rough Trade Records, Mute, Red Rhino Records, Fast Product, New Hormones, Beggars Banquet, Postcard Records and Factory Records entered the record business and provided another source of income for the studio sector. Strachan (2003) considers that punk opened up access to music making and production, encouraged involvement in DIY production, and promoted the idea that production and distribution could exist outside the major label system. Strachan (2003, p. 54) observes that although the number of small labels operating in this era is difficult to accurately quantify, "there is no doubt that the upsurge in independent production was significant". In many cases punk bands and independent punk labels predominantly utilized the services of local studios, and the punk scene contributed to further expansion of the studio sector, particularly smaller facilities. The increased record sales of the period generated substantial revenue that filtered down to studios and pro-audio manufacturers. The following discussion will examine the considerable growth of the studio sector in the 1970s, as the sector both expands and matures.

An Era of Growth.

There were a number of key developments in the studio sector during the 1970s. Kealy's (1990) art-mode became prevalent and London became an international

recording centre. The studio sector stratified into distinct levels, largely predicated by the track count of tape recorders and the standard of equipment offered by studios. Competition started to increase which, when combined with the high inflation of the period, made the sector less profitable by the end of the decade. Studios began to become standardized around specific technical equipment and acoustic design concepts. Home studios became a relatively affordable option for musicians, producers and composers in this decade.

Unlike the 1960s, technological innovation occurred relatively slowly in the 1970s once the 24-track recorder became an industry standard in the early part of the decade. The common recording aesthetic of the era had been established in the 1960s when multitrack technology was adopted in the UK. Significant transformative digital studio technology started to be introduced at the end of decade. Corporate producers were superseded by the 1970s and corporate studios became less significant, as increasingly the majority of recording and production took place in the independent sector. This process was part of a global trend in the record industry. "The large record companies started to outsource all activities that were not directly related to the marketing of music production" (Tschmuck, 2006, p. 136). Independent studios, independent labels and independent producers were already by the 1970s a key part of the industry, so there were no major upheavals in organizational structure or occupational careers in the period. The outsourcing of music production to independent producers and the outsourcing of talent search to independent labels minimized financial risk for the major labels (Tschmuck, 2006). Freelance careers for producers and engineers were introduced in the 1960s, and this became a more common arrangement in the 1970s. To summarize, by the early 1970s a professional studio's equipment consisted of a large format console linked to

a 24-track tape recorder manufactured by companies such as Ampex, Studer, 3M, or MCI. A range of analogue outboard processing equipment, microphones, and instruments and mastering machines would augment this core setup. The equipment was expensive to purchase and then maintain, requiring the studio to employ specialist maintenance staff, and the studio spaces were expensive to design and build, making studio recording a high entry cost business. As Leader notes, "A decent 24-track and a decent desk, any sort of desk, cost a fortune" (Leader, 2013b). [89] The shift in recording aesthetics resulted in greater revenue for recording studios. "From the late 1960s onward, as the multitrack recording studio became increasingly used not only for recording music but also as a tool in its very conception and construction, the costs of producing an album quickly skyrocketed" (Theberge, 1997, p. 231). The producer Mickie Most blamed the increased length of recording projects on The Beatles; but lengthy album projects were obviously financially beneficial for commercially-run studios.

> It all had to take years, and that started off a fashion in recording which was very good for the studios, who were laughing when people were taking two or three weeks to put one track down. (Most cited in Grundy & Tobler, 1982, p. 141)

Although there is an element of exaggeration in Most's quote, in essence his comment is accurate. As an example of the possible length of 1970's album projects, the British band Fleetwood Mac spent almost a year recording their album 'Rumours' (Caillat & Stiefel, 2012). This particular recording took place in the US but is indicative of the duration of some recording projects in this period. The considerable increase in the time spent on recording projects was financially beneficial for studio owners, and contributed to the growth of the sector.

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[89] Personal Communication (26/02/13)

There was steady growth in the studio sector in parallel with the growth in popularity of rock music. "The rise of rock gave impetus to the intense proliferation of studios, roughly between 1968 and 1973: according to *Billboard*, during this period the number of new studios in the USA grew by about 70 per year" (Theberge, 2004, p. 769). In accord with Theberge's observation, which is based on the growth of the American studio sector, the UK studio sector expanded rapidly from the late 1960s onwards. The overall recording business (labels and studios) was now very much an international phenomenon. Hearn (2013) observes that throughout most of the 1960s and 1970s the music industry was thriving. As a consequence, recording budgets were not as closely scrutinized as they are in the 21st century. "Recording studios reaped the benefits of these practices by charging enough for their services to enjoy a healthy profit margin and, for a time, a lucrative business model" (Hearn, 2013).

Despite the high initial cost of building and equipping a facility, running a studio in the 1970s was potentially a profitable business, which attracted a number of new entrants to the sector. The large initial outlay could be recouped, as the hourly rates that could be charged were very high in comparison with today's rates. Currently, without factoring in inflation – apart from the very top end of the studio market – the cost of studio time is broadly similar to the prices charged in the mid to late 1970s.

> For instance, in the '60s and '70s, you would not be paying more than a £100,000 to £150,000 to equip a studio. That's not including building costs that's just the equipment. Then if you think that in those days you were charging, well when we stopped in '76 we were charging £40 an hour. Sessions were very different in those days, but if you equated that £40 an hour to what people are paying today, then it's about the same. (Wood, 2013) [90]

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[90] Personal Communication (23/02/13)

To put the above quote into context, in 1976, £100,000 was the equivalent of around £600,000 today, and £40 was the equivalent of over £250 today, allowing for inflation. Consequently when inflation is factored in, a studio in 1976 could charge (for a ten-hour day) the equivalent of over £2,500 nowadays. So, in this era it was clearly quite possible to recoup the initial investment on equipment relatively quickly if the studio was busy. A well-equipped mid-level modern facility in London (the equivalent of Sound Techniques which is where the figures above originate) can charge around £500 a day, only the very top end of the contemporary studio market can charge more. Hence Wood's (2013) comment that the hourly rate a studio can charge has hardly changed. Obviously, if hourly rates haven't really risen, the impact of four decades of inflation significantly undermines the profitability of the current sector. During the 1970s the studio business was perceived as lucrative and it was consequently relatively straightforward to obtain financial investment, as a result numerous studios opened in this period. As another example of the necessary investment needed to build, equip and run a studio, Townhouse Studios (owned by Virgin Records) was completed in 1978, and cost around a million pounds, the complex was staffed by two engineers, five assistant engineers and five qualified maintenance engineers (Newell, 2008). The rate Townhouse charged was £85 an hour, which allowing for inflation is the equivalent of charging £435 an hour nowadays, a rate that very few (if any) studios in the world could currently command. Amek's Graham Langley made some interesting comments on the studio sector in the late 1970s.

> Say 1977, it became a fashion industry. A lot of people threw a lot of money into it from outside, you know businessman putting a lot of money into things. Thinking recording studios are the way to make lots of money. And then it was purely down to the physical size of the facilities; a key factor was the physical

size of the console. The bigger the console the more clients they could get, it showed they had an impressive room. (Langley, 2013) [91]

The above respondent (a console manufacturer) suggested that the record labels' A&R departments drove the trend towards large highly-specified facilities, he also observed that studios often received outside investment to upgrade their facilities, as the sector was perceived to be very profitable: "Well it was more the A&R people, if you had a posh studio they would direct their clientele to that studio. And then somebody would fund it, and that was the model that they worked on." (Langley, 2013). [92] The studio sector had always been technologically driven, but as Langley (ibid) notes, from the late 1970s onwards, studio facilities competed with each other on technical specifications (and comfort and recreational facilities), and an impressively large console would help to sell the studio to A&R staff, who were often involved in setting recording budgets and booking suitable studios.

The size of the overall studio sector is problematic to accurately quantify as the focus of the trade yearbooks, industry magazines and academic literature was usually on the larger 'iconic' studios. Inaccuracies also occur in the trade yearbooks, for example, the 1972-73 Music Yearbook [93] lists Inter-City Studios in Stockport as trading, in fact by then it had closed and re-opened in another location as Strawberry Studios (which is also listed). However, the picture given by the publication over the years is nevertheless instructive. The Music Yearbook from 1972-73 indicates that there were recording studios all over the UK by the early 1970s. By far the largest concentration was in London, with 90 studios listed; in contrast, the rest of the country has 81 in total. This situation has changed only slightly in the 1973-74 Music Yearbook, with a few more studios opening both in London and the regions. A

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[91] Personal Communication (03/03/13)
[92] Personal Communication (03/03/13)
[93] A survey and directory with statistics and reference articles.

significant percentage of these studios were members of The Association of Professional Recording Services (APRS), the trade body that represents the audio industry. An examination of the studios listed on the 'philsbook' website, which documents the history of 76 of the larger (or 'classic' as it terms them) UK recording facilities that were running from the 1960s to the 1980s, shows that the majority of the studios listed on the site opened in the 1970s. Again, this is not an exhaustive list of facilities. The APRS (2014) website has details of a forthcoming book aimed at celebrating the 'Great British Recording Studios' of the 1960s and 1970s, this also lists 76 studios (although not the same 76 studios as the philsbook website), all of which were significant in the recording industry. [94] However, there were also many relatively undocumented smaller studios operating all over the UK by the mid-1970s, which is still the case nowadays. We can nevertheless see from these sources that a large number of professional studios opened in the 1970s, and that although the main studios are located in London there were professional recording facilities throughout the UK.

Art-Mode

The introduction of art-mode collaboration caused a shift in the balance of power in terms of the work organization of studio collaboration, as musicians gained some agency in the recording process (Kealy, 1990). This mode of collaboration started to occur in the late 1960s, but became the dominant mode of production in the 1970s. Album projects generally took considerably longer to complete once multitracking was introduced, as the technology facilitated greater experimentation in the studio. The widespread adoption of 16-track and then 24-track machines meant that the

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[94] See Appendix one for the list from the APRS website.

studio had become an integral part of the creative process. Indeed, Kealy argues that rock musicians had come to understand "studio equipment as practically another instrument" (Kealy, ibid, p. 216). As a consequence of the integral role of studio equipment in creating what Horning (2004) terms an 'engineered performance', musicians became focused on gaining further agency in the recording and mixing process. Some successful bands and solo artists invested the money they had earned into building their own studios. "As soon as bands started to make bigger money they then started to build their own facilities, sometimes in their own houses. They had the money and they had the desire" (Wood, 2011).[95] Once musicians started to obtain recording equipment, they gained some control over the production process; owning a studio represented a complete realization of art-mode (Kealy, 1990). The length of recording projects and the high cost of studio time in the 1970s made ownership of a studio seem a valid investment for artists, especially if it offered the artist greater control over their work. "Yes, you got places like Maison Rouge which was Jethro Tull's studio, the Moody Blues did it, Floyd did it, Gus Dudgeon the producer did it, and there were a lot of studios all of a sudden" (Wood, 2013). [96] To expand on Wood's (ibid) comment, the Moody Blues took over the largest studio in Decca's Broadhurst Gardens complex, which was a significant development as Decca had effectively relinquished part of their company's studio complex to one of their signed artists. The Pink Floyd built Britannia Row Studios, and Dudgeon built the Mill Studios. [97] A number of artists also built studios primarily for their own use, for example, Alvin Lee, Steve Winwood and John Lennon all had studios built in their homes. Owning a recording studio was equally attractive to producers. George

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[95] Personal Communication (15/04/11)
[96] Personal Communication (23/02/13)
[97] Other commercially run artist-owned facilities included The Beatles' Apple Studios, The Who's Ramport Studios, The Kink's Konk Studios, The Rolling Stones' Mobile Studio, Ronnie Lane's Mobile Studio and 10cc's Strawberry Studios.

Martin opened AIR (Associated Independent Recordings) in 1970; after he and a number of other producers had left the corporate labels they worked for and set up as independent producers. They re-invested part of their royalty payments into AIR which was then also used by other independent producers and engineers (Thompson, 2008). Studio ownership could be financially and artistically advantageous for a producer, when Tony Visconti started a production company in 1974 he realized the money he was spending on studio time could be better invested in his own facility.

> So I built my first studio, a sixteen-track, in my house at Shepherd's Bush. It had a lot of gadgets. Although it was physically small, I could do anything in it, and it cost me £40,000. When you think that at the same time, George Martin was building his Air Studio, which cost him £2 million, I think the results I was getting were equivalent to what he was getting. (Visconti cited in Grundy & Tobler, 1982, p. 175)

The producer Richard Burgess (2014) comments positively on his experiences in the mid-1970s working in Ringo Starr's professionally equipped home studio (which had previously belonged to John Lennon) and in the producer Tony Visconti's home studio. Not all of these artist or producer-owned studios were run commercially, although many were. Visconti subsequently opened a fully-fledged commercial facility 'Good Earth Studios' in 1977 when his home studio proved restrictive. There were tax incentives available if a business invested in equipment, which provided another motive for artists and producers to invest in studios. A respondent suggested that the Wilson government of the 1960s encouraged reinvestment in plant equipment, or musical equipment and studio equipment in the case of musicians and producers.

> The Labour government I'm sure it was under Wilson, under his 'white heat of technology' stuff, where you could reinvest 100% on plant expenditure. If you

were Pink Floyd or somebody you might as well spend it on equipment, as tax was probably about 75/80% then. (Wood, 2013) [98]

Owning a recording facility could reduce the cost of recording, and recording costs could potentially be charged to the label, allowing the artist or producer to directly access the recording budget, and the tax benefits were attractive. Ownership facilitated greater experimentation as time constraints were removed and owning a studio offered musicians more control over their recordings. The addition of artist and producer-owned facilities added to the rapid increase in the number of studios in the 1970s.

The UK Becomes an International Recording Centre

By the late 1960s, London began to be recognized as an international recording centre and started to attract clients from Europe and America. Prior to the recession in the mid-1970s and its associated inflation there were considerable cost benefits for foreign artists. European studios were technically a few years behind the UK sector at the start of the decade and were not in competition with UK studios at this point.

> For many years, by common consent, the United Kingdom led the European field in the technique of recording, and British studios were constantly echoing to the sounds of European artists and groups concerned to get the best sound. (Billboard, 1972a)

As an example of the success of the UK record industry and the UK studios, in the early 1970s the American music industry trade magazine Billboard ran a section called 'Spotlight on London'; this section was devoted to the blossoming UK recording industry. UK studios and equipment manufacturers advertised their facilities and products to attract business from America. One of the attractions of working in the UK for American artists and labels was that UK session musician's

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[98] Personal Communication (23/02/13)

rates were lower than in America, and studio rates were also far lower. Even after travel costs were factored in, UK studios were cheaper. "Adrian Ibbotson of Wessex estimates that by coming here to record, American artists can save up to one third of what it would cost at home" (Billboard, 1971c). The advertisements below confirm that major American artists were recording in the UK in this period. Trident appears to have been particularly successful in attracting major US artists to record in the UK by 1971. They were marketing their studio based on its equipment, atmosphere, success and level of service.

Spotlight on London: Trident advert (Billboard, 1971b)

The Wessex Sound Studios advertisement below states that 40% of the studio's work is from the USA, again, the studio's 'atmosphere' is mentioned in its marketing material.

Wessex Sound Studios Advertisement (Billboard, 1971e)

This mention of 'atmosphere' is presumably a deliberate strategy of the independent studios' marketing, included to differentiate them from a corporate label-owned facility. Wessex also offers Quadraphonic recording, a cutting edge technology at the time. Studio promotional material is prone to hyperbole, but these advertisements are nevertheless indicative of the clients the studios are attracting. Despite the rapid growth of the studio sector in the late 1960s and early 1970s the sector was still profitable, and was expanding out of central London to areas with cheaper rental rates and lower property prices, and without the parking problems of central London. The London studio sector was thought to have peaked by 1973 when Command Studios in Piccadilly went bankrupt, but growth continued throughout the decade (Anderson, 1973). The Billboard article below shows the demo market was now

worthy of note, and the article infers that in 1973 most studios had an album project in progress.

> Instead more studios opened and the existing ones began to expand. It became obvious that even the smallest and least well-run studios were managing to make a profit. High costs in central London meant that smaller studios could open further out of town and cut prices by more than half. They continued to attract the demo makers and lesser groups who in the main were quite satisfied with an eight-track mix. During the last year to cope with this situation, most of the bigger studios have put in more and more equipment. There is hardly a studio now that is not working on an album… (Anderson, 1973)

By 1973 European studios had caught up with the UK in terms of equipment and technical skills, and were now competing with the UK studios for American and European artists' projects (Billboard, 1972a; Anderson, 1973). However, the success of UK artists in America (and worldwide) was still driving the UK record industry forward, and in turn the studio sector. Significantly, Mulligan (1972) notes that 25% of the American top 200 albums in 1972 were either made by British artists or by American artists who had recorded in London.

The Sector Stratifies

As the larger studios steadily upgraded to accommodate technical developments in tape recorders and mixing desks, their older equipment entered the second hand market, which encouraged the growth of smaller studios aimed at small independent labels and the 'demo' market: "Indeed, demo production has become the preferred method of introducing new talent to record companies" (Theberge, 1997, p. 112). Anderson (1973), in a Billboard article quoted above comments on the growth of demo studios in the UK using 8-track technology; the studio sector had stratified by the early 1970s with the larger studios upgrading constantly and a separate market

for demos and more affordable recording emerged. Studios were marketed at least partly on their track count, with 24-track (or 48-track) facilities at the higher end of the market, 16-track in the middle, and 8-track and 4-track at the bottom of the market. In the late 1950s and early 1960s artists/bands were expected to undergo a recording test with a record label to see if they could make the transition from the live circuit to becoming a recording artist. As recording became more accessible and two track tape recorders (and then cassette players) became commonplace in record company A&R offices for staff to listen to demo recordings, small demo studios sprang up around the UK. Leader, reflecting on the ubiquity of such studios, comments: "Every community had a crossroads with traffic lights, a pub, a betting shop and an eight-track studio at one point" (Leader, 2013b). [99] Making demos to send to labels or to obtain gigs became part of the culture of aspiring bands; and this became a significant income stream for small studios. In some instances bands with record deals would use a smaller studio for pre-production to keep their album costs down, which again provided work for less well-equipped facilities. Small independent labels often used more affordable local studios for recording projects, particularly in the late 1970s with the growth of punk. Many of these small studios were one-person operations, as can be seen by the following comment from a respondent. "Very often the guys who ran studios were the engineer, and did everything, a one-man show" (Massey, 2010). [100] Theberge (2004) refers to the small American independent studios of the 1950s as a cottage industry. Theberge (ibid) is discussing the American independent studio sector after the initial emergence of rock 'n' roll, he considers that many of the studios in that era were: "small, makeshift affairs, owned and operated by independent producers and engineers" (Theberge,

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[99] Personal Communication (21/02/13)
[100] Personal Communication (6/04/10)

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2004, p. 79). In the UK the proliferation of small studios occurred from the 1970s onwards, the independent studios of the 1960s and early 1970s were often relatively substantial enterprises, unlike the small independent American studios of the '50s. The growth of one-person operations contributing to the studio sector is particularly evident once punk rock emerges in the UK in 1976.

The introduction of more affordable semi-professional equipment and the increasing availability of second-hand equipment enabled a considerable number of small studios to enter the market in the 1970s. In the advertisement below for Cargo Studios in Rochdale they are offering both 16-track and 8-track recording, a strategy that meant they could accommodate professional clients working to a budget and small bands that may have only been able to afford 8-track recording.

Cargo Studios (2015c)

From the late 1970s onwards (driven by the punk DIY aesthetic) there was a considerable increase in the number of small independent labels, many of which utilized local independent studios (Spencer, 2005). Manchester's Factory Records

offers an example of the synergy between small labels and local recording facilities, as many of their releases were recorded locally (Middles, 1996). [101]

As can be seen from the advertisement below for Cargo Studios, there was a considerable amount of potential business in the studio sector in the late 1970s, even at the mid-level of the market. The advertisement lists the clients the studio attracted in its first two years of operation from 1978 to 1980. A total of 96 singles, 23 albums and 215 demos were recorded at Cargo in its first two years of business. Cargo was a 16-track studio that mainly serviced the music scene in North West England, yet the studio was attracting clients from elsewhere in the UK and Europe. This was at least partly due to the success of some of its clients and the studio's association with Factory Records.

Cargo Studios (2015e)

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[101] Factory often used Strawberry Studios in Stockport and Cargo Studios in Rochdale.

The following quote is from the owner of Cargo, who was under the impression that the studio was far busier than its rivals.

> Yes it's amazing that we had so much work. At the time I didn't think anything of it but looking back Cargo must have been the busiest studio in the UK for 5 or 6 years. It had a lot to do with the music taste at the time. The sound from the studio fitted in well with punk, heavy metal and new wave, which was prevalent at the time. Had I set it up a few years earlier when everything was disco it may not have survived. (Brierley, 2015) [102]

Although the owner perceived the studio as being exceptionally busy, this was actually a common situation for many studios in this period; a respondent from the North West noted that all the local studios were busy in the late '70s: "Because there were so few studios really, it was a busy time; it was hard to get in them, you had to get in a queue" (Massey, 2010). [103]

Hence, by the late 1970s what was once a small-scale industry had now evolved considerably, ancillary businesses had developed around sound recording, both in terms of equipment manufacture, and studio design and architecture. Independent labels such as Island and Virgin had built their own facilities, as had a number of bands and producers. Residential studios (usually in the countryside) offered an alternative to recording in an urban centre, as did mobile studios such as the Rolling Stones Mobile, Ronnie Lane's Mobile, Maison Rouge Mobile and the Pye Records Mobile. Residential studios such as Rockfield in Wales were attracting artists from America, Canada, Europe and the UK (Rockfieldmusicgroup, 2014). Charging for accommodation was a useful additional income stream increasingly adopted by studios, whether they were located in the countryside or in a city. A respondent commented on his experiences recording in London: "They had a flat there where

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[102] Personal Communication (28/4/15)
[103] Personal Communication (6/4/10)

they put us up and charged us for that too. It was a fantastic system if you were a studio owner" (Massey, 2010). [104] Part of the attraction of residential studios was the convenience of staying on the premises or near to the studio. If the studio was located in the countryside, the perceived lack of distractions offered a contrast to working in a city-based facility.

Shipton Manor was bought in 1970 by Richard Branson for £35,000, with a part loan from his Aunt Joyce and a bank. Set in 35 acres of ground, with parts of the main house dating back to the 9th century, it provided a totally different environment to record in from the inner city studios. The studio was built in the stable block to the side of the house that originally housed a squash court. The control room was set up on a balcony reached by a set of steep dimly lit stairs with a small outside window providing natural daylight. There was very little studio design to the first incarnation but by the end of 1971 in was a functioning studio of sorts.

The Manor (n.d.)

Competition in The Sector

However, what was once a lucrative business was starting to become much more competitive by the late 1970s, particularly in areas with a high concentration of studio facilities, and the costs of maintaining a competitive edge were rising as new technology was introduced. One trade journalist considered the sector to be less lucrative than in the '60s: "Ten or fifteen years ago, the studio business in the UK was a license to print money. Now, it's a very hard competitive field" (Robertshaw,

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[104] Personal Communication (6/4/10)

1979). The increased competition had come from the sheer number and range of studios, including independent studios, corporate studios, artist and producer-owned studios, demo studios, mobile studios and residential studios. Artists and producers could by now carry out much of an album project in their own facility (if they had one), reducing the amount spent in the commercial studio sector. Another issue for studio managers was that successful artists and producers would in some cases voluntarily go into tax exile and consequently record abroad, often in America. Tax rates in the upper income brackets were extremely high in this period. So, what was once a highly lucrative business in the 1960s and most of the 1970s was, by the end of the decade, becoming far more competitive, and the costs of maintaining a competitive edge were rising rapidly as new technology was introduced. Early digital technology was introduced in the late 1970s, and development in console technology at the end of decade resulted in the introduction of new computer-controlled large format mixing consoles. These new consoles were extremely expensive and placed considerable financial pressure on studios if they were to stay at the cutting edge of technology.

> There is, though, considerable pressure to stay ahead of the game. Rightly or wrongly artists and management are attracted by specifications offering the newest "toys", the most tracks, and the seventies has been a period of explosive development in electronic technology. (Robertshaw, 1979)

As a result of needing to keep up with the competition in terms of equipment there developed a constant need to update, to re-equip, even to totally rebuild at considerable cost, which has been a facet of the studio industry ever since. This was obviously the case as multitrack tape recorders were introduced, but as more studio equipment became available, and import restrictions were no longer an issue, the

industry became even more technologically driven. "There was an equipment race going on, you had to have the latest bells and whistles" (Leader, 2013b).[105] This need to stay competitive and offer 'state of the art' facilities and equipment consequently helped the UK pro-audio industry to thrive. Although by no means all of the studio technology used in UK studios was British-made, the majority of large format consoles were UK manufactured, relatively few American consoles made their way to the UK: "There weren't many American consoles that came across to the UK… I can only recall actually a few in London, and that was it. All the consoles were British made" (Toft cited in Vdovin, 2009). Zagorski-Thomas (2012) notes that Advision had installed an American manufactured Quad 8 console, but the majority of UK studios in this period featured British consoles.

Standardization

Specific acoustic design concepts became popular in the 1970s, and less equipment was built in-house as studio technology became more widely available. This meant that it became more straightforward for engineers and producers to work in different facilities. It became far more likely that they may already be familiar with the studio's equipment once some standardization of studio equipment starts to occur. A project could easily be moved between studios (even to a different country) if there was some commonality in terms of acoustic design and studio equipment. The idiosyncrasies of individual studios were at least partially eradicated by standardized equipment, particularly in the case of complex large-format mixing consoles. Theberge (2004) notes the significance of technological standardization in the studio sector, and considers that the standardization of the recording console had a

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[105] Personal Communication (26/01/13)

significant impact in 'internationalizing' the recorded music industry. For example, after the SSL console was introduced in 1976 it gradually became an industry standard, especially for mixing. This meant "an engineer could go from one studio to another, because the gear was all the same." (Padgham cited in Milner, 2009, p. 168)

Theberge (2004) argues that the acoustic insulation that allows the outside world to be shut out of a studio helped to create a non-place. Non-places are "essentially homogeneous in character and disconnected from the history and culture of the places in which they reside" (Theberge, ibid, p. 762). This concept can be used to describe many modern (or postmodern spaces), such as airports or shopping centres, which lack any tangible local identity. Theberge (ibid) notes that despite recording studios being marketed as individually unique facilities, they were often identical in character, featuring acoustically dead recording spaces, and increasingly standardized recording technologies: "Ironically, it was the more-or-less standard 24-track studio of the 1970s and 80s that became most clearly a kind of 'non-place'" (Theberge, 2004, p. 769). A characteristic of the standardized non-place studio is that it is less "connected to local musicians and musical styles and more intent on reproducing music in a variety of 'international' genres" (Theberge, ibid, p. 679). Gradually from the 1970s onwards, certain acoustic design concepts and specific items of studio equipment begin to predominate internationally. The acoustic characteristics of the recording space in a studio contributed considerably to the sound of the recordings made in the facility prior to the multitracking era. Once multitracking was introduced controlling reverberation and isolating individual instruments became a priority for engineers and producers. This then affected studio design, which in the 1960s was still an emerging field of specialism.

From the late 1960s onwards a number of specialist design firms or architects sprang up, such as Veale Associates Limited, which was started by the engineer Eddie Veale. Veale gained his start in studio design by building John Lennon's home studio in 1969 and he went on to design a number of UK studios. Another notable early UK studio designer was Keith Slaughter, who contributed to the design or upgrade of Abbey Road, Odyssey Studios, Air Studios, Wessex Studios and Ridge Farm Studios amongst others. "He was the original acoustic architect of Britain, if not the world". (Price cited in Michie, 2000). Newell (2008) observes that many control rooms in commercial recording studios were acoustically quite poor until efforts were made in the 1970s to find designs that could be relied on to produce recordings that 'travelled well', both in terms of the outside world and between studios. If a studio control room is not acoustically neutral a mix may well sound correct in that room but will not 'translate' to another environment, either another studio or the consumer's listening environment. In common with the above discussion of London as an international recording centre, Newell (2008, p. 350) notes "this was an era when work really began to travel from studio-to-studio, and even country-to-country during its production". A particularly significant international studio designer was Tom Hidley who started the company Westlake Audio in the USA in 1969. Hidley was responsible for one of the first significant commercial efforts to produce acoustically standardized 'interchangeable' rooms (Newell, 2008). Westlake sold complete studio packages, including all the equipment and the design and construction of the studio spaces. Hidley designed the Westlake Audio studio complex in the early 1970s; the studio's rooms featured an acoustic design that offered a fairly flat frequency response at the recording position, with the ability to control the reverberation (Westlakestudios, 2012). The studios were popular, and

control rooms based on this design became prevalent in the US. Hidley designed his rooms to have a reverberation time of 0.3 seconds; they featured large volumes of bass traps to control low frequency reverberation times and to avoid standing waves or resonant modes (Newell, 2008). Hidley also avoided using parallel walls in his designs, again to combat room modes. Apparently, the company's rooms came with a written guarantee of their accuracy and effectiveness. "By the mid-'70s a lot of producers and engineers would only work in 'Westlake' rooms, such was their reputation!" (Robjohns, 2013). Hidley initially developed his skills through trial and error, as there was little or no literature or research specifically on studio design at this point. Hidley's first UK contract was redesigning Threshold Studios for the Moody Blues, which was an upgrade of Decca's Studio One (Harris & Burns, 2012). Hidley was also involved in the design of Richard Branson's Manor Studios (Newell, 2008). After gaining some work in Europe, Hidley wished to set up a European office, after some conflict with his business partners Hidley sold his share of Westlake, moved to Switzerland, and started a new company called Eastlake Audio in 1975 (Robjohns, 2013). His new business concentrated purely on studio design and construction and a number of UK studios used Hidley to design or improve their studio acoustics. For example, Strawberry Studios in Stockport was upgraded to a Westlake control room.

> When 10cc got the money they didn't go to British designers to build their studio, they went to Westlake, who were American designers. The monitors, the desk and the room were tweaked so that if you did a session in Los Angeles in an Eastlake/Westlake room it could be continued successfully in any other Eastlake/Westlake room. (Barrett, 2010) [106]

Subsequently, Revolution Studios in Manchester used Eastlake to upgrade their control room. "It was Tom Hidley, it was the Eastlake boys that did this, Strawberry

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[106] Personal Communication (10/04/10)

was Westlake" (Macpherson, 2010). [107] Macpherson (ibid) commented, "it was the best decision that I ever made", as it enabled him to produce well-balanced master recordings that would translate (or sound good anywhere), as his control room was acoustically accurate. [108] Hidley's designs became a global standard, and his designs are associated with the standardization of acoustic design in this period. However, some studio owners and engineers resented this standardization of control room design and studio equipment.

> That was before all the studios came out of a plastic mould, where it was just another SSL/Eastlake room where you could put your disc into the computer and the desk could be reset to exactly the same state it had been in another studio. (Grant cited in Jopson 2009, p. 39).

Grant (ibid) adds to his comment by noting that studios were often very busy in the 1970s and 1980s, and that the ability to take a project to another studio and carry on working with similar desk settings became a necessity. As studios were so busy it may have been difficult to book further time in the same facility, so moving a project from one studio to another became common practice.

> In those days every studio was working all the time, so you needed to be able to put it under your arm (*the multitrack tape*) and take it somewhere else, which is where the SSL and all that lot came into their own. I resisted – probably to colossal financial disadvantage – the offer of making Olympic Studio 1 a plastic studio. (Grant cited in Jopson, 2009, p. 41)

Essentially, this process of standardization is a rationalization of the higher end of the studio market. A later development in control room design occurs in the late 1970s when the concept of the 'Reflection Free Zone' was developed, and 'Live–

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[107] Personal Communication (09/04/10)
[108] Personal Communication (09/04/10)

End, Dead-End (LEDE) control rooms subsequently became a popular design. The advertisement below shows that the combination of an Eastlake room and an SSL desk were considered worthy of inclusion in a studio's marketing material, computer technology still evidently had futuristic connotations in this era. Along with increased standardization, it became more common for engineers to work as freelance staff, which had some effect on employment relations. Kealy (1990) observes that along with the adoption of art-mode a hybrid studio collaborator emerges, the artist-mixer. Bands would value the artist-mixer as an important aesthetic collaborator due to their ability to apply studio technology to enhance or augment recorded music. Kealy (1990) observes that sound mixers were typically associated with a specific studio, yet rock musicians were generally nomadic. "Some aspiring artist-mixers have attempted to overcome the barriers to full participation in the rock musician's art world by plunging wholeheartedly into their lifestyle" (Kealy, 1990, p. 219). Freelance work would in theory allow engineers to work wherever the bands they worked with wished to record. Glyn Johns considers the move to freelance work a positive development for engineers. "But prior to turning freelance as an engineer, the engineer's lot was very grim" (Johns cited in Grundy & Tobler, 1982, p. 147). However, Watson (2013) notes that the relationship between engineers and studios was changed by this shift in employment relations. An engineer would bring the work they had gained to a specific studio, which in turn would recommend the engineer to their other clients. "However, while such arrangements might suggest something of a symbiotic relationship, these new employment relations are often balanced unevenly towards recording studios" (Watson, 2013, p. 332).

Eastlake & SSL (Jones, n.d. b)

In some cases studio staff would be paid a retainer rather than a full wage, to ensure their availability without significant financial commitment. This passed the financial risk of not obtaining work onto the workforce. Once there was a significant pool of freelance engineers there were gradually fewer permanent skilled studio positions available.

Technology and Innovation

During 1970 and 1971 many of the London studios adopted 16-track machines, often using Dolby noise reduction (which reduced tape hiss). British studios were technically advanced by 1971 and had adopted the Dolby noise reduction system

more quickly than American studios, which in some cases meant their American clients couldn't use Dolby if they wished to mix their UK recordings in America (Kehew & Ryan, 2006). The advertisement below shows the number of London 16-track studios that had adopted this technology by 1971.

The following London studios have 16-track recorders with complete Dolby facilities:

Advision
A.I.R.
Apple
Audio International
C.B.S.
Chappell
Command
De Lane Lea
Decca
E.M.I.
I.B.C.
Island
Maximum Sound
Morgan
Nova
Olympic
Pye
Rolling Stones mobile
Sound Techniques
Trident
Wessex

Dolby Laboratories Inc

333 Avenue of the Americas New York NY10014 tel (212) 243-2525 telex 66240
346 Clapham Road London SW9 tel 01-720 1111 telex 919109
Tiger Building 30-7 4-chome Kuramae Taito-ku Tokyo tel 03-861-5371 telex J22498

L-26   Spotlight on London
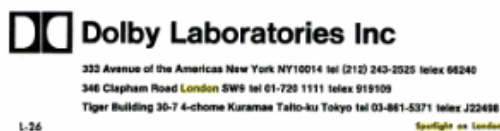
Spotlight on London: Dolby advert (Billboard, 1971a).

These 16-track machines were quickly followed by 24-track tape recorders, which soon dominated the professional studio sector. The American company MCI introduced the first 24-track recorder in 1968; the machine was followed by rival products from other manufacturers (Keller, 2011). The 24-track tape machine became an industry standard in the early 1970s and accelerated the international homogenisation of studios (Theberge, 2004). However, 24-track machines were a

sonic step backwards from 16-track two-inch machines in terms of signal to noise and crosstalk, due to the narrower track width (Burgess, 2014). The creative flexibility offered by 24-track machines offset the loss in audio quality, "and twenty-four-track machines became an almost universally compatible professional studio standard from the early seventies through the late nineties" (Burgess, 2014, p. 128). According to engineer/producer John Hudson the transition from 8-track to 24-track happened in a three-year period of rapid technological change (Cunningham, 1998). Later developments allowed the synchronization of two 24-track machines to allow 48-track recording, which could increase the rate a studio could charge. [109] Producers usually used one machine at a time, but this allowed a "master/slave" or "work reel" system. Basic tracks would be recorded on the master reel, and then submixed onto the slave reel, with the two machines synchronized using a SMPTE code track (Burgess, 2014). [110] This meant that the producer could experiment with overdubs without wearing out the master reel, as repeated playing of analogue tape results in degradation of the recording. "Eventually, the overdubs would be mixed back onto any spare tracks on the master reel and, if necessary, to a second reel that would be synchronized for mixdown" (Burgess, 2014, p. 128). In some instances engineers or producers would find themselves working with multiple slave reels, which could make a project particularly complex to organize (Brown, 2010).

> By the end of the 1970s, 24-track studios were the norm within the industry…the final mix had become such a complex process that various forms of automation had begun to be implemented in mixing console design. (Theberge, 2004, p. 769)

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[109] It was possible to lock three or four 24-track machines together to provide more tracks.
[110] SMPTE timecode is a standard defined by the Society of Motion Picture and Television Engineers.

Console automation was developed as a way of coping with the increasing complexity of the mixdown process once 16- and 24-track recording was the standard format. Allison Research introduced console automation in the USA in 1973; in their system the automation data was stored on the multitrack tape. Allison's system was a retrofitted addition to a console's facilities. In the late 1970s consoles were introduced with built in automation systems, Neve introduced their automation system NECAM in 1976, and the British firm SSL (Solid State Logic) introduced an automated console in 1977. Both of these manufacturers used a computer to handle the automation data, which was a considerable improvement on a tape-based automation system. These two firms were the most successful UK console manufacturers, and although other companies developed automation systems, SSL became the industry standard automated console.

> What really changed in the late '70s was that elements of the desk started to feature automation. The recording studio had started to become a musical instrument: you could play it much more than you had ever been able to before. (Horn, 2012)

Mix automation enabled the engineer or producer greater control over the manipulation of the desk's controls. Eventually, once automation was fully developed it enabled the recall of the console's settings, as they were stored in the desk's computer. Mixing eventually became a specialism, as the sonic possibilities offered by mix automation were considerable.

Digital audio processing equipment utilizing analogue to digital conversion (and digital to analogue) was introduced to studios in the 1970s, items such as digital delays, digital reverb and harmonizers (pitch shifting devices) then became viewed as essential studio equipment. The American firm Eventide introduced the H910

harmonizer in 1975. The UK firm AMS (Advanced Music Systems) introduced a digital delay in 1978; the American firm Lexicon introduced the Model 224 digital reverb in 1978. The Eventide, Lexicon and AMS machines became ubiquitous in high-end studios, and are still used nowadays. A respondent suggested the Manchester producer Martin Hannett had some input into the design of the AMS delay. "He got a prototype delay off AMS, he actually went out and met the owners of AMS, and they put together what Martin wanted. He helped with the design, it cost us £1,250 quid" (Ryan, 2010). [111] This is another example of the co-construction of users and technologies in the studio environment. The manufacturers mentioned above subsequently introduced other digital audio processing devices, and other manufacturers followed suit. Digital sampling had a significant impact on production techniques, with the first digital samplers being introduced in the late 1970s. The introduction of the New England Digital Synclavier was closely followed by demonstration of the prototype Fairlight CMI at the end of the decade, both machines were a significant investment and few studios or musicians initially bought them. [112]

Home Recording

Although home recording was relatively unusual in the 1960s and early 1970s, it became more common throughout the 1970s. There were a number of important developments in home recording in this period, and the subsequent diffusion of relatively affordable recording equipment resulted in musicians becoming substantial consumers of audio technology. The pro-audio industry expanded into this emerging market and certain third party mediators were responsible for creating a much wider

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[111] Personal Communication (19/08/10)

[112] More affordable sampling technology subsequently became available in the mid 1980s, such as the Akai S900.

market for audio technology. Home studios were rare in the 1960s, and usually the province of the successful musician, although it was possible to use 2-track tape recorders to create demo recordings. An early exponent of home recording was The Who's Pete Townsend, who released an album (Scoop) of his home recordings in 1983: "As early as 1964, Townshend had been experimenting with tape machines such as the Vortexion, and later the Revox, using multiple machines and new mixing tools to create occasional multitrack demos for some of The Who's most famous songs" (Madden, 2013). In the early 1970s it became more commonplace for artists to have a 2-track machine to record ideas. Stirling (cited in Cooper, 2003c) recalls that whilst working in CBS's Whitfield Street studio he was often asked to set up a basic home system using a Revox 2-track for musicians to record ideas. Manufacturers started to target products at musicians, rather than hi-fi enthusiasts who were the initial consumers of 2-track recorders.

The introduction of what was then known as 'semi-professional' equipment such as the Japanese manufactured four-track Teac 2340 and 3340 tape recorders (using quarter inch tape) released in the early 1970s, gradually made home studios more commonplace. Affordable multitrack technology had a major impact, "In terms of equipment it was the original Teac reel-to–reel four track that turned the whole industry on its head" (Stirling cited in Cooper, 2003c). Interestingly, from examining the marketing material from the time of the Teac 3340 machine's release, it seems they were also aimed at the market for quadraphonic sound and for language training, their use as multitrack recorders was not the machine's only projected purpose (Museum of Magnetic Sound Recording, n.d.f). The machine was initially sold through hi-fi shops before a network of pro-audio dealers emerged. This technology was widely used by musicians and subsequently evolved into budget 8-

track recorders. Japanese manufactured half-inch 8-track tape machines became popular home recording tools, particularly for songwriters and demo recording. Some successful commercial releases were recorded on budget 8-track machines, which served to popularize the technology even further: "Teac 3340, Tascam 80-8 suddenly made recording accessible to people, Bob Lamb recorded UB40 in a bedsit" (Thompson, 2011). [113]

From from this period onwards it became possible to make successful recordings in a domestic environment. [114] When the home studio market initially started to develop in the 1970s the majority of home studio equipment was Japanese. However, there were also British firms engaged in developing products aimed at the home or project studio. Both Soundcraft and Allen & Heath brought out packages featuring relatively affordable consoles and 8-track recorders. Another British manufacturer who successfully addressed the emerging home studio market was Studiomaster, who started trading in 1976. The introduction by Teac of the cassette-based Portastudio in 1979 was a significant milestone in terms of relatively affordable recording technology and the device became extremely popular. The British designer Andy Bereza had some input into the Portastudio concept. Bereza had previously been associated with Allen and Heath, by the late '70s he was working for Teac and considered that the Teac 2340 and 3340 tape machines were prohibitively expensive for the average musician. Bereza suggested the idea of using a cassette transport as a multitrack recording device to keep down manufacturing costs (Cooper, 2003a). The Portastudio (and subsequent similar machines from other manufacturers) was one of the results of the miniaturization of electronic technology which, "in the hands of professionals, have reduced the amount of time spent in major commercial studios

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[113] Personal Communication (17/04/11)
[114] Obviously, Joe Meek had established this precedent.

because the extensive preproduction work can be conducted more economically outside of that environment" (Cunningham, 1998, p. 346).

Teac 144 (Gearslutz, 2008)

The UK Teac representative commented that demand for Portastudios grew considerably, "it wouldn't be unusual for us to ship 1000 Portastudios a month at one stage" (Goleniowski, cited in Cooper, 2014e). The machines were commonly used for songwriting and demos although some Portastudio recordings were commercially released.

A small number of key entrepreneurs were instrumental in developing the market for home studio equipment in the UK. Andy Bereza, Ivor Taylor and Andrew Stirling who had all previously worked together at Allen and Heath, set up a retail company called Turnkey in 1978 to service the newly emerging market for home recording. This company was particularly significant in growing the UK market in home recording equipment. Turnkey formed a manufacturing company called Bandive and

brought out a number of affordable products aimed at the home studio market, these included budget mixing desks (branded Seck), spring reverbs and compressors, EQs and noise gates branded as Accessit. "Bandive was their manufacturing bit - they made the Great British Spring, the Accessit range and Seck Mixers. This was the first attempt to bring reasonable quality equipment to the impoverished musician. I take my hat off to them" (Willett, 2015).

Pinch (2003) considers that technology studies has not paid sufficient attention to the role of mediators such as marketers and salespeople in the development of technology. This reflects a general gap in the social sciences where the activities and influence of salespeople have long been neglected. Pinch (2003, p. 248) notes that because of their interaction with users, "field sellers often are the first to hear about deficiencies in current use, how a technology can be improved, and what works and what doesn't". They then pass this information back to designers and manufacturers. Field sellers can be viewed as the active agents of how a technology is domesticated (Pinch, 2003). By following the activities of the salesperson "we are able to see that what is normally taken to be an economic concept–a market–is built from a series of social and technical practices" (Pinch, 2003, p. 248). In this instance, Turnkey and Bandive were designers, manufacturers and field sellers and helped to popularise home recording in the UK. "Both the Turnkey shop and Bandive as a whole were a phenomenon" (Cooper, 2003b). Following their example, other retailers sprang up and magazine publishers then started publishing titles specifically aimed at the home recording market. One of my respondents worked as an engineer in Livingston Studios in the late 1970s and early 1980s and remembers the Turnkey shop nearby, as they occasionally brought their products to the studio for the engineers to try them out.

> Turnkey had their first shop up the road in New Barnet and they were selling Brenell stuff, and gear called Accessit, cheap and nasty stuff they actually constructed in the shop. That was the first time I was aware that there were people doing home studio stuff. (Leader, 2013a) [115]

One of Bereza's significant innovations at Turnkey was to collate a mail order catalogue for studio equipment, which apparently had never been done before. This catalogue helped the company develop and serviced the growing demand for home recording equipment.

> It was the first ever Pro Audio catalogue and it just exploded. The amount of business we got out of it was amazing. There were all these people out there who wanted to buy this stuff and yet there was almost no one selling it. (Taylor cited in Cooper, 2003b)

In common with the continual updating that larger studios were drawn into, home studio technology was constantly developing, putting pressure on musicians/producers to continually update to stay current: "The other thing about studios, which follows through into home recording, is there is a constant updating of equipment" (Leader, 2013b). [116] Essentially, from the late 1970s, musicians became significant consumers of audio recording equipment, a situation that has continued to the present day. This chapter will now examine technical developments in console design in the period, as the large format console was the centrepiece of the analogue studios of the 1970s.

Developments in Mixing Console Design

Consoles developed considerably in the 1970s, and manufacturing techniques were refined and improved. The widespread introduction of integrated circuits (ICs) into

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[115] Personal Communication (01/08/13)
[116] Personal Communication (26/02/13)

professional audio products in the 1970s reduced manufacturing costs considerably. ICs have two main advantages over discrete circuits, cost and performance, they are a far cheaper option for a manufacturer than using large numbers of individual components to build circuits and they consume less power. Early consoles were assembled using discrete circuits and were hand-wired, which increased manufacturing costs. It is rare nowadays for a console to be manufactured using discrete circuits, although some engineers and producers consider discrete audio circuits to offer greater fidelity than those that use integrated circuits (ICs). [117] Throughout the development of the mixing console designers have incorporated new technologies to enhance their designs, often these choices of technologies were based on commercial considerations (Langley, 2004). New technology may offer more facilities at a lower cost, or it may enable cheaper manufacturing.

A significant development in console design in the 1970s was the introduction of in-line console architecture. Langley (2004) refers to a console with separate input and output sections as a 'British split console' and to the in-line design as 'American'. Langley (ibid) also suggests that the American manufacturer MCI first introduced the in-line design in 1972 on their JH400 console. Robjohns (2014) claims the American console manufacturer Harrison developed in-line console design which "quickly became the standard for all big studio consoles" (Robjohns, 2014). The first fully realized iteration of the in-line design was designed by Dave Harrison for MCI before he started his own company, so it seems both Robjohns and Langley are broadly correct, if slightly inaccurate (Mixonline, 2007). However, another American, Dan Flickinger, introduced an embryonic version of the in-line design before the MCI desk was commercially available (Mixonline, 2007). A channel strip

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[117] Discrete circuits use individual electronic components such as resistors, capacitors, and diodes to achieve the circuit function, whereas integrated circuits include these components on a chip.

in an in-line console combines both a recording channel signal path and a monitor mix path in one physical desk module. Compared with the earlier 'split' layout, with physically separate input and mix sections, this doubled the input count for a given number of modules and massively increased the signal-path flexibility (Langley, 2004). The in-line design integrated the multitrack recorder more effectively into the desk. This arrangement allowed the switching of EQs and auxiliary sends between the input and monitor path. The audio signals would be routed to the tape machine through a subgroup (or buss) section.   The in-line design was more compact, simplified manufacture, and allowed the desk to consist of a quantity of identical modules, with the addition of modules for auxiliary sends, monitor selection and talkback to the performer (Langley, 2004).

Swettenham (1982) notes that by the early 1980s in-line consoles were ubiquitous, although the earlier designs of desks with separate sections offered some advantages in terms of function and ergonomics. These include the idea of separate sections for the engineer and the producer, and the fact that on an in-line console the auxiliary sends have to be shared between the input path and the monitor path. The long channels needed for an in-line console dictated that a console must, apart from the meter section, be a flat rectangular surface set at a useable angle (Swettenham, 1982). This was more for ease of construction than ergonomics, as the long channels resulted in issues with sight lines and comfortable arm reach. "As mixing became a more integral part of the recording process, the layout of a console's knobs and faders could help or hinder an engineer's job" (Milner, 2009, p. 166).

The next significant development in mixing console design was the introduction of the voltage controlled amplifier (VCA) and console automation. Again, automation was driven by the needs of engineers, the number of tracks and effects available in

the 1970s offered the engineer numerous possibilities when mixing down to stereo (or reduction as it was sometimes called in this period). Horning notes the amount of decisions involved in mixing multitrack audio: "Because mixing involves countless choices, most critically the placement of stereo and relative volume and emphasis of different instruments, the same recorded tracks can potentially yield radically different final mixes" (Horning, 2013, p. 187). Until the late 1970s, virtually all multitrack music mixing was undertaken using analogue consoles with no automation of their controls (White, 2000). Fader levels had to be changed manually during a mix, and if the mix were complicated, it would become too difficult for one person to execute alone. Additional people would often be conscripted to help; assistant engineers, producers and band members would be co-opted to assist the engineer. A mistake at any point would mean starting the mix again, or alternatively the mix would be completed in sections and recorded to tape where the best sections from several mixes could be spliced together to create a master (White, 2000). This laborious process prompted the idea of mix automation, of which there were two approaches in console design. One used motorized faders, under computer control, the other used voltage controlled amplifiers (VCAs) controlled by standard manual faders White (2000). [118]

Initially, console automation was restricted to control of the faders, but then this extended to allowing the automation of channel mutes and to control of effects sends. "The greatest advances in the last 20 years have been in the quality of automation" (Langley, 2004). Motorized faders became popular as they offered visual feedback of the mix levels. Some engineers had concerns about the distortion that could be introduced by a VCA; a moving fader was also considered to be solution to this

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[118] In the VCA system, no audio passes through the faders – they are just used to produce a DC voltage that is read by the automation computer to determine the fader position. (White, 2000).

issue. Rupert Neve introduced a digitally controlled automation system in 1976; the idea originated from the Canadian firm Allison Research's system that used two tracks on a multitrack tape recorder to record the fader information. Neve's system was known as NECAM (Neve Computer Assisted Mixdown) and was allegedly the first moving fader system.

> By 1976, a Neve 16/4 console had been equipped with machine control and George Martin was invited to try out the new system at the Neve Company studio. He spent a day remixing masters, at the end of which his comment was, "How soon can I have one? (Rupert Neve Designs, 2014b)

The British manufacturer that became synonymous with sophisticated console automation was SSL (Solid State Logic). SSL was set up by Colin Sanders who had started in business making control systems for pipe organs before branching into console manufacture. "Sanders's unique insight was in understanding that the new realities of recording in the multitrack world demanded consoles that made the engineer's job easier while fostering maximum flexibility" (Milner, 2009, p. 167). In 1977 Sanders's produced the SL 4000 B, which integrated a studio computer system with an in-line audio console. "…it should be noted that computers were first introduced into professional studios not as aids in recording, but as part of the control mechanism in mixing consoles" (Theberge, 2004, p. 769). Richard Branson's Townhouse Studio was one of (the then unknown) SSL's first customers. "They were completely off the radar" (Glossop cited in Milner, 2009, p. 167). Sanders had experience as a recording engineer himself and used this knowledge to inform his design. "He had a little sixteen-track studio where he recorded stuff, so he'd spent hours sitting behind the desk. He knew what was wrong with other desks and

thought, well, how am I going to make it better?" (Glossop cited in Milner, 2009, p. 167).

The key design innovations introduced by SSL in the 4000 Series were influenced by studio engineers' frustrations with the challenges presented by working with pieces of equipment (console, outboard equipment and tape machines) that weren't designed to be tightly integrated. As a user of studio equipment, Sanders understood how technical problems or limitations could impact on creativity by causing delays during recording and presenting obstacles to trying things out when mixing. The SSL 4000 console put a dynamics section in every channel, and built on the now popular in-line console design and included tape machine controls, including track arming, into the control surface. (Solid State Logic, 2014f). A computer was integrated into the console, which as well as offering fader automation, managed the tape transport, enabling simple command lines using dedicated keys to provide valuable support to an engineer: for example, GO TO V2 located the tape to the beginning of Verse 2, speeding up the process of recording and overdubbing (Solid State Logic, 2014f). As well as the integrated noise gate and compressor on each channel the desk featured a (now iconic) compressor on the main mix output. The compressor on the talkback circuit also became a popular studio tool after it was creatively misused on a Phil Collins' recording and this offers an example of what Akrich (1992) terms antiprogram, where a technology is deliberately misused or repurposed. The SSL console offered the engineer or producer the possibility to radically rework and transform a recording. In many cases this increased control made the recording and mixing process take even longer, "…the SSL desk was supposed to make recording quicker but it made it take much longer" (Thompson, 2011) [119] Christensen (2003)

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[119] Personal Communication (17/08/11)

defines technologies as sustaining, continuous, transformative or disruptive. Sustaining technology can be transformative, offering a radical shift in production and practice, or continuous, where the technology offers incremental improvement. Console automation was a transformative technology, as it radically extended the capabilities of an existing piece of technology, the mixing console.

Technology Manufacturers

The pro-audio manufacturing sector grew considerably in the 1970s, driven by the rapid expansion of the studio sector, both in the UK and internationally. In America, the engineer Bill Putnam is considered to be a major influence on American console design, however, the UK produced its own innovators and their work had a significant impact on the development of console technology and studio practice. "There were probably more English desk manufacturers in those days than there were American" (Toft cited in Zagorski-Thomas, 2012, p. 72). Relatively few American-made consoles were imported to the UK in the 1960s and 1970s, which allowed the UK manufacturers to dominate the local market. In the early 1970s the professional audio industry was still relatively small, but expanding rapidly, and by the mid-1970s the international professional audio landscape was populated with manufacturers, dealers, magazines and consultants (Caldwell, 1999).

Alongside the console manufacturers discussed previously, there were a number of significant entrants to the manufacturing sector in the 1970s, some key companies also ceased trading or changed hands in this period. Some of the new entrants had a background in live music, as during the 1970s there was considerable improvement in the quality of live sound equipment and sophisticated mixing consoles were introduced specifically for the live music scene. It was then a logical step for these

companies to manufacture products for the studio sector and "a small nucleus of designers, engineers and entrepreneurs exploded out of the 1970s rock scene and created the British Pro Audio business" (Cooper, 2003a). Allen and Heath, Amek and Soundcraft were all companies initially involved in live sound before becoming known for their studio equipment.

Trident and Cadac traded successfully throughout the 1970s, although some of the previously established companies foundered in this decade. Helios traded until 1979, and the company eventually closed when it faced greater competition in the late 1970s, as by then a number of other manufacturers had entered the growing market. Sound Techniques ceased to manufacture consoles in 1976. Both companies had sold their products worldwide, but did not survive when competition increased. Swettenham custom-built each Helios console to the client's specific requirements. However, despite the increase in the number of studios, other console manufacturers were offering standardized products that would undercut the cost of a custom-built design. Swettenham (n.d.) observes that, "by the late seventies the purchasing decisions for audio mixing consoles were moving away from sonic quality to appearance: it became a game of 'knobs per dollar'." The manufacturers needed to sell consoles in quantity to sustain a viable business, manufacturing custom-built products limited the number of consoles Helios could manufacture, which affected the financial viability of the company. It is suggested that competition in the mid-1970s from the American console manufacturers, API, MCI and Harrison started the demise of some of the British manufacturers (Langley, 2013). [120] The American consoles were usually a standard product and offered a wide range of features for relatively low cost (Harris & Burns, 2012). Rupert Neve's company also faced

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[120] Personal Communication (03/03/13)

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problems in the 1970s, despite concentrating on the upper end of the studio market. Neve had sold a significant number of consoles in America and worldwide, an achievement that is celebrated in the advertising copy below. Neve's company expanded rapidly and in 1975 despite considerable success in terms of sales, the firm suffered financial difficulties, the company was then sold and Rupert Neve agreed to a non-competition agreement for ten years, he subsequently reentered the manufacturing sector in the 1980s (AMS-Neve, 2015a).

Neve Advertisement (Billboard, 1972b)

Although the company carried on trading in his name, Rupert Neve was no longer personally involved. The pre-amp, EQ and compressor designs that Neve introduced in the 1960s and 1970s are still manufactured today, however, he no longer owns the original company name or the intellectual property rights to his early designs.

Soundcraft were one of the new entrants to the manufacturing sector, the electronics designer Graham Blyth and the sound engineer Phil Dudderidge started the company in 1973. Their early products were aimed at the live sound sector of the audio industry as Dudderidge had a background in the nascent live sound industry as an

engineer for Led Zeppelin (Soundcraft, 2014). Soundcraft's first product was the Series 1, the first mixing console built into a flight-case. In 1976 they introduced a multipurpose console (The Series 2) that could be used in both a live concert or in a studio. Initially, the company aimed its products at the lower end of the studio market. Their subsequent product (The Series 3) was introduced in 1977 and was specifically aimed at studios; a number of more sophisticated consoles followed and the company achieved significant sales in the UK and worldwide (Soundcraft, 2014). The company's position in the market can be gauged by their advertising (see below) as they are selling their products on their relative affordability in comparison to the products of some of their competitors. The studio market had stratified by the mid-1970s and the products offered by Soundcraft (and some other manufacturers) were aimed at songwriters or studios servicing the demo market and independent label clients. For example, Cargo was a mid-level studio and featured a Soundcraft console, as can be seen in the equipment list below.

EQUIPMENT AND FACILITIES
24 CHANNEL INTO 16 SOUNDCRAFT DESK
16 TRACK CADEY
J.B.L./QUAD MONITORING
NEUMANN, A.K.G., CALREC, BEYER MICROPHONES
DOLBY 'A' NOISE REDUCTION
TRIDENT LIMITER/COMPRESSORS
A.D.T., ECHO, TAPE ECHO, REVERB, ANOLOG DELAY, FLANGER
STUDIO ACCOMMODATES UP TO THIRTY MUSICIANS
SESSION MUSICIANS AVAILABLE
⎯⎯⎯
CASSETTE DUPLICATION & RECORD PRESSING SERVICE
REEL TO REEL & REEL TO CASSETTE COPYING
⎯⎯⎯
PUB NEXT DOOR — SNACK BARS & RESTAURANTS NEARBY
FREE PARKING NEXT TO STUDIO

Cargo Studios (2015d)

Due to the stratification of the market, some manufacturers traded on price and relative performance, in contrast to the no-expense spared products offered by Neve and SSL, the Soundcraft advertisement below offers an example of this kind of market positioning.

Soundcraft Advert (Museum of Magnetic Recording, n.d.c).

Manufacturers had to balance component cost against performance when designing their products, to ensure profitability. Cheaper consoles appealed to songwriters and producers who were starting to become customers for studio equipment.

Soundcraft branched into tape recorder manufacture in 1977, as they could see some potential selling mixers and tape-recorders as a package. This was a response to a rival company's (Allen and Heath) entry into tape recorder manufacture. The new business (Soundcraft Magnetics) was formed as a subsidiary of Soundcraft Electronics, and was run by Alex Nicholas who had worked at Brenell (a British tape recorder manufacturer) and John Eustace of Richardson Electronics, with the aim of developing from a clean sheet, truly professional multitrack studio tape-recorders (Jones, 2013b). Soundcraft Magnetics brought out the SCM 380 series in 1979,

initially a one-inch 8-track machine this product was then updated to allow 16- and then 24-track recording.

Allen and Heath traded throughout the 1970s; in common with Soundcraft and Amek, their early products were aimed at the expanding live sound industry. For example, Allen and Heath manufactured a quadrophonic console for the Pink Floyd in the early '70s. One of their early products was a self-assembly kit, the Mini Mixer, which sold for under £100 (Cooper, 2003a). Allen and Heath gradually moved into making affordable mixing consoles aimed at use with 8-track tape recorders. The company introduced a number of innovative manufacturing methods, which kept down the prices of the consoles and facilitated considerably more efficient and cost-effective manufacturing. Another key development was making the entire mixing desk modular; other innovative cost-cutting techniques also enabled efficient manufacturing and the company prospered. Innovations that reduced manufacturing costs were a part of the maturation of the professional audio industry, as in the early days of console manufacture consoles were hand made with discrete components but "ever since 1974 gear has been designed to make the manufacturing process cheaper" (Thompson, 2011). [121] Rationalizing the manufacturing process enabled greater profitability and competitive pricing.

> I think Andy was the first person to say: "I can do it for two and sixpence and I can cut all these corners". Fundamentally it pointed the way that all mixers were going to be built. (Taylor cited in Cooper, 2003b)

Other key innovations introduced by the company included the use of op-amps in the Syncon A mixer. [122] The Syncon mixer was also capable of mixing quadrophonic

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[121] Personal Communication (17/08/11).
[122] Op-amps are widely used electronic devices today, but were not commonly used in consoles at that point in the early 1970s.

sound. The company worked closely with the British tape recorder company Brenell from 1974, Allen and Heath were aiming to expand their product range with an inexpensive, 'Turnkey' studio console complete with multitrack tape recorder (Jones, 2013b). The tape recorder in question was a 1-inch 8-track machine, and this package of console and recorder began a working relationship between Brenell and Allen & Heath. However by 1975 Brenell were facing a cash flow crisis due to a terminal decline in domestic sales of tape recorders, which was their main market. Allen & Heath were keen to ensure the development and continuity of supply of this 8-track and stepped in, buying the Brenell company (Jones, 2013b). Allen and Heath moved their entire production operation into Brenell's factory and invested heavily in new manufacturing equipment. Allen and Heath stopped production of Brenell's quarter inch two track machines and concentrated on the manufacture of the Mini-8 machine (Jones, 2013b). The machine sold fairly well in the UK, particularly to composers and musicians, but achieved few sales in the USA where Allen & Heath's mixers had gained a significant market share. However, there were some considerable problems with the Mini-8's reliability. Brenell's engineers started to develop a 24-track machine which was about to be released at a trade show in 1978 when Allen and Heath "abandoned the project a matter of days before the show, and began winding down production of the Mini-8 before withdrawing from tape deck manufacture to concentrate on their mixers at a new factory in Cornwall" (Jones, 2013b).

The Manchester-based manufacturer Amek started trading in 1973, the company was set up by Graham Langley and Nick Franks, initially making bespoke equipment for live sound (Langley, 2013). [123] It was common in the early 1970s for bands to buy their own mixing consoles, and the company forged links with the first British PA

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[123] Personal Communication (03/03/13)

hire companies. The company then moved into the recording and broadcast markets. After an order for a specialist console with 4-band EQ, the company looked at developing an in-line console based on the success of the American MCI JH400. The MCI product was a popular console in the US, but expensive in the UK, and Amek introduced the 2016 console as a more affordable product with similar features (Langley, 2004). The company first exported to France, and then branched into the American market by showing their products at the 1976 APRS trade show and gaining interest from an American audio retailer. At this point the company was relatively small and only sold a total of 50 consoles in 1977, the majority of the recording consoles going abroad (Lockwood, 1995), which was a pattern in their later product sales too as Adshead explains, "Yeah, we sold a lot of stuff overseas, they went all over the world. There wasn't anywhere they didn't go" (Adshead, 2013). [124] The company expanded rapidly and in the late 1970s introduced a highly specified recording console the M3000, which could be ordered with fader automation (the Allison 65K system). These were to a degree custom-built for each client and only eight were made, a basic version of the M3000 sold for around $46,000.00. (Gette, 2013). [125]Again, this console was inspired by an MCI design, in this case the MCI JH500. The M3000 was simplified in a later large format console product the 2500; the company subsequently sold 110 of this model (Lockwood, 1995).

Another respected console manufacturer that emerged in the 1970s was Raindirk; the designer Cyril Jones founded the company in 1973. The company was started after Jones was asked by Ian Gillan of Deep Purple to submit designs for a 24-track recording console to be installed in the former Kingsway recording studio in London

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[124] Personal Communication (19/02/2013).
[125] Allowing for inflation this is around £100,000 nowadays.

(Raindirkaudio, 2015). The console was installed during August 1973; following this installation Raindirk initially targeted the smaller format console market prior to developing a larger in-line console in 1979. Jones had previously worked at Sound Techniques and he also worked closely with Olympic Studios.

Solid State Logic eventually became the dominant UK console manufacturer. SSL developed the SL4000 A Series console in 1975; but only two of this model were built. The SL4000 B Series - which integrated the first SSL Studio Computer – was introduced in 1977, again production was very limited as only six of these were made. The concept was further refined and released as the SL4000 E Series in 1979; this became a highly successful product for the company as the console sold in large quantities. This desk refined in-line mixing console architecture and also integrated control of the multitrack tape recorder. The console allowed the mix engineer a degree of automation and control that facilitated more complex mixing practices. Although originally designed for music production SSL sold a large number of consoles to broadcast and post-production clients. The SSL console became an industry standard for many years and SSL sold their 1000th analogue console in 1994, coincidentally to Townhouse Studios who were one of their original customers (Museum of Magnetic Sound Recording, n.d.a). These consoles routinely cost over £100,000 pounds, and in the largest configurations, several hundreds of thousands of pounds. Unlike the majority of the other console manufacturers whose flagship products often sold in relatively small numbers, SSL were extremely successful and sold far greater numbers of their products internationally.

SSL desk (Museum of Magnetic Sound Recording, n.d.e)

I have only discussed the larger manufacturers, but by the end of the decade there were a greater number of pro-audio manufacturers trading despite some of the early entrants to the market suffering financial problems and ceasing trading. This discussion offers some insight into the considerable expansion of the studio sector in this period, as it could now sustain a number of technology manufacturers. As a response to the stratification of the studio sector, manufacturers developed products geared at mid-level and demo studios, and at the upper end of the market high-end consoles became more sophisticated and expensive. Products or expertise from the tape recorder manufacturer Brenell are incorporated into both Allen and Heath and Soundcraft's businesses, resulting in UK manufactured tape recorders aimed at mid-level studios and demo studios. Audio & Design are still the only significant UK outboard equipment manufacturer in this period, and traded throughout the 1970s. Consoles that were manufactured using discrete electronics were largely superseded in this period and replaced by products manufactured using more cost effective components and efficient manufacturing methods. Despite the increased competition, a number of UK companies thrived and became very successful internationally; in

some cases their products were (and still are) closely associated with the British rock music of the early 1970s.

The British Sound

Theberge (1997) observes that specific music scenes were associated with having an identifiable sonic signature from the 1960s onwards. This concept has also been applied to the national sound of recordings and also to specific studio technology, notably mixing consoles. Zagorski-Thomas (2012) unpacks the issues around the notion of a 'British Sound', and notes that although the idea of a British Sound is contentious, many producers, musicians and engineers active in the '60s and '70s consider there were audible differences between British and American recordings. Zagorski-Thomas (ibid) considers relative differences in studio design, drum tuning, microphone technique and equipment design to be factors that contribute to differences in the character of British and American recordings in the late '60s and early 1970s. Zagorski-Thomas's (ibid) research revealed that British engineers in this period used equalization and compression more heavily than their American counterparts and this was reflected in the design of UK mixing consoles. UK consoles also had greater flexibility in terms of EQ options. Zagorski-Thomas (ibid) refers to the second British Invasion of the late '60s and early '70s as being predominantly rock-oriented. Many of the British rock bands of this era recorded in UK studios such as Kingsway, Olympic, Trident, Island Studios etc., and their recordings were produced using consoles designed by Frost (Sound Techniques), Swettenham (Olympic, Helios), Toft (Trident) and Neve. These consoles are now closely associated with a particular era of rock music.

Despite the difficulties of defining the innate characteristics of a British Sound, the

international success of UK rock music in this era appears to have contributed to the success of UK professional audio products.

> Because, I think, of the Beatles, and some of the stuff that was coming out of England. It was such a strong force, that I think a lot of American producers and engineers kind of said, "Oh, what are these Brits doing? How are they getting that sound? (Toft cited in Vodovin, 2009)

The following quote is from one of the console company Amek's founders. "We were selling in America from '77, and we started in Australia in '77, in Italy and Germany in '78. The 'English sound' was very sought after, and basically still is" (Franks cited in Lockwood, 1995). This mention of the 'English sound' is an important comment as the success of British bands in the 1960s and 1970s meant that there was considerable interest in the equipment that was used to make their recordings.

> British EQ comes out of British music. I'm sure of that. I really think it does. You've got all these artists around in the '60s and '70s, which is where the British EQ thing all started, and we were all sort of making do with what we'd got. (Toft cited in Marshall and Szalva, 2001)

A British mixing desk consequently gained a certain cachet in other countries based on the international success of British rock bands recorded in UK studios using UK manufactured consoles. The association of specific items of technology with the successful recordings of early '70s British rock bands certainly helped to market the UK manufactured consoles abroad, particularly in America. This eventually results in the marketing term 'British EQ', which is now widely used in advertising copy, often by foreign manufacturers. "Behringer is one of the manufacturers currently using it – a company founded in Germany but with production based in China" (MusicTech. 2014). The American company Mackie included the following comment in the marketing material for their budget Onyx mixer. "The Sweet,

Musical Sound of British EQ on Every Channel" (Mackie, n.d). The console designer John Oram (who worked for Trident for many years) considers that people started using the term 'British EQ' in the 1960s to account for the differences in sound quality of British and US recordings. American recordings were considered to be clearer and cleaner; while UK studios were making 'dirtier-sounding' recordings with a more pronounced midrange (MusicTech, 2014). This is possibly due to the different approaches in designing console EQ adopted by the respective manufacturers (Zagorski-Thomas, 2012).

Part of the international success of UK companies was due to their presence at trade shows run by the trade association The Association of Professional Recording Services (APRS), or at American Audio Engineering Society (AES) shows, where the APRS still has a presence. [126] APRS members include recording studios, post-production companies, mastering studios, replication, pressing and duplicating facilities, and providers of education and training, as well as record producers, audio engineers, manufacturers, suppliers and consultants (APRS, 2010b). When Malcolm Toft first went to an AES trade show in America in 1974 seeking distributors for the Trident console he had helped to design, the Trident Studio's reputation and association with specific successful recordings effectively created interest in the consoles he hoped to sell. "Before long I had people actually banging on my hotel door saying are you really from Trident Studios, how'd you get the Elton John drum sound, is this a module from the console?" (Toft cited in Marshall and Szalva, 2001). This was essentially a similar phenomenon to British studios attempting to source American studio equipment a decade earlier in an attempt to replicate the sonic signature of American record production in the late 1950s and early 1960s. For

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[126] The Audio Engineering Society was founded in 1948 and is the only professional society devoted exclusively to audio technology.

example, the producer Joe Meek imported American-made Altec, Fairchild and Ampex equipment (Cleveland, 2001). Abbey Road also used Altec and Fairchild equipment, and the equalizers in EMI's REDD desks were based on the American Pultec EQ (MusicTech, 2014).

> I think British EQ has got its name because of the manufacturers who are around. If you look back historically, most of the major desk manufacturers who have enjoyed a long life have been British. You've had Soundcraft, Amek, Solid State Logic, Trident, DDA, Neve of course, Calrec, Helios... you've got Allen and Heath, Studio Master. API's about the only American company that I know of who have been going on as long as, say, Trident have been. (Toft cited in Marshall and Szalva, 2001)

Toft's list of manufacturers above is not entirely exhaustive, as he omits Sound Techniques, Raindirk, Cadac, Audio Developments, Tweed, Alice and Seck. [127] But it does underscore the success that British console manufacturers enjoyed in the era of large recording studios. This was despite the considerable expense of the consoles when exported abroad.

> When David Briggs and I started Quadrafonic Studios in Nashville [in 1975] … We wanted a Trident A-Range, because we loved that British sound, but back then they cost around $175,000 which was a lot of money; the MCI only cost about $25,000. (Putnam cited in Zagorski-Thomas (2012, p. 74)

Toft (cited in Marshall and Szalva, 2001) observes that a number of the British firms stayed in business for longer than many of their American counterparts, he also notes the direct input that UK engineers had on console design. In the case of the early studios that made their own consoles, such as Olympic, Sound Techniques and Trident there was a close relationship between the designers and the engineers. This feedback from technical staff was a pattern of the UK industry in general and is another example of the co-construction of technology by users. Toft (ibid) considers

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[127] DDA and Seck were manufactured in the 1980s, Calrec primarily manufactured broadcast consoles.

that UK engineers were more closely involved in console design than their American counterparts: "They seemed somehow to have more input to the manufacturers than maybe the Bruce Swediens, the Bruce Botnicks, the Tom Dowds seemed to have" (Toft cited in Marshall and Szalva, ibid). Toft's (ibid) observation omits Bill Putnam's work on console design or Dave Harrison's design input into MCI consoles and subsequently his own company's designs, as Harrison had been an engineer and studio manager at King Records prior to starting to design consoles (Harrisonconsoles, 2015). Despite significant competition from American manufacturers, notably MCI, API and Harrison, British console manufacturers began to dominate the international market. "So we tended, for many, many years, to dominate the console market. … So I think just by sheer numbers, in a way, we did create a British sound" (Toft cited in Vodovin, 2009). Jopson (2006, p. 57) refers to the dominance of UK mixing consoles in the global market as "arguably the last vestige of Empire". Jopson (ibid) also comments on the number of vintage British large-format consoles from the '60s and '70s still in use in America. Vintage consoles are discussed with some reverence in industry literature; the quote below is from an American pro-audio dealer whose company restores vintage equipment and is typical of the rhetoric used. Out of the seven manufacturers mentioned below, five are British, elsewhere in the article Trident are mentioned a number of times. [128]

> Our guess is that regardless of what the future holds, it is likely that consoles from the big four – Neve, API, SSL, and Helios – will remain in very high demand and continue to be used in the future. Even rarer, more esoteric consoles, such as those built by EMI, Telefunken, Decca and a handful of others, have already transcended fashion into the category of timelessness, based on their history alone. (Nehra, 2012b, p. 51)

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[128] API are an American company and Telefunken a German company.

It seems that the association of specific console technology with iconic recordings from the 1960s and 1970s is still creating a demand for this equipment many years after the equipment's initial manufacture.

Conclusion

In terms of the market during the 1970s, record sales in the UK doubled, and the international music business also grew considerably. This growth directly contributed to the considerable expansion of the studio sector throughout the decade. The independent label sector also developed considerably, causing some change in industry structure, and contributed to the growth in record sales and offered another source of income for studios. The punk DIY aesthetic facilitated the growth and survival of smaller studios in the latter part of the decade. The recording sector stratified; studios offered distinct levels of technology and facilities, specifically catering for major label work, independent labels and demo recording. The professional audio manufacturing sector developed in tandem with this growth, and also addressed the stratification of the studio market. In this period it appears that the international success of British popular music was a contributing factor in British manufacturers developing export businesses. London became an international recording centre in the early 1970s as UK studios were now offering technical provision that was equivalent to American facilities; the UK sector was no longer trailing the American sector. Although setting up a studio involved a high initial cost, the sector was profitable throughout the 1970s as studio rates were high in comparison with the modern era. However, by the end of the decade competition was increasing, as were the costs of equipping a facility once computer-controlled consoles are introduced. In terms of technology, UK manufactured mixing consoles

become dominant worldwide, particularly once SSL enter the market. Although technological innovation was not as rapid as in the 1960s, the 24-track tape machine became an industry standard and early digital technology was integrated into studios in the latter part of the decade. A degree of standardization of both equipment and acoustic design at the high-end of the studio sector started to occur in the 1970s. In common with Grant's observation above on what he refers to as a 'plastic studio', Theberge (2004) notes that the standard 24-track studio of the 1970s and 1980s became a 'non-place', despite each studio being marketed as unique, they were essentially similar. This was both in terms of acoustic design and equipment, standardisation allowed engineers and producers to change studios with little difficulty, as they did not have to adapt to the idiosyncrasies of different equipment or acoustic spaces. Home studios began to become more common once affordable technology entered the marketplace, starting a trend that eventually undermines the traditional studio sector. I would argue that the development of a market for home recording in this decade was a significant shift in the relationship between musicians and recording technology. In the early part of the decade only a small number of successful musicians could afford to purchase multitrack technology; once more affordable equipment entered the market amateur and semi-professional musicians began to become significant consumers of studio technology. This process accelerates in the 1980s as the impact of digital technology reshapes music recording and production. Although there is change and considerable growth in the studio sector throughout the 1970s, the decade was a consolidation of the radical developments that occurred in the 1960s. The era was defined by the production aesthetic that emerged in the 1960s, with the studio as a site of experimental creativity. The technology and practice of the era was geared at recording rock

bands, and the continued growth of the studio sector and pro-audio manufacturing was predicated on the success of the record labels at exploiting the market for rock music. The next chapter will now examine developments in the sector in the 1980s, the period in which the digital era begins for the music industry as a whole.

Chapter Four

The 1980s: a Decade of Digital Innovation

Introduction

The 1980s featured radical changes to both the record industry and the studio sector,
as digital technology reshaped both the production and consumption of popular
music. Although there was some integration of digital technology in the 1970s, the
1980s was the real advent of digitization in the recording industry. The radical
impact of digitization on the 21st century recording industry can be traced back to the
introduction of digital technology in the 1980s; consequently, an examination of the
technological innovations of the period provides a clear context for the historical
process of the digitization of the recording industry. As noted by Theberge (2015, p.
329) digitalization has been "a relatively long transformative process of economic,
technological, social and cultural change". This chapter will argue that in order to
fully understand the emergence and implications of digitization it must be examined
using a long historical arc, and in more detail than in previous work in this area, such
as Leyshon (2001, 2005, 2009). The chapter will also argue that there is clearly a
feedback loop between the market for popular music, technology, technology
manufacture and practice. In a broad sense, digitization directly affected the market
for popular music in this period. The introduction of the compact disc in 1983
considerably increased revenue in the record industry from the late 1980s onwards, a
phenomenon which continued throughout most of the 1990s. Innovations in digital
technology were integrated into numerous new studio products, which then impacted
on practice; the results of that practice then affected the market. Digital technology
became extensively integrated into both professional studios and home/project
studios in the 1980s. From this period onwards electronic music produced using

digital technology became increasingly popular and began to generate considerable income for the record industry. This chapter will also argue that the emergence of digitization in the 1980s meant that home and project studios begin to radically undermine the relevance of professional studios. "The so-called 'project studio' – essentially a home studio that takes in commercial work and often consisting of little more than a well-equipped control room and perhaps a small booth for recording single instruments or vocals…" (Theberge, 2012, p. 82). Although some producers and musicians working in electronic genres utilized professional studios, they were not integral to the explosion in electronic music production in the period.

The key themes of this chapter are the integration of digital technology – notably MIDI and digital recording – as this was a key development that affected all types of studios in the 1980s. On the one hand this meant that start up and maintenance costs (or upgrade costs) for professional studios increased in the period, on the other, powerful integrated studio set-ups became available for the home recording market. There was a move towards further standardization in the studio sector in the 1980s that was partly driven by the pro-audio sector, and the studio sector matured further and consequently expanded more slowly than in the 1970s. I will argue that the broad effect of digitization on the studio sector of the 1980s was twofold. There was a pressure for studios to upgrade to the latest digital technology, effectively a technological arms race at the top end of the sector. However, we see also the emergence of the project studio, a flexible site that often integrated new technologies more effectively than the professional sector, and one that began to undermine the role and viability of the professional sector in this period. This chapter will examine the market, costs and competition in the studio sector, technology and innovation, the rise of the project studio, developments in mixing desk design, and the evolution of

the pro-audio manufacturing sector. It will first examine the 1980's market for recorded music as this provided the financial framework within which the studio sector and pro-audio manufacturing sector are embedded.

The Market

A buoyant market in terms of popular music sales results in investment from the record industry in new artists and recording projects, without which the studio sector cannot survive. The pro-audio sector is also dependent on the studio sector continually investing in new equipment and on home studio owners' perception that purchasing recording technology can further their career. As can be seen from the BPI chart below, throughout the 1980s the sales of singles declined in the UK. However, the market for albums increased significantly as can be seen in the second BPI chart below, and by 1989 CD sales account for a quarter of the total album sales. The introduction of the compact disc was a significant development in the 1980s and drove an increase in album sales in the latter half of the decade and throughout the 1990s. By 1988 worldwide sales of CDs were greater than traditional vinyl albums (Southall, 2009). Growth is not quite as rapid as in previous decades, but the revenues the labels recouped from CD sales were proportionally greater than from vinyl or cassette sales. At this point in time CDs were expensive to purchase and artists received a lower royalty rate on their CD sales.

Annual Totals SINGLES UNITS (000s) - TRADE DELIVERIES

	7"	12"	Cass	CD	Total
1964					64,000
1965					56,000
1966					46,000
1967					46,000
1968					44,000
1969					41,000
1970					41,000
1971					43,000
1972					46,200
1973					54,600
1974					62,700
1975					56,900
1976					56,924
1977					62,143
1978					88,847
1979					89,085
1980					77,907
1981					77,406
1982					78,638
1983					73,999
1984					77,032
1985					73,826
1986					67,444
1987	43,363	19,315	275	460	63,413
1988	40,291	17,656	113	2,058	60,118
1989	37,537	18,760	1,141	3,676	61,114

(Crutchley, 2014)

Annual Totals ALBUMS UNITS (000s) - TRADE DELIVERIES

	LP	8-Track*	Cass	CD	Total
1964	24,000				24,000
1965	27,000				27,000
1966	28,000				28,000
1967	30,000	100			30,100
1968	39,000	200			39,200
1969	45,000	300			45,300
1970	49,000	1,000			50,000
1971	52,000	4,000			56,000
1972	59,300	3,200	4,900		67,400
1973	81,000	5,700	9,800		96,500
1974	89,500	6,200	14,000		109,700
1975	91,600	3,700	16,500		111,800
1976	83,794	2,246	15,967		102,007
1977	81,673	1,112	18,530		101,315
1978	86,060	584	20,604		107,248
1979	74,536	73	23,454		98,063
1980	67,441		25,229		92,670
1981	64,014		28,672		92,686
1982	57,840		31,480		89,320
1983	54,253		35,782	162	90,197
1984	54,071		45,341	800	100,212
1985	52,948		55,391	3,111	111,450
1986	52,289		69,559	8,351	130,199
1987	52,155		74,423	18,162	144,740
1988	50,208		80,874	29,196	160,278
1989	37,897		83,040	41,726	162,663
Source: BPI Surveys					
*1967-1971 - includes 8-Track and cassettes					

(Crutchley, 2014)

Tschmuck (2006) observes that during the early 1980s the international market stagnated, which was the case in the UK also, however from 1983 onwards, international sales grew steadily. In the UK, a significant increase in album sales occurs in 1984. The stagnation of the market at the latter end of the 1970s and during the early 1980s is considered to be due to a worldwide recession after an oil crisis and is also partially attributed to cassette technology facilitating private copying (Tschmuck, 2006). The introduction of the Music Television video channel (MTV) in 1981 played a major part in promoting popular music to an international audience throughout the 1980s, by 1990 MTV reached a global audience of over 100 million (Tschmuck, 2006). One effect of the promotional influence of MTV was the creation of global superstar artists, where their status was based not only on album sales but also on their global media presence. "The superstar phenomenon can be observed especially well in the mid 1980s" (Tschmuck, 2006, p. 154). The major labels responded to this development by cutting their artist rosters and concentrating their marketing activities on a few successful acts (Tschmuck, 2006). Burgess (2014) notes the record industry went through a number of mergers and acquisitions from the 1980s onwards; in some cases labels were purchased by non-music-based corporations. This structural change altered the culture within the major labels, and the focus on quarterly growth affected producers and artists. Producers were expected to deliver hits from the first release and the period allowed for the development of new artists became shorter (Burgess, 2014). The consolidation of the major labels resulted in there being only six major labels by 1986.

In parallel to the established industry structure of the period, the UK independent sector saw significant developments throughout the 1980s, particularly once regional independent distributors formed an alliance called the Cartel (King, 2012). Of

particular significance here is the plethora of independent labels that emerged as dance music became popular in the late 1980s. As Rojek (2011, p. 138) notes, "Indie labels often feed off a breakthrough in musical genres that the big record labels have under-represented or ignored".   Much of this music was produced using new technology, and a significant amount was made using home and project studios outside of the professional studio sector. Despite the fact that dance music was incorporated into major label rosters once it became a mainstream success (although many releases were still on independent labels), the emergence of a new type of recording practice in this context would have significant implications over the coming decades, both in terms of where commercially successful recordings could be produced and the working practices that were common in their production. We can see a clear feedback loop here whereby technology impacts on practice and then practice impacts on the market.

Costs and Competition

This section will examine costs, competition and the start of a decline in the professional studio sector. I will argue that this decline was at least in part a consequence of affordable home studio technology impacting on the business model of professional studios. Although there were some aesthetic changes to record production and recording that were facilitated by the new technologies, the continual acquisition of the latest recording technology was perceived as an essential investment to maintain competitiveness in the sector. This also extended to acoustic design, and many studios were updated to maintain currency in this area too. Technology itself became a discourse, one in which new technology holds power regardless of application or necessity.

There has always been pressure placed on studios at every end of the market to maintain technical currency, this has been clearly obvious from the introduction of multitracking, when track counts started to stratify the studio sector. The consumption of new recording technology was driven by a techno-utopian discourse that privileged the latest technology; although this discourse was at least in part created by the pro-audio sector's marketing efforts. Studios, producers, engineers and musicians perceived that they could gain competitive advantage by adopting new technology. Langley's (2013) empirical perception of the studio business is that is has always been driven by fads, "in every sense, the most fashionable room, the most fashionable equipment, and the most fashionable staff as well. It is purely a fashion industry". [129] Langley's (ibid) comment may sound cynical, but it is based on some decades' experience as a successful technology designer and manufacturer, in which many of his clients were recording studios. Maintaining technical currency (or staying in fashion) in the 1980s had serious financial implications for many studios. Much of the new digital technology aimed at the professional sector was extremely expensive, particularly large format automated consoles and digital tape recorders, and the cost of equipping a professional facility rose considerably through the 1980s. One of my respondents commented that in the 1980s there was some pressure from both record companies and artists alike to purchase an SSL console for his facility. Although introduced in the 1970s, the SSL console became an industry standard in this period and studios perceived that to stay competitive they had to make the considerable investment necessary to purchase or lease an SSL desk: "During the '80s it seemed like you had to have one" (Macpherson, 2010). [130] Due to the extraordinary expense of maintaining technical currency (or fashion) this techno-

[129] Personal Communication (03/03/13)
[130] Personal Communication (09/04/10)

utopian discourse was often detrimental to the financial viability of many studios. Technologies are always framed socially and culturally, almost regardless of use value or application. The cost of entry to the studio business in the 1980s (at the upper end of the market) increased considerably as the large format automated consoles that became standard in well-specified studios were extremely expensive, as was the digital recording equipment that became more commonplace. The process of standardization of professional studios that began in the 1970s continued throughout the 1980s. This was an international phenomenon, based on specific equipment and acoustic design principles, and resulted in considerable homogeneity in the sector: "Even at a distance approaching 30 years, the initials SSL still bring to my mind's eye an international network of major studios, all with the same acoustic designs, multitrack tape recorders and SSL consoles" (Thomas, 2014).

In terms of acoustic design in this period, Hidley's control room designs of the 1970s were by now attracting some criticism, and after a break between 1980 and 1983 Hidley returned with a new design concept, the Non-Environment room (Newell, 2008). This design featured a reflective front wall and studio floor, and all other surfaces were made as absorbent as possible. This design was very consistent in application, and offered a standardized acoustic environment in the control rooms that Hidley designed in the 1980s: "The consistency between Non-Environment type rooms is, perhaps, greater than that between other types of room" (Newell, 2008, p. 355). The Japanese acoustician Sam Toyoshima's studio designs also featured a live front wall and a dead rear wall. A clear division in acoustic design philosophy occurred in this period, between designers who favored a live rear wall in a studio and those that favored absorption. "Effectively the option was becoming between 'Live-End, Dead-End' and 'Dead-End', Live-End'" (Newell, 2008, p. 357). The

different factions all agreed that a control room should have directional acoustics whose properties depended on the position of the sound source, and not a generally diffuse sound field of uniform decay time, that was independent of the source position (Newell, 2008). "Differences in opinion about which end should be live and which should be dead continue to the present day" (Newell, 2008, p. 357). The scenario of standardized equipment continued as further developments in digital audio became integrated into studio practice. The cost of updating technical equipment and acoustic design to maintain currency caused a number of studios to over extend financially, which in some cases resulted in closure. Some more cautious studio owners resisted the temptation to stay at the cutting edge of studio technology. Jethro Tull's Ian Anderson left the studio business in 1982 due to the projected cost of updating his studio Maison Rouge. Note the use of the term 'unfashionable' in the quote below, as Amek's Graham Langley (2004, 2013) repeatedly referred to the studio business as a fashion industry, or fashion conscious, in both an interview and an AES lecture he delivered on mixing console development.

> I sold my studio around 1982 because I saw it coming that all the original equipment that had gone in would be unfashionable within two or three years.... The... digitals were coming in. It became very threatening to realize that we might have to invest something in the region of £500,000 to re-equip both studios with new gear. And there was no way that I was going to make that kind of profit in a couple of years. (Anderson cited in Harris & Burns, 2012)

The advertisement below is for a complete studio package offered by the pro-audio dealer HHB in 1987, this features digital tape recorders and the £300,000 plus price illustrates the expense now faced by studios to maintain technical currency. If a studio was starting from scratch they would also need to purchase microphones, microphone stands, headphones, outboard equipment, instruments, etc. This package

does not include any building, acoustic design or installation costs, which would add considerably to the cost of entering the sector. The package is based around a mid-level Amek console; an SSL or Neve console would have significantly increased the quoted price. A high end Amek console could cost well over £100,000 in the late 1980s depending on its specification, and large format Neve and SSL consoles could cost over £250,000; by the 1990s particularly large esoteric consoles could be far more expensive.

APPROXIMATE PRICE
£300,000 PLUS

PACKAGE 1

'The Ultimate 48 Track System'
A state-of-the-art, no-holds-barred digital set-up, configured with only the top studios in mind.

Equipment includes:

Amek G2520 56/48 track mixing console
Two Sony PCM 3324 digital multi-track recorders
Sony PCM 1630/DMR 2000 Compact Disc Mastering
Sony PCM 2500 or Sony DTC 1000ES (pictured) DAT Digital Mastering
A selection of high quality outboard gear from AMS, Drawmer and many more.
Packages like this are regularly devised, installed and maintained by HHB's experienced team of engineering professionals.

Two Sony PCM-3324 DASH machines with mixer and digital mastering gear, a package from 1987. (Dorman, 2001)

A studio owner I interviewed upgraded his facility to a digital recording system and an automated Amek console in the 1980s. "I'd spent easily over £230,000 on gear, which I dreamt I would be able to sustain" (Macpherson, 2010). [131] The same respondent commented that the overheads involved in upgrading made his studio business struggle financially, despite the studio being extremely busy and bringing in

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[131] Personal Communication (09/04/10)

over £250,000 a year in business. The recouping of any financial outlay on equipment was also subject to regional variations in the market as studio rates in London have always been higher than in the regions. This was a medium sized facility in Manchester with a small number of staff; note that the owner considers the threat of project studios to be less significant than the perception he has to maintain technical currency at any expense.

> It was my own fault, at the time I nearly disappeared down the tubes, I was taking about £23k a month, that's how hot the engine got, how high the revs got, and I got into this vortex of digital clack. Nothing to do with home studios, drum machines, it was the market sucking you in to buying £138,000 digital machines. (Macpherson, 2010) [132]

The respondent's comment above is an example of the discourses surrounding the power of new technology. The perception that you had to have the latest technology to maintain competitiveness was at least partly shaped by pro-audio marketing. Despite the large recording budgets available in the 1980s the pressure to commit to significant capital investment in digital equipment started to impact on the financial viability of many studios; although their eventual demise often took some time to occur. The following quote illustrates this point, the investment needed to purchase a number of SSL consoles would have been considerable.

> Livingston had an Amek console, and when the A&R people started putting lots of clientele their way they went out and bought, I can't remember, maybe 4 SSLs. They couldn't fund it, external people did. Unfortunately, not long after was the ruin of many studios. (Langley, 2013) [133]

Many studios were obtaining the new digital equipment using leasing packages or by obtaining the necessary funding from banks or outside investors, the doubling of

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[132] Personal Communication (09/04/10)
[133] Personal Communication (03/03/13)

interest rates in the UK at the end of the decade from 4% to 8% meant that a number of studios became over-extended financially and had to close: "Banks started to chew your heels up. Overdrafts were shortened, and as you know, the interest rate went berserk" (Macpherson, 2010). [134] The need to keep up to date with continual software and hardware updates once studios integrated digital equipment placed an extra strain on a studio's cash flow as "These additional upkeep costs were not part of the recording studio business until digital technology started entering the recording studio in the late 1970s and early 1980s" (Hearn, 2013).

Despite the increased competition occurring in the sector by the end of the 1970s, if a studio could keep its costs down, the market in the 1980s was buoyant, as high-end studios could charge up to £2000 a day. A respondent who managed producers in the 1980s commented: "I'd be paying £2k a day for recording backing tracks in Abbey Road or Wessex, then £600 a day for overdubs somewhere else, then £1,500 a day in Sarm to mix" (Thompson, 2011). [135] A smaller less well-equipped studio was also potentially lucrative.

> When I took over managing David's studio in Bath in the mid 80s, he had a small studio, a 40 channel SSL, the first SSL outside London. The total investment of gear in the studio was probably a couple of hundred thousand quid, MTR 90, Urei monitors, he didn't even have a 480, a modest mic collection, a smallish live room with a piano. The first thing I did was make it residential as he and his partner had a flat next door. I could get a £1,000 a day or £5,000 a week, for 52 weeks of the year; if I got a cancellation I could fill it within a day. (Thompson, 2011). [136]

Studios in the North West (which have historically had lower rates than London studios) could charge more in the late 1980s than the market can stand nowadays in London. They too were also consistently busy in this period.

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[134] Personal Communication (09/04/10)
[135] Personal Communication (17/08/11)
[136] Personal Communication (17/08/11)

You can't charge what you could years ago. I think Mirage was £750 a day. Strawberry was about £550/600, but Mirage was a 48-track, when it was running 48-track it was £750 plus Vat. And we were getting it. When I was at The Windings that was £500 a day. Strawberry was busy when I was there and would earn £750 a day from a daytime booking and an evening session. (McLarnon, 2010). [137]

Despite the relatively high rates that could be charged by studios in the 1980s, a respondent considered that studio rates had not increased to cope with years of inflation in the UK economy, and were relatively speaking cheaper than in the early 1970s: "You have to remember that post decimalization there was horrendous inflation going on, and studio prices hadn't kept pace with inflation even eight or nine years after the early '70s" (Leader, 2013b). [138] Inflation in the late '70s reached over 20%, and was 18% in 1980. During the 1980s inflation dips below 4% only briefly, over the course of the decade the constant increase in running costs, rising rental prices, and higher interest payments impacted on the overall profitability of the sector. A number of substantial studios consequently closed in the late 1980s, such as Strawberry South and Odyssey Studios. Despite the difficulties faced by some facilities the Metropolis Studios complex opened in London in 1989. This was somewhat against the grain, as there had not been any substantial studio builds for some years: "Nobody had really built for many, many, years a big recording studio, or complex, they were things that seemed to happen in the '60s and '70s" (Langan cited in Metropolis, 2012).

Digital production techniques were time consuming and album costs started to increase considerably. The engineer Phill Brown (2010) observes that A&R staff took advantage of the possibilities of computer-automated consoles and became more involved in the choice of the final mixes of recordings. This would also

[137] Personal Communication (26/08/10)
[138] Personal Communication (26/02/13)

increase costs, as numerous alternative mixes could add considerably to the total cost of an album. Warner (2003, p. 81) notes the costs of the Frankie Goes to Hollywood albums, "the final recording costs for the first album totaled £394,000, while the second claimed a further £760,000". A respondent confirmed these high levels of recording costs. "It was not unusual back in the '80s for an album to cost half a million, it was just nonsense, but the records sold then, sometimes in the millions" (Thompson, 2011). [139] The engineer Phill Brown (2010) mentions spending eight months working on a Talk Talk album in this period, the album took 1,700 hours of studio time to complete in Wessex Studios and used 20 miles of tape; large recording budgets were not unusual in the 1980s.

In summary, by the 1980s the professional studio sector has matured and was no longer expanding as it was in the 1970s, the technology has become advanced and the costs involved in setting up and running a professional high-end studio have increased considerably. Leyshon (2014, p. 131) considers that the ubiquity of SSL and Neve consoles meant that many studios were on an equal technological footing in the 1980s, which allowed record companies to force studios to discount their rates from the mid-1980s onwards. An era of destructive competition based on rate cutting started to pervade the recording studio sector (Leyshon, 2014). Amek's Graham Langley confirmed Leyshon's (ibid) observation, and considered rate cutting was a factor in the unprofitability of many studios in the late 1980s, which then affected Amek's console sales: "Studios were closing, so it was harder to sell products" (Langley, 2013). [140] Competition and rate cutting impacted on the sector, and studio rates had not risen enough to compensate for the inflation that occurred in the

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[139] Personal Communication (17/08/11)
[140] Personal Communication (03/03/13)

economy in the 1970s and 1980s. Another factor in the gradual demise of the professional sector was the rise of the project studio.

The Emergence of the Project Studio

Another implication of the onset of digitization was the threat to the viability of professional recording studios presented by the growth of home and project studios. The introduction of technology that allowed musicians to set up an affordable home recording studio in the 1970s was a radical development in the recording industry. However, there were considerable developments in relatively affordable recording and production equipment in the 1980s, particularly once MIDI enabled digital technology enters the market, and this technology had a significant effect on the viability of the traditional recording studio. As equipping a home studio was a significant outlay, not all musicians and electronic music producers could afford their own facility, which meant that running a project studio on a commercial basis became a viable business model in the 1980s. Professional studios were charging high daily rates throughout the 1980s; however, project studios could drastically undercut the rates charged by professional studios, as their outlay on equipment and overheads were much lower. The sector was simultaneously splitting into two pricing directions at this point, a trend that had long-term implications for the viability of the UK's professional sector. The studio designer Philip Newell (2008) observed that from the 1920s to the 1980s, recording studios developed almost entirely in the hands of trained professionals, and by the mid-1980s professional studios were highly sophisticated. The main clients were the record, film and advertising industries, who were accustomed to paying high rates for services. Newell (ibid) notes that this scenario was undermined by the introduction of affordable recording

equipment in the 1980s, and the availability of domestic/semi-professional digital equipment a few years later, which led to what he refers to as an 'explosion' in the number of small studios. The recording industry fragmented into a large number of small studios, which "severely damaged the commercial viability of many of the larger studios" (Newell, ibid, xxi). The trained teams of staff in the larger studios started to break up and disperse, and as a consequence the traditional studio apprenticeship of generation-to-generation knowledge transfer began to be lost (Newell, ibid).

Warner (2003, p. 20) notes that in many cases music that is mixed in a conventional studio will often have been created in "the now ubiquitous 'home studio', which has become virtually a prerequisite for any aspiring pop musician". Home studios changed the way that music was written and recorded; they also allowed greater experimentation, as studio time was no longer financially constrained: "It's liberating, as you can get it wrong and it doesn't matter as back then you were under more pressure as you were paying for the time" (Massey, 2010). [141] As recording technology evolved, well-equipped project studios increasingly started to take on commercial work, which impacted on the professional studio sector. Project studios were another possible configuration of the commercial recording studio, and they grew in number in the 1980s as relatively affordable digital production technology became available. Electronic dance music also grew in tandem with the growth of the home and project studio. The ability to use and program the latest recording technology became a more widespread skill; this diffusion of knowledge and technology started to break down the amateur/professional status in the production process (Warner, 2003; Watson, 2015). The possibility of musicians and producers

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[141] Personal Communication (06/04/10)

undertaking songwriting, arrangement, pre-production and even the final mix outside of the traditional studio environment obviously impacted on the amount of work available for larger studios. This was an international phenomenon, for example, Langley (2013) notes that when Amek first opened an office in Los Angeles in the late 1970s, there were hundreds of studios in the local area, when they closed in 2004 there were twelve. [142] Langley (ibid) considered this decline was largely due to larger studios losing business to project studios. In Los Angeles in the late 1980s professional studios banded together to form the Hollywood Association of Recording Professionals (HARP), in order to confront the proliferation of home or project studios that were perceived as a threat to the established order (Daley, 1999). The underlying issue was that the sound quality of the recordings made in these small studios was in some cases rivaling the traditional studios (Theberge, 1997). Home and project studios also adopted new digital technology and the associated working practices more quickly than the majority of studios in the professional sector. As project studios were often self-operated the traditional studio roles of composition, production and engineering were blurred. There were a number of important technological innovations in the 1980s, which will be the focus of the next sections.

Technology and Innovation

The Musical Instrument Digital Interface (MIDI) protocol was announced in 1982, and introduced in 1983; this allowed the interconnection of electronic instruments from different manufacturers. Other connection protocols were developed that enabled the interconnection of digital devices, notably AES/EBU and Sony Phillips

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[142] Personal Communication (03/03/13)

S-P/DIF. There were subsequently numerous innovations in computer controlled instruments and studio technology that took advantage of these interconnection standards. Digital technology was rapidly incorporated into the composition, production and recording of popular music. Taylor (2001) considers the introduction of digital technology in the 1980s to be the most fundamental change in Western music since the invention of music notation. [143] Production methods quickly evolved to take advantage of the new digital tools, and new roles emerged, such as specialist mixers and programmers to operate complex digital production equipment. In many productions digital technology supplanted the performances of musicians, a trend that has continued and intensified. MIDI-based home studios become widespread in the 1980s, and the range of available home recording equipment increased considerably. Digital production technology was integral to the development of a number of music genres in the 1980s, notably hip-hop and house music, but mainstream popular music also demonstrated considerable use of digital technology. For example, synth-pop featured heavily in the UK charts throughout the 1980s, much of this music utilized new technology, either digital or digitally controlled. "Western popular music of the mid-late 1980s was an age of synthesizer-dominant recordings" (Bennett, 2009). Warner (2003) notes that the use of new technologies as sound sources resulted in important changes in the production of pop music, as synthesizers and samplers now supply many, if not all, of the sounds heard on pop recordings. This was a trend that began to affect a considerable amount of popular music production in the 1980s. Functional synthesizers were produced from the 1930s onwards and samplers in the late 1970s; and synthesizers featured in popular music from the 1960s onwards. However, the widespread incorporation of both

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[143] A key part of the underpinning technology of digital audio was conceived as long ago as 1929, when Harry Nyquist published his sampling theorem, the Nyquist Theorem (Burgess, 2014).

synthesizers and samplers into many styles of popular music was a development that started in the 1980s, particularly once MIDI was introduced. Moorefield (2005) observes that successful recordings that utilize advanced technologies set trends, and then create further demand for new equipment, which in turn increases the possibilities of studio recording and production, creating a feedback loop between technology and practice, ultimately one that also affects the pro-audio sector and the record industry.

Technological innovations in the 1980s had a significant impact on the role of the producer, and on the type of knowledge necessary for engineers and producers to perform their work in an increasingly digital studio environment. Moorefield (2005) notes the interdependence between music technology and popular music and considers that both are constantly evolving and influencing each other. For example, the robotic pulse of the drum machine "spawned music which built on its mechanical feel" (Moorefield, 2005, p. 110). Producers harnessed the emerging digital equipment to gain greater control over the arrangement and manipulation of audio, effectively taking on a compositional role, which underscores the significance of the new technology. "The creative involvement of the producer in the shaping of a record's sound also reflects how technology and artistic creation are increasingly interdependent in our culture" (Moorefield, 2005, p. xvii). Throughout the 1980s popular music composition increasingly featured electronic sound sources, and was often composed in the studio. Moorefield (ibid) refers to the 'producer as composer' as a characteristic of this type of production; producers became progressively more reliant on digital technology as it allowed far more control of the overall sound and final mixes of recordings than analogue technology. Digital tools offered far greater possibilities in terms of manipulating and processing audio: "The advantage of

digitization is that sound, once rendered into data, can be manipulated in a variety of ways down to the smallest detail" (Katz, 2004, p. 139). Recording projects began to take much longer to complete, as the new digital tools allowed time-consuming possibilities for editing and audio manipulation, consequently recording costs increased. Some industry practitioners considered the new genres of music that developed from the introduction of digital technology to have boosted growth in the record industry as "The creative possibilities brought about by MIDI technology have been credited as having helped to revive the music industry in the 1980s" (Shuker, 1994, p. 286). New styles of music composed using digital technology may have contributed to the growth of the record industry in the 1980s, but I will argue (with the benefit of hindsight) that the introduction of digital technology in the 1980s was the beginning of the end for many traditional studios. Digital technology helped to create new genres of music, which undermined the rock aesthetic, and it also completely undermined the business model of record companies by the millennium. Consequently, the introduction of digital technology had a number of unforeseen disruptive effects. As noted by Christensen (2003), a disruptive innovation can create a new market and value network, and eventually disrupts an existing market and value network, displacing an earlier technology.

At both ends of the market, the key developments in 1980s studio technology were all digital, as computer-controlled consoles, digital tape recording, sampling, and MIDI equipment radically reshaped the recording and mixing process. This is not to say there was a technologically determinist flow between technology and use, and as various studies have considered, agency involves a complex flow between culture and technology (Taylor, 2001). Although technology can direct or influence action, input from users is a key part of how technology develops (Oudshoorn & Pinch,

2003). This input can be in terms of suggesting possible improvements, or manufacturers adapting their products to the way users interact with their technology. "Just as the technology shapes the activities of its users, their activities shape the technology. This dynamic is evident throughout the course of recording history" (Katz, 2004, p. 190). Products were often used in ways that were unforeseen by the manufacturers, an example of what Akrich (1992) terms 'antiprogram'. For example, the use of sampling technology to rework previously existing recordings into new compositions, this type of creative misuse often leads to manufacturers modifying equipment to accommodate the way users are employing it. Bennett (2009) observes that the technological acceleration that occurred in the 1980s resulted in the adoption of new working practices; the roles of producers and engineers also became redefined during the decade as studio equipment integrated digital technology. "Specialist mixers began to emerge in the early to mid-eighties" (Bennett, 2014, p. 112). Mixing became a post-production process with the introduction of multitrack tape machines, but it was still seen as a part of the producer or engineer's role prior to the emergence of specialist mixers. Console automation was a key development that allowed far more complex mixes to be undertaken than could be completed manually. Console recall also enabled a console to be reset using the information saved on a disc, and allowed producers and engineers to move a project more easily between different studios.

In terms of recording technology, tape-based digital multitrack recorders were introduced in the late 1970s and early 1980s, and eventually hard disc recording becomes commonplace in studios by the mid-1990s, although the technology was

initially introduced in the 1980s.[144] Digital audio tape recorders were initially attractive to engineers and producers as there was theoretically no loss of quality when the tape was played or stored. Analogue tape degraded when played repeatedly and print-through could occur when it was stored for lengthy periods. "Digital recording disturbed a long period of compatible standards in recording studios" (Burgess, 2014, p. 127). There were three competing digital tape machines, from the manufacturers 3M, Mitsubishi and Sony, each machine cost well over $100,000. Subsequently, engineers and producers discovered that when you synchronized two digital recorders together it was possible to completely rearrange the structure of a track, which was a major innovation at the time.

> Lippo (Steve Lipson) said, 'Check this out,' and he played me Welcome To The Pleasure Dome, but the verse was on one machine and the chorus on the other; he'd offset the time code on them. I'd never thought of that before and we then realized that we could put anything anywhere. Obviously, everyone's used to doing this easily in Pro Tools now, but back then there wasn't any way of doing that. (Horn, 2012)

This manipulation of audio was possible using samplers, but sampling technology was still hampered by limited memory capacity and reduced sound quality in comparison to digital tape recording. During the 1980s recording the final mix to a digital format became customary. [145]

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[144] The Synclavier II allowed hard disc recording and was introduced in 1982. The British firm AMS introduced the Audiofile system in 1984. Hard disc recording offered the advantages of digital audio tape recording, but enabled more complex editing and manipulation of the audio tracks.

[145] Sony had introduced the 16-bit PCM-F1 system in 1981 as a master recorder, and there were soon rival products from other manufacturers. Digital Audio Tape (DAT) became the common mastering format by the late 1980s.

Mitsubishi's X-880 ProDigi 32-track recorder. (Dorman, 2001)

Sampling Technology and MIDI Equipment

Sampling technology was introduced at the end of the 1970s, by the early 1980s despite the considerable expense; some producers and studios had integrated the technology into their workflow. Investment in a Fairlight or Synclavier system offered producers a competitive advantage; Trevor Horn was an early adopter and invested £18,000 in a Fairlight. This machine was used extensively on Horn's 1980's productions, allowing him to build tracks in an entirely new way. This digital technology was often operated by a specialist programmer/technician, and this became a new job role for a period until engineers assumed responsibility for operating digital equipment: "Trevor declares that one of the clever things he did at the time was to hire someone to be a specialist operator, learning and manning what he calls "a tricky machine to use when it first arrived"" (Musictech, 2010). Horn also added a Synclavier system to his studio. Similar early sampling products were the Emu Emulator, which was introduced in 1981 and the Kurzweil 250, which was

introduced in 1984 (Manning, 2004). "By 1984, groups like Frankie Goes to Hollywood, and producers like Stock, Aitken and Waterman, were issuing records that were fabricated according to a new formula" (Chanan, 1995, p. 161). The producer Daniel Miller also invested in a Synclavier, which was used by Depeche Mode amongst others, again, this machine offered new possibilities for record production. Brown (2010) recounts working as an engineer on a Go West album in 1986, the first day was spent accumulating 1,000 acoustic drum samples from which the producer Gary Stevenson selected the most suitable sounds to create a drum kit for the album in his Fairlight CMI. Sampling technology allowed much greater possibilities for sonic manipulation and sound design and removed the need for notation or performers. Akai introduced more affordable samplers in 1985, and improved their technology throughout the decade. There were rival products from other manufacturers, but Akai samplers became a standard technological item, in both professional and home studios. The limitations of early sampling technology shaped the practices of dance music producers as the samplers only had enough memory to loop brief snippets of audio, which is now an accepted part of much electronic music composition. Burgess 2014, p. 143) refers to this as "yet another example of technology defining musical parameters". This isn't a deterministic viewpoint, particularly as the manufactures of digital samplers didn't expect them to be used to sample recordings that already existed. Subsequently, sampling technology became a key part of most electronic music production, and some genres relied on it entirely for the creation of musical parts. As Katz argues "Sampling has changed the very art of composition… Composers who work with samples work directly with sound, thus becoming more like their counterparts in the visual and plastic arts" (Katz, 2004, p. 157). The LinnDrum machine was released in 1982, and

this product and other drum machines had a significant impact on record production, particularly in terms of the introduction of velocity-consistent and metronomic drum parts. Producers such as Martin Rushent made extensive use of the LinnDrum in their work. It became possible once MIDI was introduced to easily synchronize different machines together, which enabled precise timing and the construction of backing tracks from sections or fragments of recordings. This is a standard method of working nowadays but was only possible with expensive and innovative technology in the early 1980s when MIDI hadn't been introduced. Horn noted that using a synchronization box, which allowed him to lock a LinnDrum and the Fairlight CMI together, helped him to create Frankie Goes To Hollywood's 'Relax': "This was so new; then, as everyone cottoned on, plenty of ways to sync machines together became available." (Horn, 2012). Replacing young musicians on their own recordings with experienced session musicians was common in the 1960s, in the 1980s their performances were often supplanted by machines. Horn's work with Frankie Goes to Hollywood is a clear example of this practice, as the vocal performances of the singers were often the only musical parts by the band that survived to the finished mix on their hit records, a practice that was adopted by other producers and remixers. [146] Warner (2003) notes that the performance styles of musicians working in pop music studios also had to evolve in order to cope with the demands of working with machine-generated musical parts. It became common that musicians had to work with a click track when recording so that they could synchronize their performance with any machine generated parts. Digital effects units become ubiquitous in both professional and home studios during the 1980s and contributed heavily to the sound of popular music of the period. Professional studios

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[146] Digital technology also facilitated the growth of remixing as a common industry practice.

extensively featured digital effects units from Eventide, Lexicon and AMS, home studios incorporated cheaper technology from Yamaha and Alesis. "By the late 1980s, MIDI hardware and software, and personal computers, had become completely integrated into many recording studios" (Theberge, 2004, p. 773). MIDI was what Christensen (2003) terms a disruptive technology, as the possibilities offered by the technology were considerable and the combination of MIDI and a hardware sequencer radically changed compositional methods, and helped to create new musical styles. Hardware sequencers allowed the recording and editing of MIDI data, and could be synchronized to a tape machine. Home studio owners were quick to integrate MIDI technology and sequencing packages in the 1980s. Burgess (2014) considers the introduction of MIDI equipment, then software sequencers, along with falling prices for equipment, to have begun the process of democratization of recording and production. For example, in 1977 a hardware sequencer (the Roland MC-8 Microcomposer) cost "just less than $5000, and nearly twice that in the UK" (Burgess, 2014, p. 136). By the late 1980s MIDI technology was widely available, hardware sequencers were relatively affordable, and the first software sequencers started to emerge.

However, it took some time for MIDI technology to become fully integrated into professional studios, as some studios were wary of its impact on studio practices and profits. A respondent noted that despite requests from the studio's engineers to purchase a PC and a sampler Strawberry was initially reluctant to adopt the technology: "Put it this way, Strawberry wouldn't buy an Atari, for ages, wouldn't buy a sampler, they'd say it was question of money. The frustration for us was people wanted to use us, but we didn't have the right gear" (Barrett, 2010).

[147]According to the London studio Strongroom's website they were the first UK studio to fully integrate MIDI technology with analogue equipment in 1989 when they opened Strongroom 2.

> This smaller space was dedicated to the emerging MIDI technology, and featured an Atari 520ST and one of the earliest Apple Macintosh computers. At the time, this was a radical move for a recording studio. Elsewhere studio owners played down the significance of the new technology, fearing the affect it would have on traditional recording methods and the studio practices that had led to healthy profits throughout the 1980s. (Strongroom, 2014)

A respondent noted that relatively few studios offered a wide range of instruments as part of their facilities, which is possibly why professional studios were slow to integrate the new production technology. "There was a bigger division between the musician and the studio" (Thompson, 2015). [148] The digital keyboards, sequencers and samplers of the 1980s were perceived as a form of technology that musicians would own, not as studio equipment (Thompson, 2015). [149] In contrast to the relatively slow adoption of the new MIDI technology by professional studios, by 1989 many project studios and home studios had already integrated MIDI keyboards and effects, samplers and computer-based sequencers.

The Home Studio Becomes Digital

In the 1980s, innovations in what was often termed 'semi-professional' digital and analogue equipment allowed home studios and commercially run project studios to become far more sophisticated and powerful, and MIDI based studios (often

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[147] Personal Communication (10/04/10).
[148] Personal Communication (14/08/15)
[149] Personal Communication (14/08/15)

augmented by narrow format tape recorders) become commonplace. [150] Prior to the introduction of MIDI, there were a number of competing interconnection/synchronization systems, the difficulties of synchronizing these machines held back the widespread adoption of new technology. Manufacturers had developed their own synchronization systems, such as Roland's DIN sync system, which in practice often meant that an instrument from another manufacturer could not be easily integrated. MIDI standardised the interconnection of the new electronic music instruments that were developed from the 1980s onwards. This new technology allowed the home studio owner to produce sophisticated compositions in a domestic environment, which for many was a liberating experience.

> There was sense of democracy that came with the technology when it was new that was really liberating. You didn't have to wait for other musicians to form ideas and get into the right place. At the time, in terms of writing, the technology was really liberating. (Massey, 2010) [151]

MIDI technology has not only changed the ways in which popular music was created, but often who was making it, and where they were making it. Technological competence can often be as useful and relevant as traditional musical skills when working with digital music technology. MIDI was rendered particularly useful through sequencing technology, initially hardware sequencers and then personal computers running sequencing programs. [152] Yamaha introduced an early computer music system in 1984, the CX5M. This acted as a sequencer and included an FM

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[150] MIDI is a technical standard that describes a protocol, digital interface and connectors and allows a wide variety of electronic musical instruments, computers and other related devices to connect and communicate with one another.

[151] Personal Communication (06/04/10)

[152] A music sequencer is a hardware device or software application that can record, edit, or play back music, by handling note and performance information in several forms, typically MIDI or CV/Gate in the case of hardware sequencers. PC based DAWs can in addition to handling MIDI information, record and manipulate audio, record and playback mix automation, and run software routines (plug-ins) that replicate hardware processors.

(Frequency Modulation) synthesizer module. There was an influx of relatively affordable synthesizer and sampling technology throughout the 1980s, notably from Japanese manufacturers. This had the effect of encouraging electronic music composition and creating a new consumer market for recording and production equipment (Theberge, 1997; Watson, 2015). Consequently, the number of independent productions in the UK exponentially increased with the widespread adoption of digital technologies in the 1980s, particularly once dance music became popular in the late 1980s. The increased availability of music technology equipment in the 1980s and the associated marketing meant it became far more common for musicians to aspire to owning a home or project studio, as production methods shifted from capturing a live performance to a more compositional approach largely using electronic sounds generated by MIDI modules. Amek's Graham Langley observed, "the home studio market exploded" in the 1980s and, in common with a number of other audio manufacturers, his firm targeted the emerging domestic market (Langley, 2004). As a measure of the popularity of MIDI technology, the Yamaha DX7 digital synthesizer was introduced in 1983 and sold over 200,000 units (Pinch & Bijsterveld, 2003). Along with developments in MIDI instruments there was rapid growth in the range and availability of semi-professional or prosumer audio equipment throughout the 1980s and 1990s, such as narrow format multitrack tape recorders. Fostex and Tascam (a division of TEAC) both brought out narrow format 8- and 16-track tape machines in the mid-1980s. These machines used quarter-inch or half-inch tape rather than the two-inch format used in professional studios, half-inch tape was considerably more affordable than a reel of two-inch tape. Akai introduced a home studio digital recording system that recorded onto a

videotape cartridge in the mid 1980s, the MG1212. This was effectively a digital Portastudio as it incorporated a mixing desk,

Akai MG1212 digital recorder with built in mixing desk. (Akai MG1212, n.d.)

Numerous manufacturers specifically targeted the home studio sector, mixing desks and outboard processing equipment emerged aimed specifically at the emerging domestic market. Affordable digital reverberation products became available in the 1980s, such as the Alesis Midiverb. Multi-effects units such as Yamaha's SPX 90 were introduced to the market, and these offered a range of time-delay effects and digital reverberation for a relatively low price. In common with professional studios, digital effects units were widely integrated into home studios. Another important development was the keyboard workstation, which integrated sound generation and sequencing with a MIDI keyboard, the Korg M1 (released in 1988) was the first popular example, and over 100,000 units were sold (Korg, 2015).

The role of software and computer technology in composition and recording became increasingly more significant in the 1980s, software has been used in music making for over half a century, initially in experimental research environments utilising mainframes or expensive mini computers. However, audio had not been a concern

for computer manufacturers prior to the 1980s: "It will be recalled that until the mid-1980s the development of audio resources for computers was not a high priority for the computer industry" (Manning, 2004, p. 348). From the mid-80s small computers (termed PCs) were produced that with the addition of suitable software could be used for music production, Voyetra produced a sequencer programme for the IBM PC in 1985, and Opcode produced a MIDI sequencer for the Apple Mac in 1986. Once software packages were developed that ran on more affordable personal computers such as the Commodore 64 and the Atari ST computer-based music production began to gain in popularity. Personal computers became used extensively in home studios as sequencing devices to record, arrange and edit MIDI information from the late 1980s onwards.[153] The adoption of PC-based sequencing in the home studio sector in this period was significant, as this meant that in many cases home studios were more technologically advanced than professional studios. The combination of a PC-based computer sequencer, a selection of MIDI modules, a mixing desk and a synchronized narrow format tape recorder, resulted in the most powerful iteration of the home/project studio so far. After the introduction of MIDI both the marketplace for audio products and the nature of electronic music production were radically reorganized.

> This particular moment marks not only a significant period of innovation in the design, marketing, and use of electronic musical instruments but also, I will argue, a watershed moment in the history of popular music-making as regards the very relationship between production and consumption. (Theberge, 1997, p. 5)

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[153] Running software such as Pro-24, SMPTE Track, Cubase, Creator/Notator, often on an Atari machine.

Theberge's statement above can be corroborated by the introduction of the UK music technology magazine *Sound on Sound* in 1985, which was aimed at the emerging home recording market. This magazine reviewed and advertised 'prosumer' [154] recording equipment (nowadays the magazine also covers high-end equipment), as well as offering insights into recording and production techniques.

> The 1980s were witness to an enormous growth in the innovation, diffusion, and use of digital musical instruments in the production of popular music. This phenomenon was supported by the commercial magazines devoted to musicians and technicians. (Theberge, 1997, p. 128)

Magazines such as *Sound on Sound* [155] have helped to popularize the home studio and also encouraged the consumption of electronic recording and production equipment. Theberge (1997) notes that magazines such as *Sound on Sound* effectively promoted a philosophy of music making that was based around new technology and continual consumption, as musicians were encouraged to upgrade constantly: "The pressure to keep updating was intense back then. I think there was a point where buying fatigue kicked in as you saw stuff getting out-dated so quickly. There was almost like a constant wave of new technology" (Massey, 2010). [156] The growth of home recording in the 1980s started to impact on the professional sector, as composition and pre-production could occur outside the studio environment. Alternatively, many independent dance music releases were entirely programmed, recorded and mixed in a home or project studio; an environment that lent itself to electronic music production, which grew in popularity throughout the 1980s. "The

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[154] The term *prosumer*, one who is both producer and consumer, was coined by Alvin Toffler in 1980.

[155] There are a number of similar magazines that explore production and engineering techniques, but this is largely as an adjunct to their role in encouraging the consumption of electronic production and recording equipment.

[156] Personal Communication (6/4/10)

technology has made music move in different directions. Dance and rap wouldn't have come about without technology" (Pela cited in Shilling, 2012g, p 31). The discussion will now examine developments in 1980s console technology as digital technology is integrated further into the mixing desks of the period.

Developments In Mixing Console Design

Ever since the introduction of multitracking, manufacturers have constantly introduced products that offered ever-greater possibilities in terms of manipulating recordings. Advances in console technology in the 1980s were therefore geared towards the aim of increasing the options for engineers and producers, particularly when mixing. Innovations in advanced console technology in the 1980s had a significant impact on production practice and standardization. Computer controlled consoles offered far greater control over the final mix, which had a major impact on the role of producers and, as discussed above, they often assumed a compositional role (Moorefield, 2005). The job role of specialist mixer that emerged in the 1980s was a consequence of the sonic possibilities presented by automated consoles. Automated consoles with recall facilities became standard equipment for large professional studios, and contributed to a overall standardization of the professional sector. As part of the ongoing process of digitization there was considerable innovation in terms of integrating digital technology into analogue consoles in this period. Console manufacturers integrated digital technology in the late 1970s, but there were significant improvements to this integration in the 1980s, resulting in hybrid digital/analogue technology by the end of the decade. Developing a fully digital console with the technology that was available in the 1980s presented a considerable challenge for the manufacturers. Early attempts at fully digital consoles

were flawed as the technology necessary was not yet fully developed, but the early attempts paved the way for later innovations. A fully digital desk was seen as a desirable improvement on an analogue console that had some digital facilities, and would potentially offer even more creative mixing possibilities.

The SSL console became the dominant console for mixing in the UK (and worldwide), particularly once Total Recall was introduced in 1981. Total Recall allowed a producer or engineer to replicate a mix in another studio far more easily than by writing a console's settings down and attempting to duplicate them. Building on the SSL 4000E console's existing automation and multitrack machine control facilities, Total Recall enabled the user to save and restore the settings of every switch and pot on every channel. This data was recorded in the computer and displayed on a screen, allowing the user to manually match the desk settings with those on the screen, this innovation saved time when a mix had to be revisited (Solid State Logic, 2014f). The illustration below shows the SSL computer's display of a channel's settings; an engineer would then have to match the physical console settings to this visual guide. Although it could be time-consuming to manually match the console's settings this facility was a revelation at the time it was introduced. Total Recall was the major console innovation of the period.
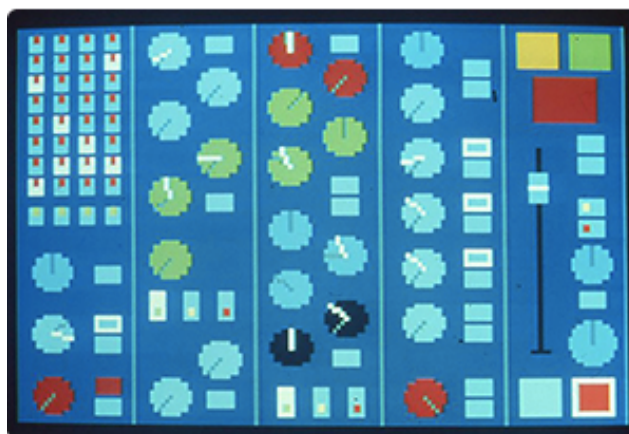
(Solid State Logic, 2014f)

Burgess (2014, p. 101) considers the introduction of Total Recall and automation to be "transformative technologies for producers, artists and A&R people". These innovations meant that a mix no longer needed to be completed in one session, and no longer required several people to learn fader moves etc. By 1981 "the SSL 4000 E was awarded the prestigious UK Design Council Award, having revolutionized studio management with Total Recall" (Solid State Logic, 2014c). The console offered the engineer, producer or mixer the possibility to radically rework and transform a recording. Although represented as a time saving facility in many cases this increased control made the recording and mixing process take far longer. The SSL 4000 E console became an industry standard worldwide in the 1980s, and was replaced by the SSL 4000 G which was introduced in 1987. Many engineers preferred the sound of other consoles, such as Neve's designs, but the automation and recall possibilities offered by the SSL desks meant they dominated the studio market, particularly for mixing purposes. Some engineers and producers preferred to record using a Neve console and mix on an SSL. "We all disliked the sound of the Solid State Logic (SSL) console and tried bypassing it whenever possible" (Brown, 2010, p. 281). Similarly, an American producer and studio owner who purchased an SSL console in 1980 specifically due to the popularity of the technology and not for the sound of the console, commented: "I didn't like the way it sounded, but economics dictated that I either bought one of those things or people would go someplace else" (Bongiovi cited in Milner, 2009, p. 168). These types of comments make explicit the issue of currency and its place within discourses of technology within the sector, and how it might be in conflict with particular aesthetic goals or working practices. The benefits of the SSL did however have a fundamental impact on a wider level due to its interoperability, as the ubiquity of the SSL console meant

that engineers could easily move from one studio to another. Many engineers became familiar with SSL's consoles both in terms of their features and the computer system, and resisted using (or learning) other manufacturer's automation systems. The console also became associated with certain engineers and producers (such as Trevor Horn), who learnt to exploit the possibilities of computer-controlled mixing and the built-in signal processing in the console. Langley (2004) notes that the market for large-format consoles is 'very fashion conscious', which may partly explain the success of SSL. Langley (ibid) also notes that very large consoles were preferred by studios, this is not only as they offered a greater amount of channels, functions and controls, but as "the sheer size impresses prospective clients and gives confidence in the studio." There were, however, issues introduced by the considerable size of the larger consoles that were a feature of the 1980s, as their sheer size made them more difficult for engineers and producers to use.

The halfway stage before a fully digital mixing desk was a digitally controlled analogue console, such as the Trident Di-An, which was developed in the early 1980s. Computers at this point in time were not considered powerful enough to process multiple channels of audio but they were able to "manage, control and memorize all the functions of analogue circuitry whose design was already proven and optimized" (Swettenham, n.d.). The rush to introduce fully digital consoles took the focus away from this technology, although a few manufacturers introduced consoles based on the concept. Langley (2004) noted that there were very few software engineers with experience of the audio industry available in the mid-1980s, and converters (A/D and D/A) and processors were hard to obtain or unsuitable for use in a mixing console. As a consequence of these obstacles to building a fully digital console, Amek designed a control surface and an automation system and then

applied it to an analogue console. Arthur (2009) refers to the mixing of technological components and systems as a form of 'chemistry', as elements can be combined and reconfigured in new ways to create new technologies. Reworking an established technology with the addition of digital technology resulted in new products.

> Slowly, at a pace measured in decades, we are shifting from technologies that produced fixed physical outputs to technologies whose main character is that they can be combined and configured endlessly for fresh purposes. Technology, once a means of production, is becoming a chemistry. (Arthur, 2009, p. 25)

In the UK Calrec and Amek brought out consoles based on the digitally controlled analogue concept, which was also adopted by the American firm Euphonix. Amek's APC (Assignable Production Console) was introduced in 1987 and was originally designed for use in the broadcast industry, but the console was purchased by some forward-thinking recording studios (Langley, 2004). The console featured motorized faders, and the facility to store snapshots and fader information; all the possible switch settings on the desk were also automated. As Langley reflects, "It was not a major commercial success, however it directly led to the development of the Mozart console and Amek's Supertrue automation, and also provided the basis for the control surface system for Amek's digital consoles" (Langley, 2004). The next significant developments in design occurred as manufacturers started to believe a fully digital audio path was imminent (Langley, 2004): "We actually got a government grant to develop digital consoles. Which was in about 1985. We developed a massive great big processing engine" (Langley, 2013). [157] British research into digital consoles originated at the BBC in the 1970s. In common with Amek, as part of a government-funded technology initiative, Neve also received

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[157] Personal Communication (03/03/13)

government grants to develop a digital console. [158] "Another major factor in the DSP-1 development was the availability of government money via the Department of Trade and Industry (DTI)" (Andrews, 2006, p. 40). The first large scale Neve digital desks (the DSP-1) were delivered to CTS in Wembley and the BBC in 1985, prior to this they had sold a small number of digital mastering consoles. The early digital desks were technically flawed, both in design, manufacture and implementation. "Unfortunately, both consoles suffered initially from reliability problems (which was hardly surprising given that the 150 circuit boards in the racks each carried 150 chips and had over three million solder joints!)" (Andrews, 2006, p. 43). Six more DSP-1 consoles were delivered, although the challenges and costs involved with developing the technology resulted in the company suffering financial difficulties and being sold to the multinational company Siemens. It took some years for all-digital desks to be successfully developed and integrated into recording studios.

Some of the proposed advantages of an all-digital desk were the facility to reset the desk (without manually adjusting all the controls) and the possibility of storing and recalling a number of console 'snapshots', which would allow even more complex mixes. In a complex mix which requires a number of changes to happen instantaneously, it's easier to create a snapshot, which can be called up at the appropriate time (under control of the automation), rather than spending a considerable amount of time editing a mix to change numerous fader and mute settings (White, 2000).

> A snapshot, sometimes called a scene, is simply a set of automation data reflecting the state of the console fader gains and mutes at the time the snapshot was stored. On a digital console, the snapshot may also include the pan, EQ, aux, effects and dynamics settings, though input gain trim settings are rarely automated. (White, 2000)

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[158] "The original research into the application of Digital Signal Processing (DSP) to audio mixers was carried out by Guy McNally and his colleagues at the BBC Research Department at Kingswood Warren in the late 1970s" (Andrews, 2006, p. 40).

The digital innovation of the 1980s confirms that British manufacturers were at the forefront in terms of the transition from analogue to digital consoles, although the transition was problematic and early products were not always reliable (Langley, 2013). [159] As mid-range console prices dropped in the 1980s, a number of manufacturers introduced their own automation systems, which were integrated within the console. For many years comprehensive dynamic control was only available on the highest quality consoles. However, Amek introduced 'Supertrue Dynamics' in 1989 on lower priced consoles; this was a spin-off from their design work on a hybrid digital/analogue desk, and offers another example of the combination of existing technologies to create new products. "All technologies are combinations. This simply means that individual technologies are constructed or put together–combined–from components or assemblies or subsystems at hand" (Arthur, 2009, p. 23). This technology offered the facilities available on an SSL console at a much lower price point. Manufacturers competed with each other to introduce new innovations to their products as a way of attracting business, which was largely Neve's motive in developing a digital console, as SSL had gained market dominance with Total Recall.

> The Mozart was the first console with switch automation, or lots of switch automation. The SSL was still on recall. We didn't have recall but we put that on at a later stage. The key thing was it was purely technology and one-upmanship. (Langley 2013) [160]

Amek apparently owned the worldwide patent for automated consoles. "We had the global patent for the concept of the automated mixing console. Which meant that SSL were infringing the patent, well everybody was infringing the patent. You

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[159] Personal Communication (03/03/13)
[160] Personal Communication (03/03/11)

couldn't fight it though as it would cost so much" (Langley, 2013). [161] The UK console manufacturers were apparently infringing each other's patented innovations on a regular basis: "I mean SSL were always on our backs. All we'd do is wave our patent back at them" (Langley, 2013). [162] Prior to the start of a spate of corporate takeovers in the pro-audio sector, which commenced from the mid-1980s, there seems to have been a community spirit amongst the UK manufacturers: "Up to 1985 to an extent, all the major players, it was one big happy family kind of thing. At trade shows everyone would have a good drink together. But after '85, it got more cutthroat." (Langley, 2013). [163] Another development in mixing desk design in the 1980s was geared at the home studio, musicians often used a number of MIDI equipped sound modules and effects boxes, consequently there emerged a demand for home studio mixing desks that could accommodate a large number of inputs. Langley (2004) refers to the 'all input' console as an alternative design to the in-line desk. This type of desk allowed "every source to be equalized and routed without the compromises forced by the in-line format." The layout had more in common with a live sound console and a number of multi-purpose consoles sold in large numbers, such as the TAC Scorpion console (TAC were a budget range introduced by Amek). Some manufacturers also introduced MIDI control to their analogue consoles; this allowed channel muting to be controlled using a computer sequencer. As can be seen by the above discussion, the key innovations in console technology in the 1980s featured the integration of digital technology, with the eventual aim of developing a fully digital console that could offer engineers and producers even greater possibilities when mixing.

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[161] Personal Communication (03/03/11)
[162] Personal Communication (03/03/11)
[163] Personal Communication (03/03/11)

Technology Manufacturers

Competitiveness between pro-audio companies contributed to a rapid turnover of new products in the period; effectively the companies propagated the techno-utopian discourse that drove the sales of digital technology in the period. This is particularly evident in the marketing of home and project studio equipment, which became a very significant market in the 1980s. Indeed, Theberge states that "By the late 1980s, the production of digital musical instruments had become a world-wide, billion dollar industry." (Theberge, 1997, p. 128). In some instances, UK companies were purchased by international conglomerates, in parallel with the consolidation of the record industry and trends in the wider economy. The expense of developing digital products for professional studios caused some manufacturers to suffer financial difficulties and left them vulnerable to takeovers. Yet due to the still buoyant international market for studio equipment there are some new entrants to the sector. The console manufacturers DDA and Soundtracs started trading in the 1980s, and competed at the mid-level of the market. SSL dominated the upper end of the large-format console market along with Neve. SSL grew rapidly and moved into a much larger manufacturing facility in the late 1980s. The introduction of the Total Recall system gave SSL a market leading position for many years, even after rival products emerged. SSL start to develop digital consoles in the mid-1980s, and in 1988 the company became part of UEI PLC, a technology group.

In 1985, after suffering financial problems due to their investment into developing digital technology the Neve Group was sold to the Siemens Corporation of Austria (AMS-Neve, 2015a). The Neve V series analogue console was introduced in the same year, the Neve VR, in 1988. The VR featured Neve's version of Total Recall. Coincidentally, in 1985 (the ten year non-competition clause having elapsed) Rupert

Neve started a new company, Focusrite, who brought out a new range of outboard equipment to meet the demands of studios, such as rack mounted equalizers, dynamics processors, and microphone amplifiers. Focusrite initially produced the ISA 110 (Input Signal Amplifier) module as a project for Sir George Martin, specifically for the AIR Studios' consoles (AMS-Neve, 2015a). That order led to the development of a line of products, the ISA 110 (a microphone preamplifier and equalizer) and the ISA 130 (compressor/limiter). Neve's approach to the Focusrite ISA product range was to use the best components, often military-specification. Based on the success of those products, Neve started to receive requests to produce a console, with "many promises of support and investment from friends in the industry, Focusrite Ltd. accepted orders for eight monster sound control consoles" (Rupert Neve Designs, 2014g). The intention was to produce the highest-quality recording console possible at the time, regardless of cost. Neve had originally planned to build four desks as the first production run with the new company, two Forté consoles were actually finished, one for Electric Lady in New York, and one for Master Rock in London (Focusrite, 2014). The audio part of the design was straightforward but the digital control aspects of the desk were outside of Rupert Neve's expertise, and after significant delays the company went into liquidation in January 1989. Langley (2013) noted the considerable expense involved with developing digital products, an issue that any manufacturer involved with developing consoles incorporating digital technology had to contend with, and the outlay on R&D contributed to Focusrite's financial problems: "Following on from 1985 you had this period where again everybody was having to put a lot of money into product design on digital stuff, and having to come up with products quickly designed from

scratch" (Langley, 2013). [164] Phil Dudderidge then bought the Focusrite company. Dudderidge had previously owned Soundcraft Electronics before the sale of Soundcraft to the American company Harman International Industries in 1988 (Focusrite, 2014). "I was co-founder of Soundcraft and after 15 years we sold the company and I was left with nothing to do and money in the bank, a very dangerous combination" (Dudderidge cited in Focusrite, 2014). Dudderidge established the new company as Focusrite Audio Engineering Ltd and reissued Neve's early Focusrite ISA modules along with some new designs. Harman continued to release products badged with the Soundcraft name.

Prior to the sale to Harman, Soundcraft had developed a sophisticated 24-track tape machine, the Saturn, which blended a computer-controlled transport with analogue audio recording technologies. This was an advanced design and represented a challenge to the Japanese manufactured Otari machines, which were dominant in the studio market of the late 1980s (Jones, 2013b). Unfortunately, the Saturn's development coincided with a serious financial crisis at the parent company, Soundcraft Electronics. It was also launched at a time when analogue tape was being gradually ousted by digital recording and Soundcraft could not afford to develop or license digital technology. Consequently, the Saturn failed to achieve a significant market share and then in March 1988, Soundcraft Magnetics was declared 'technically insolvent', and promptly closed. Briefly in the mid-1980s the UK firm Aces entered the multitrack tape recorder market, but their products gained a reputation for unreliability and the company did not survive. The Saturn would be the last British made studio tape recorder, as Brenell was dissolved in 1984 and Leevers Rich had ceased to make tape recorders by the early 1980s (Jones, 2013b).

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[164] Personal Communication (03/03/13)

Allen and Heath continued to make consoles aimed at the live sector, mid-level professional studios and project studios. In 1989 the Allen & Heath CMC console was the first console to use a microprocessor to integrate MIDI capabilities within a mixing desk. Amek expanded steadily through the 1980s, and again by simplifying a former product (the 2500) they came up with the Amek Angela, "we sold 500 of those in ten years" (Franks cited in Lockwood, 1995). Other innovations from Amek included a live console with a recall system, and the APC (Automated Production Console), which included comprehensive computer control of the console's functions (digitally controlled analogue). The company entered into an alliance with Rupert Neve in 1989 after Focusrite had been declared bankrupt. AMS continued to develop innovative digital products throughout the 1980s. AMS released a digital reverberation unit the RMX 16 in 1981, the Audiofile in 1984 (an early hard disc recording and editing system) and in 1988 an automated digital console, the Logic 1. The most successful of those innovations was the RMX16; the company's 1580 digital delay also continued to sell worldwide. In terms of analogue outboard equipment manufacturers, Drawmer started trading in 1981 and have successfully sold a range of studio outboard equipment ever since. Audio & Design continued to manufacture studio outboard equipment through the 1980s.

As can be seen by the discussion here and in the previous chapters, UK manufacturers were particularly successful at console manufacture, and introduced a number of innovative market-leading products. British companies were at the forefront of digital console innovation in this period. Tape recorder and microphone manufacture did not develop to the same degree in the UK. However, UK loudspeaker manufacturers have achieved considerable success manufacturing studio monitors, and ATC and Tannoy traded throughout the decade. Again, in common

with the origins of a number of the console manufacturers, ATC started in the live sound sector: "There was a crossover with live sound and music recording" (Langley, 2013). [165] A respondent who manufactures outboard processing modules and sells spares for the surviving Amek consoles, commented on the success of the UK audio sector in the 1970s and 1980s and noted the way the UK industry developed. He considered that UK console manufacturers were successful as the companies were more technologically advanced than their rivals. "We in the UK were way ahead of our time in that period" (Adshead, 2013). [166]

This section has so far focused on the development of the professional audio industry, and has included some discussion of key UK companies. The pro-audio manufacturers were (or at least originally) geared at producing products for professional individuals, companies and recording studios, for the purpose of producing professional sound recordings. Essentially this equipment provided the 'tools of the trade' and comprised one aspect of the making of professional recordings, which are the tangible outcomes from its use. Without label-funded production projects, and musical and recording skills, this equipment had no real purpose (Bennett, 2012b). However, at the other end of the scale we have an industry geared at producing budget lines of cheaper technology. These included MIDI enabled synthesizers and samplers, recording equipment and software. These products were aggressively marketed and advertised through the music technology press, and mainly consumed by a different demographic to the products of the professional audio industry. Bennett (2012b) considers that in many cases there is little real purpose or outcome from the consumption of this budget technology. Bennett's (ibid) observation is quite astute, as a substantial hobbyist consumer group

[165] Personal Communication (03/03/13)
[166] Personal Communication (19/02/13)

has developed in tandem with the home studio equipment industry, which has largely been created through marketing. Theberge (1997, p. 130) refers to the simultaneous growth of digital technologies and periodicals as a 'double-production industry', and infers that whilst manufacturers were producing digital equipment, the technology press was producing the consumers. As the music technology periodicals relied heavily on income from advertising revenue, their equipment reviews were consequently almost always favourable (Bennett, 2009; Watson, 2015). The magazines promoted the emerging digital technology "expressing idealistic or even techno-utopian standpoints in their commentary and reviews" (Bennett, 2009). These publications contained (and still do) "page after page of equipment advertising" directed at aspiring musicians (Bennett, 2012b, p. 121). Again, this is contributing to a discourse where new technology is seen as essential for success.

> Go to your room and play … using the MT2X Multitrack Recorder/Mixer, you can layer your recording just as you would in a real studio – one track at a time … So if you've been wondering where you're going to get your first big break in music, now you know. At home. (Chanan, 1995, p. 154)

Note the rhetoric in the Yamaha advertisement in the above quote; the technology was represented as a substitute for a real studio and beneficial to a musician's career. Bennett (2009) observes that the rhetoric of equipment manufacturers' advertising was usually based around "notions of progress, betterment, futurism, leadership and new languages that had to be learned". Bennett (2012b, p. 123), in accordance with Theberge's (1997) observation above, argues that the music technology press were not acting as impartial advisors to consumers, "but as business partners with technology manufacturers". Bennett (ibid) also notes the role of trade shows such as the Association of Professional Recording Services (APRS) in promoting equipment sales and the consumption of recording technology. More specific to the UK home

studio market were trade shows such as the *MIDI Music Show* and the *Music Production Show.*

The role of Turnkey in developing the UK market for home recording was discussed above, but the company expands through the 1980s, and is joined by a network of audio dealers that contribute significantly to the growth of the market for recording and production equipment. Although there were some UK manufactured home studio products, the market was dominated by Japanese products in the 1980s. Theberge (1997) notes the role of the technology press in marketing audio products, but the magazine sector specifically relied on advertising from manufacturers and dealers for revenue. I would argue that the dealers that were selling this equipment were as significant a factor in the growth of the home recording market as the magazines, if not more so. Turnkey distributed products from a number of manufacturers through the 1980s, as well as selling their own Accessit and Seck products. In addition to the established Teac/Tascam tape machines, Turnkey also distributed products by the Japanese company Fostex, who developed a range of narrow format tape recorders that became extremely popular throughout the 1980s. As well as selling affordable home studio equipment Turnkey were selling significant numbers of professional level mixing desk and multitrack recorder packages to better-off musicians in this period, which was a relatively new market at the time, as in the past the majority of clients for professional equipment were studios. Turnkey eventually sold more multitrack Studer tape machines than the official distributor (Stirling cited in Cooper, 2003c). As the company became more successful they opened Turnkey 2, which offered studio design and build packages, and the company employed the acoustic

designers Andy Munro, Roger D'Arcy and Hugh Flynn. [167] Taylor (cited in Cooper, 2003b) considers that part of Turnkey's success at selling professional equipment was that many musicians were reaping the rewards of improved music publishing deals and substantial Performing Right Society (PRS) payments in this period, just at the point in which Turnkey was growing: "You'd gone from a time when nobody had been spending money like that, to a time when suddenly a lot of people were" (Taylor cited in Cooper, 2003b). Taylor (ibid) considers that the amount of musicians in the 1980s with reinvented careers, or lucrative record deals, drove the sector and allowed companies such as Turnkey to thrive. "That was the money pump that drove REW, HHB, Turnkey, Don Larkin, Music Laboratories and the rest" (Taylor cited in Cooper, 2003b). As well as the pro-audio dealers mentioned in the above quote, there were other significant retail operations that facilitated bridging the gap between home studios and the professional studios. Also selling increasingly powerful packages to musicians were Thatched Cottage Audio, Music Village and Audio Services. Musical instrument shops also started to stock home recording equipment. As an indication of the popularity of home studio packages in the period, Thatched Cottage Audio sold "in the region of 650 eight- and sixteen-track systems in a twelve month period" (Gravel cited in Cooper, 2003d). The emerging market for home/project studios "gave musical instrument shops an entirely new stream of potential business and impelled the growth of a new concept–the professional audio dealer" (Cooper, 2014d). The dealers helped to create a market and also influenced the products that were available, by mediating between users and manufacturers. "It is sellers that who tie the world of use to the world of design and manufacture" (Pinch, 2003, p. 270). Gravel (cited in Cooper, 2003d) worked for Teac/Tascam for

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[167] These acousticians started the acoustic design companies Munro Acoustics and Recording Studio Architecture in later years.

over twenty years, and observed that the new audio dealers formed a nucleus of UK retailers who blurred the distinctions between musical instrument sales and pro-audio. These businesses concentrated on selling increasingly powerful packages of recording equipment to musicians, producers and hobbyists. "And it was this that eventually forced so many of the major UK professional multitrack studios out of business" (Gravel cited in Cooper, 2003d). The rapid growth of project studios and home recording starts to impact on the professional studios by the end of the 1980s: "The record companies were more prepared to buy the equipment, instead of paying for the artist to spend days or weeks down at The Sol or Ridge Farm. It was inevitable that the major studios were going to suffer." (Gravel cited in Cooper, 2003d). By the end of the decade record companies had started to encourage artists to purchase recording equipment with their advances, or artists would receive equipment as part of their advance from the label. The major labels considered this would save them money as the overall cost of an album could potentially be reduced. From the 1980s onwards at least part of a recording project would often be undertaken outside the traditional studio environment, a practice that has continued from this era.

Conclusion

The 1980s was the decade when digital technology impacted on both the record industry and the studio sector. Music was increasingly composed, recorded and mixed using digital technology in this period and the new consumption medium was a digital sound carrier, the compact disc. For the record industry digitization was initially financially beneficial, but some years later the consequences of this technological innovation became apparent. In terms of the market, album sales

increased significantly, and after some takeovers and mergers there were fewer major labels. The independent label sector thrived throughout the decade. Digital production technology increased the cost of equipping a professional studio, and recording projects started to take far longer to complete and consequently often cost more than in the analogue era. Potentially, in a period of high recording budgets and high studio rates, the sector could be profitable. However, the cost of upgrading, high interest rates, and rate cutting started to destabilize the studio sector by the end of the 1980s. In addition, as the home/project studio became potentially far more sophisticated once relatively affordable digital equipment entered the market, small technically advanced facilities started to impact on the business models of traditional studios. From this period on a considerable amount of the work involved in a recording project took place outside the conventional studio environment. Rojek (2011) considers that the digitization of music production facilitated by MIDI equipment to have disembedded the musician from the traditional recording studio. The impact of home and project studios certainly became an issue for larger studios to contend with at the end of the decade. The aesthetics of record production changed significantly as digital equipment was integrated into production, and affected the configurations of large studios. In some cases studio complexes incorporated mix rooms equipped with just an overdub booth and no live room, as recording a band live became less fundamental to many productions and mixing became a more significant part of the production process. New genres of music emerged in the 1980s that were specifically based on the use of new technology. Consequently, digital technology transformed popular music, both in terms of production methods and stylistically. Producers increasingly took on a compositional role as they utilized digital technology in their work. Music generated with new digital technology

became part of the mainstream record industry; gradually rendering studios solely equipped for conventional rock recording projects an anachronism. The impact of digital technology wasn't necessarily immediately apparent in the 1980s, but the scene was set for radical change in the studio sector in the next decade. Technology manufacture continues to develop in the UK, and digital technology is incorporated into many mixing consoles, which were the most successful products of the UK pro-audio manufacturing sector. The market for home recording equipment increased considerably and a substantial network of dealers emerged that both fuelled and serviced demand for recording and production technology. The home studio of the 1980s became a viable production environment, particularly for electronic music, rendering a conventional studio an unnecessary luxury for some styles of music. In this period home/project studios often adopted digital technology before many of the professional studios. From the 1980s onwards, driven by increased product marketing, music technology equipment became a type of consumer goods, despite the equipment's intended function as audio tools. As Bennett (2012b) observes, many of the consumers of home recording equipment do not produce music that is commercially released.

To summarise, in terms of the production of culture perspective, there were significant changes in technology in this period, due to the widespread introduction and integration of digital technology. This was the most significant change in terms of the six facets of the production perspective. There were changes in industry structure in the record industry, as the major labels consolidated and UK independent labels achieved considerable success throughout the 1980s. Corporate takeovers also started to occur in the pro-audio industry. In terms of organisational structure, the studio sector began to be undermined by home/project studios. In terms of

occupational careers, the role of the producer changed, new job roles emerged such as specialist mixers and programmers/operators of digital equipment; and freelance work was now common in the sector. As was the case in the previous two decades, the market for popular music increased considerably during the 1980s, driven by cassette and CD sales, and new markets for electronic music developed. The next chapter will now examine the 1990s, an era where software became of particular significance in music recording and production, and CD sales continued to provide significant revenues to the labels.

Chapter Five

The 1990s: A Transition From Hardware to Software

Introduction

In common with the previous decade, technology drove considerable change in the 1990s, for both the record industry and the recording studio sector. Significant disruptive changes to the business models of both the record labels and professional studios occurred at the end of the decade. The resulting crisis is a classic example of what Christensen (2003) terms disruptive innovation, a theory that explains why leading companies often fail when confronted with disruptive changes in technology and market structure. The transition from the analogue studios of the 1960s and 1970s to an all-digital studio commenced in the late 1970s, and continued throughout the 1980s. During the 1980s we saw the widespread adoption of computer-controlled consoles, digital effects, sampling technology, MIDI equipment and tape-based digital recording. During the 1990s sophisticated large-format digital mixing consoles enter the market, making the all-digital studio a reality. The introduction of hard disc recorders as an alternative to digital tape recorders also occurred in the 1990s. It was still necessary to utilize analogue technology to capture audio (such as microphones), but once an audio signal was captured it could be stored digitally using either a hard disc system or a digital tape recorder and then processed digitally using a digital console and digital effects, the mix could then be recorded using a digital master recorder. However, digital consoles and digital recorders represent a hardware-based transitional technology. Throughout the decade studios incorporate this type of transitional digital technology relatively slowly, as many studios still used analogue consoles and traditional tape recorders. Effectively, digital consoles and digital tape machines were transformative sustaining technologies, offering an

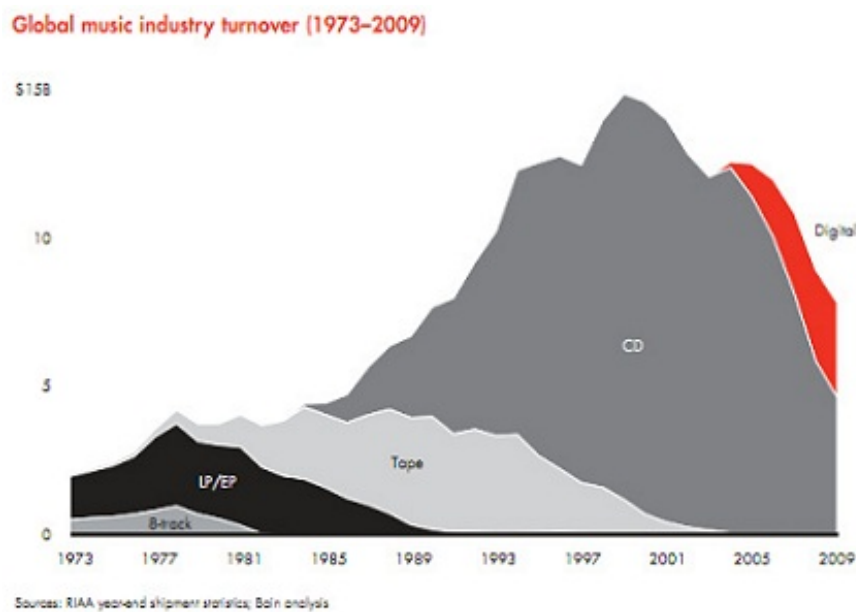improvement (at considerable expense) on previous analogue technologies rather than a radical change.

The next significant shift in terms of the adoption of new technology – which then radically impacted on practice – was the adoption of Digital Audio Workstation (DAW) technology by professional studios. However, studios were slow to adopt newer software-based technology due to the significant investment they had made in earlier technology, either digital or analogue. By the end of the decade the gradual introduction of the software programme Pro Tools into professional studios meant that computers could now be used for recording and processing audio. Prior to this point, computers were used for MIDI sequencing, controlling a large-format analogue console and occasionally for digital editing. The DAW transforms the recording, processing and mixing of popular music. This paradigm shift commenced at the end of the 1990s, and I will argue that this is a major turning point in music recording, production and mixing which then completely reshaped the professional studio sector in the following years. The DAW equipped PC was the disruptive technology that reinvented the recording studio. After the DAW became the common recording and mixing environment the traditional studio model rapidly became an anachronism. In parallel to this development in larger studios, home and project studio owners extensively adopted new digital technology in the 1990s. I will argue that this utilisation of digital tools occurred before professional studios integrated the technology, which impacted on the business model of the professional facilities. Increasingly, throughout the 1990s home and project studios became ever more sophisticated production environments from which professional results could be achieved. A number of large studios closed during the 1990s as the market was over-saturated and highly competitive, larger studios also lost work due to the impact of

relatively affordable recording technology. The market for home studio equipment continued to increase throughout the 1990s, whereas the overall market for products designed for professional studios declined, and many pro-audio manufacturers started to focus their attentions on the home and project studio market. The phenomenon of corporate takeovers in the pro-audio sector continued through the 1990s. The market for popular music grew through the 1990s, driven by CD sales, prior to the impact of file sharing at the end of the decade. In common with the 1980s, electronic music continues to gain in popularity, much of this music was produced outside the professional studio sector. Both the spectacular growth and subsequent decline of CD sales demonstrate different aspects of the impact of digitization. Worldwide sales of popular music reach a peak in 1999, before the effect of filesharing on the record industry becomes apparent. The combination of network technology, software and PCs combined to cause significant disruptive change to the record industry from this point onwards. To reiterate, I will argue that the most significant developments in the overall recording sector in this period are driven by software, although this impact only becomes apparent at the very end of the 1990s. We will now examine the market for music sales in the 1990s.

The Market

As noted by Hracs (2012, p. 445), until the late 1990s the record industry had profited from a "mutually beneficial relationship with technology". Each technological development in sound recording and reproduction (shellac discs, electrical recording, tape recording, vinyl records, compact disc etc.) had been beneficial to the labels in terms of sales (Burgess, 2014). From the point of view of record companies, the initial digitization of music was very profitable, as the

introduction of the compact disc boosted the revenues of record companies from the late 1980s up until the rise of Napster and other file-sharing services at the end of the 1990s. "The compact disc (CD) proved to be real boom technology for the record industry and provided the platform for a decade-long period of super-profits." (Rogers, 2013, p .16).

Global music industry turnover (1973–2009)

Sources: RIAA year-end shipment statistics; Bain analysis

Recording Industry Association of America (2010)

The RIAA graphic above shows a global sales peak in 1999. Tschmuck (2006) contradicts the RIAA figures, and considers the worldwide sales peak to occur in 1996, but it is clear from a wide range of industry statistics that the record labels suffered a steep decline in revenue after the sales peak at the end of the decade. The RIAA graphic is useful to illustrate the steep rise in CD sales throughout the 1990s, which more than doubles the total revenue accrued by the labels between 1990 and 1999. There were further rounds of mergers and acquisitions in the record industry throughout the 1990s; at the end of the decade there are only five major labels, and they command 83.6% of the global market (Tschmuck, 2006). As an example of the

size of the majors by the end of the decade, EMI's annual report for 1998-1999 stated that the label was the world's third–largest record company, operating in 50 countries, and employed over 10,000 staff. Their recorded music division had a roster of 1,500 artists (Southall, 2009). The independent sector in the UK continued to be successful in the 1990s despite the demise of the Cartel; labels such as Creation achieved considerable sales. Electronic dance music is by the early 1990s an established part of mainstream popular music in the UK, and despite the success of rock subgenres such as Britpop and grunge, a considerable amount of the popular music of the 1990s was produced using electronic music production tools and techniques. Genres such as drum and bass and UK Garage emerged in the 1990s and achieved mainstream success, and added to the ever-increasing typology of electronic music. As an example of the popularity of electronic music styles, Collins (2005) suggests that in 1999 more turntables were sold than guitars. Trends in instrument sales are indicative of the popularity of specific music genres at certain points in history. [168] Guitars had previously been a significant consumer item since the mid-1950s due to the growth of rock 'n' roll and then rock music. Widespread access to digital production technology helped to popularise electronic music production, which in many cases did not require a conventional studio for its production and mixing. Technology impacts on practice and practice can affect the market. I would argue that the aesthetics of music production were significantly influenced by digital technology and this dynamic continued to cause significant change in the market for popular music during the 1990s.

The introduction of the Internet as a consumer technology and the widespread adoption of personal computers in the 1990s created the infrastructure that was then

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[168] Sales of guitars and drum kits are currently relatively low in the 21st century.

exploited by music piracy in the late 1990s. Music piracy networks relied on the MP3 codec as a standard music file format. The MP3 audio coding format is attributed to the Moving Pictures Expert Group (MPEG) and was introduced in 1992, it was part of a project to standardise audio and video transmission (Leyshon, 2001). [169] The Fraunhofer Institute in Germany released the first public version of the encoder in 1994 (which was hacked and shared online), and the technology gradually gained in popularity as a means of sharing music files online (Sterne, 2013). By the late 1990s websites such as mp3.com were illegally offering large catalogues of MP3 files, but it was the introduction of the P2P (peer to peer) file sharing service Napster in 1999 that effectively made file sharing a mainstream activity. A young computer programmer Shawn Fanning developed the initial technology behind Napster; the Napster client software had gained 500,000 users by 2000 and 60 million users by 2001 (Leyshon, 2014). To summarise the key market developments, in the late 1990s CD sales revenues reached their highest point; and at the end of the decade digital technology began to impact on the labels' business model. Electronic music had become a significant part of the global music business by the 1990s.

The Decline of the Professional Studio Sector in the 1990s

A significant change to the structure of the studio sector occurred in the 1990s, as the professional end of the studio market declined considerably due to financial pressures and the impact of home and project studios. Even if project studios were not necessarily directly competing with large studios, any composition, arrangement, pre-production or recording that occurred outside the conventional studio sector obviously impacted on business. Computer based music production became more

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[169] MP3 is a lossy compression format that considerably reduces the size of a digital audio file.

affordable in the 1990s and electronic music production became ubiquitous, rendering a traditional studio less necessary to produce commercial music. There was no need for a large live recording space in productions that were primarily using MIDI instruments and samples. Studio closures accelerated throughout the 1990s and this process carried on after the millennium. One strategy adopted by some large studios to combat the rise of project studios was to offer a different level of service. Verna (1994) notes that by 1994 astute studio managers were realizing that a 'full service' studio (a high end studio with numerous staff and offering services such as food and accommodation) could differentiate itself from what a basic studio could offer. When the Townhouse Studio complex was upgraded in 1994, this refurbishment was undertaken to maintain a competitive edge and to offer facilities a project studio could not offer: "The Virgin owned complex is trying to stay on the edge even as project studios continue to erode market share from full-range facilities" (Verna, 1994, p. 85). Unfortunately for the professional studios, any attempt to sustain the business model of the large complexes was ultimately doomed to failure. As an example of the difficulties faced by the sector, the press cutting below reports the takeover of Maison Rouge, which Ian Anderson presciently sold in 1983, the next owner updated the facility and installed two SSL consoles, it was then purchased by the producer Robin Millar in 1990, who had to sell the studio in 1992 due to financial problems. Maison Rouge finally closed in 2000 as competition in the sector and the rates that could be charged for studio time could no longer sustain the business, the building was sold to property developers who subsequently demolished it (Harris & Burns, 2012). Label budgets were beginning to be scrutinised far more carefully in the 1990s, which also affected the professional sector.

Gradual changes at Maison Rouge

LONDON, UK – Nigel Frieda, owner of the successful Matrix studios in Fulham and Little Russell Street, is carefully scrutinising Maison Rouge studios which he acquired in August to see what changes need to be made to bring it into line with his existing facilities.

Maison Rouge changed hands on 8 August when Frieda bought it from the administrator appointed by the National Westminster bank acting on behalf of the previous owners, Robin Millar's Scarlett Group.

Frieda is not prepared to reveal how much he paid for Maison Rouge but the deal did include all of the studio's existing equipment. Maison Rouge, which will keep its existing name, is operating as normal while Frieda finalises details for a number of upgrades.

Frieda said: "I'm taking advice from the artists, producers and engineers who regularly use the studios to see what changes they would like us to make."

Robin Millar said he was delighted that the studio is now under Frieda's control. "I have great faith in his ability to run a trimmed, streamlined operation."

October 1992   *Sue Sillitoe*

Gradual Changes at Maison Rouge (Sillitoe, 1992)

Livingston Studios went into receivership in 1993, although the complex was subsequently taken over and still continues to run. In an earlier quote Langley (2013) commented on the significant investment Livingston had made on SSL consoles in the 1980s, by the early 1990s this investment seems to have contributed to the studio's financial viability. [170] Note the comment on leased equipment in the press cutting below, as high-cost studio technology was often obtained through leasing packages. Interest rates reached around 15% in 1990, which will have impacted on the cost of finance packages. When the Livingston complex went into receivership it seems most of the equipment (apart from outboard equipment) was leased.

Frieda buys Livingston's gear

UK – Nigel Frieda, owner of the London based Matrix group of studios, has purchased the contents of Livingston Studios following the closure of the complex in early May.

Former owner Jerry Boys was the only bidder for Livingston according to receivers Levy Gee who had placed an administration deadline of 22 April on the studios. Livingston had been £500,000 in debt when it went in receivership.

Frieda's purchase of all non-leased equipment from the studio, is mainly outboard gear and will, he said, find a new home at Maison Rouge where rebuilding work continues. "Even if we can't put down new carpets we can put in new toys which the studio badly needs," he explained

Livingston is now closed, the desks have been reclaimed by leaseholders and the old premises seem likely to be converted into office space. Recession and rate-cutting were cited as the main reasons for its demise.   *Neville Farmer*

Livingston 1993 (n.d.)

[170] Personal Communication (03/03/13)

An indication of the problems faced by the sector can be seen from the following studio closures. Trident was taken over in 1985 and reopened as Tape One, which closed in 1990. Utopia Studios closed in 1992. Virgin's Manor Studio complex closed in 1995 after the company merged with EMI and the studio and its associated property was then sold for redevelopment. Strawberry Studios in Stockport closed in 1993, and was converted to offices. Chipping Norton studio closed in 1999 and "Planning consent was given for it to be converted into homes but now the major part of the building is a dental practice" (Harris & Burns, 2011). The Matrix group, which by the end of the decade owned substantial studio complexes at five locations in London, was also a victim of diminishing studio rates and increasing overheads, and the owner sold all of the studios at the end of the decade. Redevelopment is the common result when studio complexes are sold as the property the studio is housed in is usually far more valuable than the equipment or the actual business. This was the fate of Wessex Studios, which has been converted to flats. R.G. Jones was refurbished in 1997 and later sold; the building now houses a shipping company (Harris & Burns, 2012). This is by no means an exhaustive list of studio closures, but offers an indication of the difficulties faced by the upper end of the studio sector in the 1990s. A respondent commented on the challenges faced by studios in this period: "Through the '90s I saw studio owners on Valium trying to balance the books as they'd bought all this expensive gear, and suddenly everybody was recording at home" (McLarnon, 2010). [171]

The studio designer Philip Newell left London in the early 1990s as the recording studio business was in decline. He notes that there were more than sixty studios for sale in London alone at that point, which meant that there was little work in the UK

[171] Personal Communication (26/08/10)

for someone who designs and oversees the building of recording studios (Newell, 2008). As well as the challenges presented by competition from project studios, price-cutting to compete with other studios was endemic in the studio sector, as supply exceeded demand in the 1990s. There were more studios than the market could realistically support even before the impact of project studios. As noted by Leyshon (2009), a characteristic of oligopsonies is that the concentrated power of buyers encourages intense competition amongst the suppliers. "When the sellers of a service far outnumber the buyers in a marketplace, the buyers are able to create leverage by pitting sellers against each other" (Hearn, 2013). This situation obviously impacted on the sector's profitability, as studios felt pressured to undercut each another: "According to Townhouse technical manager Ian Davidson, rate-cutting in particular is threatening the London studio market" (Verna, 1994, p. 85). Certainly by the late-1990s, the rates that large recording studios could charge no longer offset their initial investment and running costs. One respondent who had worked at one of the largest London studios (Angel) noted this financial issue: "When I started there it had been open a year, and they had spent £2.5 million on it. You can only charge £125 an hour and that doesn't take into account your outgoings" (Leader, 2013a). [172] Recouping the cost of building and equipping a professional facility became virtually impossible in this period. This situation was exacerbated further by the adoption of Pro Tools, which commenced in the late 1990s: "Pro Tools came in and the rates started dropping because there was a lot of competition" (Sides cited in Crane, 2015, p. 24). In his research on the UK recording sector Leyshon (2009) found that studio owners had not significantly increased the rates charged for renting out their studios from the mid-1980s. As more project studios entered the market (their entry

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[172] Personal Communication (26/02/13)

facilitated by the relatively low cost of digital recording equipment), this had the effect of exacerbating the oligopsony discussed by Leyshon, (2009). The professional studio sector was under pressure from economic forces such as high interest rates, high rents, low studio rates, and reduced budgets; and large studios were also being affected by the competition from project studios that could undercut their prices by a considerable amount. Small and medium sized studios were equally affected by these problems, and by the end of the decade even project studios are beginning to suffer financially. Many musicians and budding producers obtained their own equipment, particularly once DAW technology was capable of recording, processing and mixing audio to a high standard. This rendered the viability of the project studio as a commercial entity that hired studio time to customers a phenomenon of the 1980s and 1990s. The discussion will next examine technology and innovation in the period.

Technology and Innovation

The first significant development in technology in the 1990s was the introduction of innovative hardware based digital devices, such as hard disc recorders, which were incorporated into some professional studios in the 1990s. There were hard disc recording systems available in the 1980s, but relatively few studios adopted the technology in that decade. Earlier systems such as the Synclavier and the AMS Audiofile offered hard disc recording, but they did not offer as many simultaneous recording channels as tape machines (digital or analogue). Early hard disc recording systems were however widely used in audio post-production. In 1991, the Canadian company IZ Technology demonstrated a prototype of RADAR, a 24-track hard disc digital audio recorder, at the Musikmesse trade show. The RADAR system achieved

acclaim for its high sound quality and reliability and was distributed by Otari from 1994. Fairlight also brought out a 24-track hard disc recorder (the MFX3) in 1994 (Manning, 2004). Hard disc recording offered many advantages over digital tape recording, notably the lower cost of the storage medium and the arrangement possibilities offered by powerful non-linear editing. Although hard disc recording was used in a number of American studios by the mid-1990s it did not gain significant market share in the UK in this period. Daley (1997) discusses a number of high profile American recording projects that utilized hard disc recording systems in the mid-1990s. Interestingly, Daley's (ibid) article infers that Nashville studios are integrated new technology and growing faster than the market can stand. Oversupply in the market and the impact of affordable consumer technology was an international phenomenon.

Fairlight MFX3 (1996)

Hard disc recording technology was introduced at a point when UK studios were starting to struggle financially, which slowed its adoption in the UK. A respondent (now a pro-audio dealer) recalled that the musician Mike Oldfield was an early adopter of the Fairlight hard disc recorder pictured above, and that although the Radar system was distributed in the UK in the 1990s it did not sell in significant

numbers (Thompson, 2015). [173] However, in contrast, many project studios incorporated hard disc recorders in the 1990s. In the mid-1990s, utilizing developments in Digital Signal Processing (DSP) technology, a number of large-format digital mixing desks were introduced to the professional studio market, such as the Neve Capricorn and the Sony Oxford. The Neve Capricorn was specifically designed to be used with digital multitrack tape recorders, an area of the market that was dominated at this point by Studer, Sony and Mitsubishi.

To minimise the number of connections between the console and the recorder, Neve proposed a system that would allow a large number of digital signals to be transmitted down a single cable at high speed. Discussions between Neve, the digital tape machine manufacturers and SSL resulted in the development of the Multichannel Audio Digital Interface standard (MADI) (Andrews, 2007). A more radical technological development was the introduction of the personal computer as a recording platform, which began to encroach on the tape machine (digital or analogue) or hard disc recorder as the recording medium of choice in some studios by the end of the 1990s. The DAW Pro Tools subsequently became the industry standard in professional studios. Advances in personal computer technology and external DSP meant that DAW technology was capable of recording an adequate number of audio tracks concurrently by the late 1990s. There are a number of other popular DAWs, but Pro Tools has dominated the professional studio sector. Initially, DAWs were only used in professional studios for audio editing, but by the late 1990s they began to be found in some UK studios as a primary recording medium. The eventual shift to DAW production significantly impacted on the viability of the

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[173] Personal Communication (14/08/15)

conventional studio sector. [174] The first version of Pro Tools, released in 1991, had four tracks and sold for $6,000. Gradually, successive versions began to gain adherents. Pro Tools was sold as a system with its own digital signal processing (DSP) cards and digital conversion hardware as personal computers were not powerful enough to offer a significant amount of native (within the computer itself) processing until shortly after the millennium. [175] The advantages of non-linear editing and the lack of degradation of the recorded material made Pro Tools an attractive proposition. A Pro Tools mix could also be automated more easily than a mix using a large format console. Initially Pro Tools was used as a recording device, as mixing was perceived to require the use of a console and outboard processing. It was clear by the late 1990s that Pro Tools was effective for both recording and editing, but mixing remained an analogue process. Since the introduction of digitally controlled desks in the late 1970s, the general perception of engineers and producers was that mixing required a substantial amount of sound processing, using a range of outboard processing equipment and a large format console (Milner, 2009). In 1997, Pro Tools released a 24-bit, 48-track version, and it was this iteration of the software and accompanying hardware that accelerated the adoption of Pro Tools in professional recording studios. Mixing entirely within the computer (in-the-box) using a DSP-enhanced DAW was technically possible by the late 1990s, although issues with processing power were still restrictive in terms of the amount of audio tracks and plug-ins that could be utilized without computer 'glitches'. [176] In-the-box mixing was initially utilized for song demos or by musicians who could not afford

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[174] The precursor to Pro Tools was a stereo recording and editing system called Sound Tools, which was introduced in 1989 (Burgess, 2014).
[175] Pro Tools gained its market share as it was more reliable than its early rival products and the system offered DSP capabilities when PCs were limited in terms of processing power.

[176] A plug-in is a software routine that runs within a DAW, they often emulate hardware audio processing equipment.

access to a professional recording studio. However, by the late nineties, a newer generation of engineers who had grown up with MIDI and digital sampling began to question this orthodoxy. Ricky Martin's "Livin la Vida Loca" (1999) is considered to be the first No. 1 single to be recorded, edited, and mixed completely 'in-the-box' within the Pro Tools environment (Milner, 2009). This track was engineered by the American engineer/producer Charles Dye, whose employer Desmond Child was an early adopter of Pro Tools. Child was attracted to the software by its non-linear editing capabilities and the lack of degradation of the recorded audio.

> In 1997, Dye did a shoot-out between the Sony 3348, the company's leading 16-bit DAT recorder, and the latest version of Digidesign's Pro Tools. The DAW won. "I realized that for $20,000, including interfaces, you could get something that sounded better than a $250,000 machine," he says. (Milner, 2009, p. 294)

The possibilities of micro-editing audio parts such as vocal performances meant that a performance could be easily manipulated within the DAW: "That's what Desmond got into–the fact that he could invent a vocal performance that he was hearing in his head," (Dye cited in Milner, 2009, p. 294). Working with Pro Tools meant that phrases and even syllables could be adjusted in time to subtly change the nuances of a vocal performance. A similar attention to detail could be applied to the whole recording. Earlier digital technology allowed this kind of manipulation but was more complex to utilize effectively, and the process would consequently be far more time-consuming. Initially, the idea of using a DAW to mix wasn't taken seriously in professional circles.

> They thought it was nuts, because there was this inertia of working in million dollar rooms, and this belief that a $250,000 console with a $250,000 tape machine and another $100,000 worth of outboard gear was the only way to mix a record. (Dye cited in Milner, 2009, p. 295)

The mainstream success of Dye's in-the-box mix was a defining moment in digital audio history. Digital recording and mixing using a DAW is now the most common method of working for contemporary practitioners, and this has had a significant impact on the recording studio sector, as professional studios became less integral to the whole recording and mixing process. Some UK studios used the earlier versions of the software as an editing device, but a respondent recalled first seeing a full Pro Tools system in a UK studio in 1998.

> I first saw a Pro Tools system at Comfort's Place in 1998, it seemed amazing at the time. They were recording the drummer Mel Gaynor, and we were impressed that they could easily move a drum fill anywhere in the arrangement. (Thompson, 2015) [177]

The visual editing and mouse-based graphical user interface (GUI) rendered the software far simpler to use than an equivalent hard disc system. However, at the point the software was introduced few engineers could operate it competently, and operating Pro Tools then became a specialist job role. Pro Tool's eventual dominance in professional studios occurs after the millennium, but by the end of the 1990s the technology was in place for the subsequent rapid shift to software based recording and mixing.

Home Studio Technology

A number of affordable options for digital recording became available for home studios in this period, both in terms of digital consoles, hard disc recording and digital audio tape recorders. The shift to digital recording in the home studio was significant, as the quality of recordings that could be achieved using consumer level technology impacted on the professional studios' business model. The Alesis Digital

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[177] Personal Communication (14/08/15)

Audio Tape machine (ADAT) was introduced in 1992, the machine used VHS tape, a format used for video recorders.

Alesis ADAT digital tape recorder. (Alesis ADAT, n.d.)

ADAT machines became very popular and the machine was often combined with an analogue console made by the American firm Mackie: "rivaling professional mixers' features for a fraction of the cost, the ADAT-Mackie-based studio spawned the birth of the 'project studio'" (Cole, 2011, p. 450). The term 'project studio' was in fact used before the ADAT format became popular, but the combination of the Mackie desk (or similar) and the ADAT machine was significant as small studios equipped with this technology could directly compete with professional studios. Musicians began purchasing ADAT machines or similar products, [178] which were the first relatively affordable audio devices to lay claim to 'professional quality sound'– rather than renting time in commercial studios (Ryan and Peterson, 1993). The machine was capable of 8-track recording but a number of units could be linked together to create a powerful multitrack system (theoretically up to 128 tracks). A respondent recalled that a successful album his band completed in the late 1990s was largely recorded on two ADAT machines, some of the tracks were entirely completed in the band's own facility. "We did 'Lost Souls' on ADAT in our place and then dumped that onto analogue tape when we worked in a real studio. That

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[178] Tascam introduced a rival digital tape format in 1993.

album was all printed (*recorded to tape, digital or analogue*)" (Goodwin, 2015). [179] The ADAT recorder enabled musicians and producers to record high quality audio recordings at home, however, equipping these home studios still required a fairly large capital investment: "It was big investment then, it was a big investment to get a computer, a desk, a tape machine, a sampler" (Massey, 2010). [180] This investment could easily increase once all the ancillary equipment necessary to run a studio was factored into the cost.

Well-equipped project studios were run as commercial enterprises, and as mentioned above, were taking work from larger studios in some cases. Even if home studios were not run commercially, the work a band or producer carried out in their own facility reduced the revenue spent in the studio sector. Burgess (2014) notes that although this development was damaging to the professional studio business it did encourage the recording of more music. Burgess (2014) considers the ADAT machine (and rival products) to have democratized the recording process, and to have significantly contributed to the growth of the project studio market. "The Alesis ADAT was a democratizing inflexion point, where the means of producing high quality recordings began to de-concentrate socioeconomically" (Burgess, 2014, p. 133). The machine (and similar rival products) provided a cost-effective way for producers or musicians to produce high-quality masters, it also encouraged songwriters to develop their production skills; songwriters "were empowered to produce high-quality demos and move into production" (Burgess, 2014, p. 133). A number of hard disc recording systems were released in the mid-1990s aimed at the home studio, Akai brought out 4-track, 8-track and 16-track machines in the mid-90s. These could be linked together and controlled using MIDI, and Fostex also released

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[179] Personal Communication (14/08/15)
[180] Personal Communication (06/04/10)

similar products. In parallel with developments in the professional sector, digital mixing desks became available for the home studio. Yamaha introduced the Promix 01 console in 1995 for less than £2,000. This console featured onboard DSP effects, equalization and dynamics processing. This was closely followed by the more sophisticated Yamaha 02R in 1996, this was a significant investment at £7,000, but nevertheless became a very successful product. These consoles could be automated using the MIDI protocol, and essentially offered all of the features found in the sophisticated digital consoles available in a professional studio. Other manufacturers followed Yamaha's example and brought out rival products. The DSP power in these digital desks was significant, as native computer-based DSP had yet to offer enough power for processing a complex mix. Allied with a digital recorder these consoles potentially offered a powerful recording and mixing system. "You can go in there with an 02R and a DA-88-and with someone who knows what they are doing, you can get a professional recording in a bedroom" (Filipetti cited in Massey, 2000, p. 8). Filipetti's observation is confirmed by the producer John Leckie (cited in Smith, 2011), who notes that the first radical change in his recording career was instigated by the introduction of multitrack tape recorders, the second major change was the introduction of digital technology, particularly equipment aimed at the home studio: "There used to be an area of recording called 'semi-pro' – essentially 'demo' equipment and studios… But somehow that distinction became blurred, because now you can have a pro recording studio in your bedroom" (Leckie cited in Smith, 2011, p. 46). Assuming the user was competent, the results that could be achieved in a home studio using the new digital tools became much closer to those possible in a professional studio.

DAW technology aimed at the consumer market was released in the 1990s, and the

practice of using a computer to record audio was adopted more rapidly in home and project studios than in the professional studio sector. This conforms to Christensen's (2003) theory of disruptive innovation; disruptive products are simpler and cheaper and they initially produce less profit to manufacturers than established technologies. Secondly, disruptive technologies are usually first commercialized in emerging markets, in this case the home studio market. And thirdly, leading firms' most profitable customers generally do not want, and indeed initially cannot use, products based on disruptive technologies. Early DAW technology was not adequate for the needs of professional studios, it was however suitable for home and project studios that didn't need to record multiple audio tracks simultaneously. There had been early hard disc recording systems that ran on the Atari platform but these were somewhat limited by the machine's capabilities. Software was subsequently released to run on the Mac or PC platforms, Cubase Audio was released in 1992, Logic Audio in 1994. Cubase VST (Virtual Studio Technology) was introduced in 1996; there were also similar products from Mark of the Unicorn and Opcode. A Pro Tools system was too expensive to feature in many home studios at this point. The steadily increasing power of personal computers (and the capabilities of music software) gradually reduced the costs of equipping a home or project studio, and this too substantially narrowed the gap between project and commercial studios. The quality of soundcards (digital converters) also improved rapidly in the 1990s, which increased the quality of recordings made using DAW technology. DAWs offered recording facilities, a visual user interface, mix processing, mix automation, and file storage. As the technology matured, the introduction of numerous software effects and virtual instruments made the DAW an attractive proposition for both the professional user and the home studio owner. By the late 1990s, applications such as Cubase and

Logic had emulated most of the functions of the multitrack recording studio. A respondent commented that his band integrated Logic into their studio setup in the late 1990s as they realized the software could potentially replace their ADAT machines (Goodwin, 2015). [181] DAW technology evolved steadily and exploited the developments in computer technology that occurred throughout the 1990s. Until 1999 Pro Tools was aimed specifically at the professional studio sector, but in 1999 MIDI capabilities were added and a consumer version of the software was made available, further blurring the difference between a professional and consumer recording system.

Strachan (2016) observes (based on data from the National Association of Music Merchants (NAMM)) that from 1997 onwards there was a considerable rise in the sales of DAWs and soundcards, and a significant decline in the sales of hard disc recorders, hardware sequencers and MIDI sound modules. For many consumers the DAW equipped computer was now the core technology for music production: "Clearly a significant development in how the creative process is imagined as a whole" (Strachan, 2016, p. 22). By the end of the decade the shift to software based recording and mixing in home and project studios had gained momentum and was occurring more rapidly than in the professional sector. Shortly after this 'in the box' recording and mixing became the common working method in home studios. The discussion will now examine the major developments in console design in the 1990s.

The Evolution of the Mixing Console

Innovations in console technology in the 1990s were based on advances in digital technology; some manufacturers were also integrating digital technology into their

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[181] Personal Communication (14/8/15)

existing analogue products. For example, Amek introduced 'Virtual Dynamics' as part of the Supertrue automation system in 1991, which was an innovative software-controlled dynamics system, offering compression, gating and limiting. The most significant innovation of the period was the widespread introduction of digital consoles. A fully digital console consists of three main hardware elements, the processing engine, the I/O system that interfaces the console to the outside world or other pieces of equipment, and the control surface (Langley, 2004). As the microprocessor industry released dedicated DSP chips, and convertor technology improved, building an effective large format digital console became a more viable proposition. Although there were earlier digital consoles, the Neve Capricorn is considered the world's first large format digital console (up to 256 signal paths), and was manufactured between 1993 and 2001; Abbey Road was the first customer (AMS-Neve, 2015b). Neve sold over a hundred Capricorn consoles in the nine years the console was in production (Schoepe, 2014a). However, the R&D costs for the Capricorn were over £12 million pounds (Andrews, 2007). SSL were also a digital audio pioneer, and put significant effort into digital innovation, although most of their initial team of digital engineers decamped to develop the Sony Oxford console; SSL subsequently brought a number of digital desks (the A Series). The Sony Oxford digital console achieved around forty sales by the end of the 1990s (Robjohns, 2000). Soundtracs also produced a large format digital console in the late 1990s. British manufacturers were at the forefront of digital console design and concentrated on the higher end of the digital console market, companies such as Yamaha and Mackie successfully addressed the home/project studio market. The cheaper digital consoles sold in far greater numbers and were largely based on the design principles and innovations introduced in the high-end consoles. The primary advantages of a digital

console were that the possibilities for automation and recall were far greater than an analogue console could offer. Digital consoles were designed to automate all the console's facilities, including fader positions, pans, aux send/return levels, EQ, dynamics, effects and mutes. Unlike a physical console with a recall system where the engineer had to manually reset the console according to the information displayed on a screen, a digital console could be reset at the touch of a button. Digital consoles featured built-in digital effects processors, moving faders, and often included dynamics control such as compression or gating, often on every channel. Digital desks also offered fader grouping and featured the facility to store snapshots (White, 2000). Technical developments in recording technology have generally offered ever-greater control over the individual musical elements in a recording, and digital consoles offered engineers and producers greater possibilities when mixing. They emerged just before the DAW became a fully-fledged mixing tool, once DAW technology was widely adopted the demand for consoles started to decline rapidly. The evolution of DAWs had a major effect on the audio industry, as even the cheaper products offered good audio performance. Langley (2004) considers that rapid improvements in DAW technology "killed off the mid-range recording console market." This was a lucrative market for a number of British manufacturers and when combined with a downturn in the global studio market left a number of pro-audio firms in financial difficulties as the market for large-format consoles had also declined. The discussion will now examine the pro-audio sector in the 1990s.

The Pro-Audio Sector

Throughout the decade there were a number of mergers and takeovers in the pro-audio industry, some manufacturers ceased trading, and the sector consolidated into a

smaller number of companies. Despite competition from American manufacturers, British consoles were still dominating the international professional recording industry. An example of this can be seen in the Billboard chart below, in the 1990s Billboard started to show the equipment used to create hit singles as well as acknowledging the relevant studios, engineers, and producers involved. In the chart below the only consoles mentioned are British (Soundtracs, Amek, SSL, Neve), which was a common pattern in many of these charts. British-made Quested studio monitor speakers also feature. From viewing a number of these charts, SSL consoles were mainly for mixing purposes whereas Neve and other UK consoles were predominantly used for the recordings: "You've got to go with what the market is saying to you and to my knowledge it was record on a Neve – mix on an SSL" (Aitkin cited in Cooper, 2005b). The tape recorders listed in these charts are usually Swiss or Japanese and are mixture of analogue and digital machines in the 1990s.

Studio Action Chart (Billboard, 1994).

To illustrate the eventual dominance of the SSL console, a 1996 Billboard Studio Action Chart reported that 83% of number 1 hit singles that year had been produced using an SSL mixing desk, other UK-made consoles make up the other 17% (Billboard, 1996). The manufacturer's impact on popular music recording was considerable: "In fact, SSL claims that more platinum albums have been recorded on SSL equipment than on all other mixing consoles *combined"* (Rotondi, 2011). The production credits chart below (based on number one singles) from November 1997

shows a mixture of UK consoles used to record the tracks (SSL, DDA, Neve), and the mixes were all completed on SSL consoles.

PRODUCTION CREDITS
BILLBOARD'S NO. 1 SINGLES (NOVEMBER 8, 1997)

CATEGORY	HOT 100	R&B	COUNTRY	RAP	MAINSTREAM ROCK
TITLE Artist/ Producer (Label)	CANDLE IN THE WIND 1997/ SOMETHING ABOUT THE WAY YOU LOOK TONIGHT Elton John/Chris Thomas (Rocket/A&M)	YOU MAKE ME WANNA... Usher/ Jermaine Dupri (LaFace/Arista)	LOVE GETS ME EVERY TIME Shania Twain Robert John "Mutt" Lange (Mercury)	FEEL SO GOOD Mase/ Sean "Puffy" Combs, Deric "D-dot" Angelettie (Bad Boy/Arista)	TOUCH, PEEL, AND STAND Days of the New/ Scott Litt (Outpost/Geffen)
RECORDING STUDIO(S) Engineer(s)	TOWNHOUSE STUDIOS (London, England, U.K.) Pete Lewis	KROSSWIRE STUDIO (Atlanta, GA) Phil Tan	MASTERFONICS (Nashville, TN) Jeff Balding	DADDY'S HOUSE (New York, NY) Doug Wilson	WOODLAND STUDIOS/ ALLEN-MARTIN STUDIOS (Nashville, TN/Louisville, KY) Bill Klatt
RECORDING CONSOLE(S)	SSL 4072G+ w/ Ultimation	DDA AMR 12	SSL 9000J	Neve VR60	Neve 8058/ Sony MPX 3000
RECORDER(S)	Sony 3348 digital	Sony APR 24	Studer D827	Studer A800 III	Otari MTR 100A/ Studer A827
MASTER TAPE	BASF 931	Ampex 499	Ampex 467	Ampex 499	Ampex 499
MIX DOWN STUDIO(S) Engineer(s)	TOWNHOUSE STUDIOS (London, England, U.K.) Pete Lewis	STUDIO LA CO CO (Atlanta, GA) Phil Tan, Jermaine Dupri	MASTERFONICS (Nashville, TN) Mike Shipley	DADDY'S HOUSE (New York, NY) Michael Patterson	AXIS (New York, NY) Bill Klatt
CONSOLE(S)	SSL 4072G+ w/ Ultimation	SSL 4064G+ w/ Ultimation	SSL 9000J	SSL G4000	SSL E/G
RECORDER(S)	Sony 3348 digital	Studer A827	Studer D827	Studer A800 III	Studer A820
MASTER TAPE	DAT	Ampex 499	BASF 900	Ampex 499	Apogee DAT/ Ampex 499
MASTERING Engineer	TOWNHOUSE STUDIOS Frank Arkwright/Pete Lewis	POWERS HOUSE OF SOUND Herb Powers	MASTERFONICS Glenn Meadows	HIT FACTORY James Cruz	GATEWAY Bob Ludwig
CD/CASSETTE MANUFACTURER	PDO-HTM	BMG	PDO-HTM	BMG	WEA

Production Credits (Billboard, 1997)

Despite the continued dominance of UK manufactured consoles in the worldwide recording industry, the sector was not as profitable as in previous decades, and there were a number of takeovers and mergers. Allen & Heath were taken over by the American company Harman International in 1991. In 1992 Siemens closed down the Neve Group and it was incorporated into another Siemens subsidiary, the British company Advanced Music Systems (AMS Ltd), who had been successful in the field of digital audio. The owner of AMS subsequently bought back AMS/Neve from Siemens in 1995. After he lost control of Focusrite in the '80s Rupert Neve worked closely with the Manchester company Amek, who brought a number of Neve-badged

products to the market (Langley, 2013). [182] These included Neve designed modules for some of their consoles and various outboard-processing products. The partnership's flagship product was another high-end console, the Amek 9098. It took Neve and Amek five years (from 1989 until 1994) to design and manufacture the first completed console. In common with the Forté console mentioned above, this sold in relatively small numbers despite a considerable investment in design and manufacture. "We sold less than ten I imagine. They were brilliant consoles, I think the biggest one we did was sold into Japan for £600,000" (Langley, 2013). [183] Note the considerable sum Langley (ibid) mentions, console prices reached their zenith in the 1990s, as did analogue console technology. In 1994 Neve relocated his ARN consultancy business to the USA, whilst initially still maintaining links with Amek. Amek sold numerous rack modules based on the 9098 consoles, which offset the considerable investment in developing the desk itself: "They also sold a lot of rack gear, EQs etc., we sold literally thousands of them. They must have sold seven or eight thousand EQs at £1500 to £2000 a time" (Adshead, 2013). [184]

The directors of Amek sold a 30% share of their company to the Austrian company AKG in the early 1990s, initially as part of an alliance where they would oversee the manufacture of small desks for AKG. AKG suffered financial difficulties in 1993 and the company was bought by Harman, which meant that Amek were now part owned by the Harman group. At the time Amek were competing very successfully with two of Harman's sub-companies, Soundcraft and Studer (who also made broadcast consoles as well as tape machines). "We'd killed Soundcraft in the recording studio market, and Harmon also owned Studer. They noticed that Amek

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[182] Personal Communication (03/03/13)
[183] Personal Communication (03/03/13)
[184] Personal Communication (19/02/13)

BC2s and BC3s at the time were killing Studer" (Langley, 2013). [185] Despite owning a share of Amek, Harman essentially saw the company as a rival, and started an aggressive campaign to undermine Amek's business with a view to taking the company over. "So, in 1997 Harman won in the battle of taking over Amek. They were stifling us, they'd dropped Soundcraft prices, and we were losing sales as they were undercutting us" (Langley, 2013). [186] There was some discussion of reorganizing the Harman group, with Amek put in charge of R&D for the mixing consoles the other partners would make. This was not a popular decision with the sub-companies, particularly Studer (Langley, 2013). [187] This left Amek in a difficult position that eventually resulted in the company closing.

Focusrite released a new flagship console in 1990, the Focusrite Studio Console that is shown in the photograph below. This was based on Neve's Forte console, the development and manufacture of which had effectively bankrupted Neve's company. Dudderidge's Focusrite company re-thought the architecture of Neve's original console design to achieve a high quality of audio and a low noise floor, the desk was then manufactured in 8-channel sections which made it cheaper to manufacture and install. Only ten of these consoles were manufactured, one was sold to Ocean Way in Los Angeles, one to Bear Tracks in New York, four were sold to Tokyo studios, one to Metropolis in London, one to BOP in South Africa, one to Conway in Los Angeles, and one was sold to Music Mill in Nashville (Focusrite, 2014). There seems to have been a pattern in pro-audio manufacturing, where the most sophisticated and advanced console products were produced in small numbers, and were consequently unprofitable. Even the manufacturers seem to have been susceptible to techno-utopian discourse. The company had more success manufacturing outboard

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[185] Personal Communication (03/03/13)
[186] Personal Communication (03/03/13)
[187] Personal Communication (03/03/13)

equipment based on Neve's original designs, before moving into the plug-in market in 1995 with an alliance with Pro Tools.

Crescente Studio, Setagaya, Tokyo, Japan (n.d.).

SSL introduced a moving fader system 'Ultimation' in 1991, as there was some criticism of the sonic performance of the VCA faders used in their earlier consoles. Unlike the majority of the other console manufacturers discussed in the thesis whose flagship products sold in small numbers, SSL were considerably more successful and sold far greater numbers of their products internationally. SSL's analogue technology was updated with the introduction of the 9000 J Series in 1994. This was based around the new Super Analogue technology that provided very high bandwidth audio performance. This console sold in smaller numbers than the E and G series consoles, as demand for large format consoles was declining in the 1990s. The reduced demand was reflecting the stagnation and decline in the professional studio sector. "Fewer consoles were sold, compared to the E/G-Series - only 190 SL9000Js in total" (Mozart, 2013). SSL invested heavily in digital audio R&D, however, their

design team defected en masse to form Oxford Digital (subsequently Sony Oxford) and SSL had to commence research and development again in this area. In 1999 SSL was sold to a private equity company. The console manufacturer DDA ceased trading in the mid-90s, two of the directors then founded the company Audient in 1997 and continued to manufacture mixing consoles.

The studio monitor manufacturer PMC started trading in 1990, adding to another successful area of UK audio technology manufacture. The UK pro-audio sector has specifically excelled at console and loudspeaker manufacture. In terms of outboard equipment manufacturers, Drawmer traded throughout the 1990s, however, Audio & Design presciently concentrated on the broadcast market from the late 1980s onwards. Ted Fletcher [188] who in the 1970s manufactured small mixing desks under the brand name 'Alice' started manufacturing a range of outboard equipment badged 'Joe Meek' in 1993, these products were primarily aimed at project studios. AMS-Neve and Focusrite both manufactured outboard equipment based on Rupert Neve's earlier designs. Although there were still a number of UK pro-audio companies operating at the end of the 1990s, sales of larger consoles have declined significantly due to a decline in the studio sector and a number of UK companies were taken over by Harman. By the end of the nineties Harman owned Soundcraft, Allen & Heath and Amek. The notable trend in the 1990s was that the majority of pro-audio companies were starting to focus their attention on the home recording market as the professional market was declining.

Home studio sales increased throughout the 1990s, with the UK manufacturers Soundcraft, Focusrite, Amek, Studiomaster, and Allen & Heath all releasing products

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[188] Fletcher worked for Joe Meek for two years in the 1960s.

aimed at home and project studios. However, products from Japanese and American companies dominated the market. Numerous new products were introduced to the market, and existing technologies (such as sampling) were constantly updated. As an example of the marketing ability of the dealers that serviced this market, and their relationships with manufacturers, Allen and Heath manufactured a mixing desk specifically for the dealer Thatched Cottage from 1991 to 1993.

In common with a number of UK pro-audio businesses, Turnkey and Bandive were taken over by Harman in the 1990s, after which Andrew Stirling started his own company (Sterling Audio), which was aimed at the professional market. Although computer-based recording is commonplace nowadays and is a significant market, the home studio market was particularly lucrative prior to the introduction of the DAW as the outlay to put together an effective system was greater in the 1990s. "The early nineties period was the most buoyant for home studio and semi-pro sales for most dealers " (Cooper, 2003d). Numerous retailers have subsequently entered the home and project studio market, a market that in the UK was to a large degree created by the companies and individuals discussed earlier in the thesis. I would argue that the retail operation setup by Turnkey was far more influential than their products as they were instrumental in developing the consumer market for home recording products. "The industry creates its consumers and their needs as much as it responds to them" (Theberge, 1997, p. 254). In common with the continual updating that larger studios were drawn into, home studio technology is constantly developing, putting pressure on musicians/producers to continually update to stay current. Essentially, from the late 1970s, musicians started to become significant consumers of audio recording equipment, a situation that has continued to the present day. Audio recording products gradually became consumer items rather than strictly professional tools.

They were marketed through magazines aimed at home studio owners and through the expanding network of dealers and distributors.

> As the home studio became an important new market for the manufacturers of microprocessor-based technologies, there was an ever-increasing pressure on musicians to surround themselves with an ever-expanding array of consumer goods. (Theberge, 1997, p. 234).

In accord with Theberge's observation above, Bennett (2012b) notes that over the last twenty-five years sound recording and music technology has been marketed less at audio professionals and more towards professional and amateur musicians. Bennett (2012b, p. 141) considers that the music technology press operates as "part of a self-serving micro economy" that operates in tandem with the manufacturers. "Music technology manufacturing and consumption can no longer be considered in parallel, but as part of the same, cyclical micro-industry" (Bennett, 2012b, p. 142). Manufacturers, affordable digital technology, the music technology press, and home studio consumers all constitute a cyclical micro-economy (Bennett, ibid). As I have noted above, the role of the dealers that grew the initial market for home recording has been overlooked, as demand was not developed solely by the music technology press or by the manufacturers' advertising. I would argue that the network of audio equipment dealers should be considered as an important part of the micro-economy Bennett (ibid) mentions.

Conclusion

The 1990s was a challenging decade for professional studios, as the market was over-saturated, studio rates were declining due to competitive price-cutting, and project studios and home studios were encroaching on the larger studios' business.

CD sales continued to grow until the end of the decade but file sharing and other factors instigated a drastic decline in the sales of recorded music from the end of the decade onwards. Electronic music became far more popular throughout the decade, which gradually rendered studios solely geared at recording rock bands an anachronism. Assuming a professional studio was used to produce electronic music (as a professional studio was not essential), there was little use for a large live room, usually all that was required was a vocal booth and a control room. There was a consolidation of both the record labels and the pro-audio sector during the 1990s, as corporate takeovers occurred in both sectors. Sales of home/project recording equipment continued to grow in the 1990s, and the relationship between technology, consumption and practice evolved further, as home recording became ever more oriented around the constant consumption of new technology. Digital technology developed considerably throughout the 1990s; initially the developments were hardware-based but the introduction of DAW technology initiated a transition to software-based recording and mixing. Home and project studios continued to adopt digital technology and software tools more rapidly than the professional sector. The impact of digitization affected professional studios, and also the record labels. The radical impact of software on the studio sector takes until a few years after the millennium to become clearly apparent, but the record industry started to feel the effects in the late 1990s. Digital tools, and notably the DAW, are often considered to have a democratizing effect on music production but the realities of the transition to software-based production are complex and will continue to be explored in the thesis. Essentially, the end of the 1990s is the start of significant disruptive change that reshapes both the studio sector and the record industry within a few years. The digitization of recorded music commenced in the 1970s and gained pace in the

1980s, and during the 1990s technological developments occurred that had unforeseeable consequences for the production and consumption of popular music. At the time, the impact of software on the recording industry was not apparent. In terms of the six-facet production model, the market grows during the 1990s based on CD sales, and electronic music genres continue to gain in popularity. In common with the 1980s, technology is the most significant of the facets to consider. Software running on PCs begins to supplant digital or analogue hardware in music production, and illegal digital music distribution utilizing computer networks becomes increasingly common at the end of the decade. In terms of industry structure, there is further consolidation of the major labels and a similar process occurred in the pro-audio sector. The only significant change to occupational careers is the introduction of specialist Pro Tools operators. In terms of organizational structure, project studios significantly impacted on the viability of professional studios. Regarding law and regulation, widespread abuse of copyright law becomes an issue at the end of the decade. The next chapter will now examine developments in the studio sector in the 21st century, a period of disruptive change.

Chapter 6

The Recording Studio in the 21st Century

Introduction

This chapter will explore the studio sector in the 21st century, and I will argue that the relevance and financial viability of professional recording studios was specific to a particular mode of cultural production, which explains their development in tandem with the growth of rock music. I will also argue that the studio sector was radically reshaped by the drastic decline in sales that the record labels suffered after the millennium, and that the personal computer and network technology were the disruptive technologies that reshaped the recording industry. In this chapter I will also explore the market for popular music, technology and innovation in the 21st century and developments in the pro-audio sector. I will closely examine the current studio sector, which now functions quite differently than in any of the periods I have previously explored in this thesis. Significant disruptive changes to the business models of both record labels and professional studios occurred in the 21st century due to the impact of digitization. The market for popular music declined rapidly from 1999 onwards, due at least in part to widespread music piracy. There were further changes in industry structure and by 2012 there were only three major labels worldwide. The economies of scale of the record industry were radically altered by the impact of file sharing and recording budgets became much reduced as the labels' sales revenue diminished rapidly in the first decade of the 21st century. Larger studios were struggling to survive in the 1990s and in the 2000s there were further closures, the surviving studios have adopted a variety of business strategies to stay financially viable, as selling studio time alone often provides insufficient revenue to sustain a studio complex. The professional studios that became the common studio

configuration from the late 1960s onwards are rarely financially viable nowadays, or even necessary for the majority of contemporary music production, particularly once the DAW became the dominant production tool. As Prior (2009, p. 84) observes, the production of music has been transformed by digital technology: "The global conquest of computers has reconfigured the way nearly all music is created, distributed and performed, as sound is increasingly encoded into binary data-forms." There are two main factors in the decline of traditional studios, firstly the growth of electronic music and its DAW-centric production methods; secondly, the much-reduced budgets allocated for many recording projects no longer provide sufficient revenue to sustain the professional sector. Small DAW-based Internet connected studios are now the new studio paradigm.

The Market

As can be seen from the graph on the next page, global income from recorded music has dropped considerably since 1999. There are many similar graphic representations of the global sales of recorded music and although the figures may vary they all point to a similar decline in the market. In 2014 global sales of recorded music dropped below $15 billion, a sum that was considerably lower than the revenue accrued in 1999, although the annual decline in income appears to have slowed. However, the IFPI figures are apparently not adjusted for inflation which renders the graph somewhat misleading, and if historic inflation is factored in, the US record industry has a value equivalent similar to that of the industry in 1966 (Silverman, 2015).

Annual global recorded music income in $bn 1999-2014

Source: IFPI
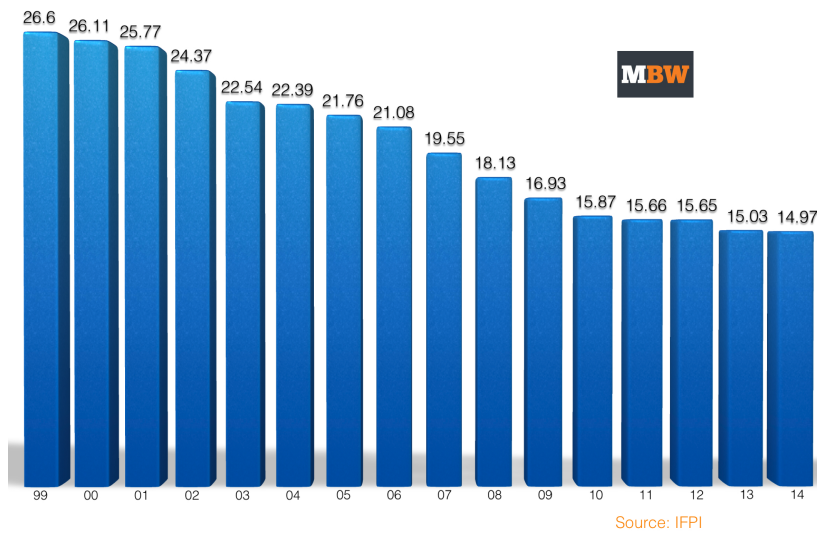
Annual global recorded music income 1999-2014 (2015)

There is considerable debate whether file sharing is solely to blame for the reduction in revenue, although it was certainly a major factor. There are certainly some other issues to consider; Leyshon (2014) notes the rise of dance music as a factor in declining sales, as for many fans of dance genres the experience of attending a club is of greater importance than the consumption of recorded music. Leyshon (2014, p. 87) also notes "popular music no longer commands the attention of consumers in the manner as it perhaps once did." In the post-war period recorded music sales grew as popular music developed along with the sociological phenomenon of the 'teenager', the main consumers of popular music from the mid-1950s onwards were people in their teens and twenties. But the ability of the record industry to "command the disposable income of those between 14 and 24 has been ebbing away rapidly" (Leyshon, 2014, p. 87). Competition from newer media and consumer electronics products has resulted in young consumers spending less on music (Laing, 2004). Essentially, recorded music has greater competition for consumers' spending power than in the past, "the recorded music industry increasingly had to compete for the

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under-24 'share of wallet' retail market with new objects of consumption such as computer games, mobile phones, and DVDs" (Leyshon, 2009, p. 1313). Mulligan (2014a) observes that music is no longer the defining cultural reference point that it once was, and that music competes with an array of alternate cultural identifiers such as branded clothing, extreme sports and networked gaming. Laing (2004, p. 89) notes, "general economic circumstances must also play a role in the fortunes of the record industry". High unemployment figures amongst the young, and the rise of low-paid unstable work (zero hours contracts, internships etc.) have also impacted on consumer spending in the 21st century. As well these economic and cultural forces, factors specifically related to the digitization of music have contributed to the reduction in record labels' revenue streams.

We Are Entering the Fourth Phase of Digital Music
The Four Key Phases of the Evolution of Digital Music

1999	2003	2008	2013/4
Rise of Piracy Networks	Rise of Download Stores	Rise of Streaming Services	Rise of curated and 'Listen' Services?
Fixed access	Fixed portability	Fixed streaming	Fixed discovery?

Source: MIDIA Research 9/14

MIDiA
Insights & Decisions in Action

The Four Key Phases of the Evolution of Digital Music (2014)

Mulligan (2014a) notes four key phases in digital music's evolution, of particular concern to this thesis are the first three phases, the introduction of Napster in 1999, which was the first large-scale piracy network, the introduction of the iTunes store in 2003, and the rise of streaming which has gained in popularity since Spotify's

introduction in 2008. [189] This discussion will now very briefly explore the first phase of digital music, music piracy networks. Napster was the first large-scale piracy network of the 21st century and its client software had gained 60 million users by 2001 (Leyshon, 2014). Napster shut down its network in 2001 to comply with an injunction and a far less successful legal version of the site eventually emerged. After Napster ceased operating numerous other websites emerged that facilitated file sharing, such as Limewire, Kazaa, Bearshare, eDonkey etc. As a measure of the popularity of these websites, Kazaa had achieved a user base of 160 million by 2006 (Leyshon, 2014). Another significant file sharing technology BitTorrent was introduced in 2001 and became the most commonly used protocol. Although Napster popularized file sharing it was not until the widespread introduction of high-speed broadband Internet access that CD sales began to plummet (Hracs, 2012). By 2006 it was estimated that 71% of all Internet traffic was due to peer-to-peer file sharing, as can be seen in the graph below.
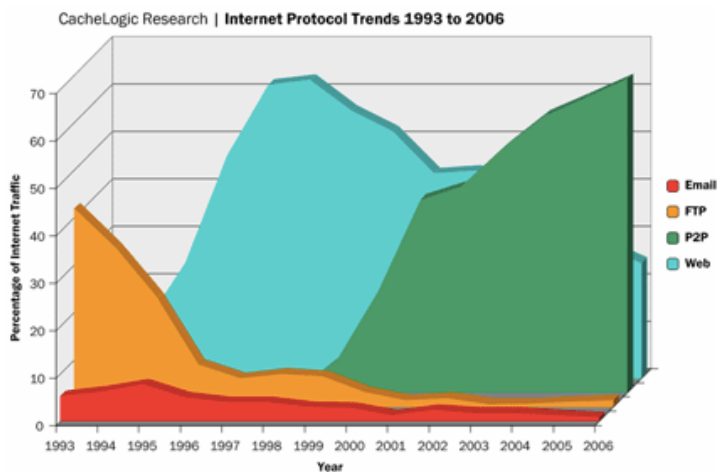
Internet Protocol Trends (2006)

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[189] There are many other digital music services, but Mulligan (2014a) concentrates on those with the greatest impact on the recording industry.

Obviously, not all of this traffic was due to the illegal sharing of music files, but the impact of file sharing on the record industry was considerable. Peterson & Anand (2004, p. 315) consider law and regulation to be a key part of the production of culture perspective; as "they create the ground rules that shape how creative fields develop". The initial lack of regulation of file sharing has shaped the modern record industry. As a consequence of the reduction in revenue and profits, record labels reduced their staffing levels and artist rosters, and signed far fewer acts; recording budgets were also considerably reduced. As noted by Leyshon (2009, 2014), the reduction in recording budgets and the smaller number of signed artists had an adverse impact on the viability of the recording studio sector. Mulligan's (2014a) second phase of digital music is the rise of download stores for the purchase of digital music files. There are a considerable number of digital retailers but Apple's iTunes store and Amazon dominate. Although these services offer a legal alternative to music piracy there were unforeseen consequences from the introduction of digital retail. The iTunes store despite offering millions of titles, heavily promotes the most popular artists, which contributes to the enormous success achieved by a small minority of artists in the contemporary record industry. [190] So, it seems that an unexpected consequence of the shift to digital retail has been a loss of diversity, which challenges the more romantic visions of the democratization of music production, distribution, and consumption (Watson, 2015). Another unexpected effect of the 'pay-per-song' model instigated by Apple was that consumers could purchase only the specific tracks they liked, rather than a whole album. Again, this impacted on label revenue, as there is greater profit in album sales than in the purchase of single tracks (Knopper, 2009). For some years sales of digital music

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[190] In 2011, 102 tracks sold more than a million units each, accounting for 15 percent of total sales. (Lefsetz, 2013). Out of a total of 870,000 albums that sold at least one copy on iTunes in 2011, 513,000 titles or nearly 60 percent sold fewer than 10 copies each (Lefsetz, 2013).

were buoyant and to a degree this helped the record labels to cope with the loss of CD sales.

However, once streaming services started to become popular digital sales began to drop, reducing the value of this revenue stream. Mulligan's (2014a) third stage of digital music is the rise of streaming services; the dominant services are currently Spotify, Apple, YouTube, and Deezer, although there are also a number of less successful services. [191] Streaming renders the concept of owning music obsolete, and relies on the Internet as a means of delivery. Users can gain access to a vast catalogue of music that exists in the 'cloud', in early 2015 Spotify offered a library of 30 million songs (Spotify, 2015). Spotify, Deezer and YouTube offer a free version of their services, but users are exposed to advertising, for a subscription fee users receive an advert-free service. The free streaming services pay a lower rate to the rights holders, which is problematic as they are far more popular than the subscription services. By 2014 the impact of streaming on digital sales was becoming apparent as the number of tracks streamed in the UK doubled in 2014, resulting a drop in digital and physical sales. 2014 was the year that digital downloads and streaming (which now counts in the UK sales charts) overtook the sales of physical copies in the UK. In 2014 48.8% of overall music consumption came from physical album sales, and 51.2% from digital downloads and audio streams. These figures only list streams from audio based services such as Spotify, yet YouTube (classed as a video service) has a far larger user base, so streaming is far more prevalent than the figures currently show. It is clear that streaming will become the dominant method of music consumption in the very near future (Mulligan, 2014b). The record labels receive less revenue from streaming than they did from digital sales, which was in

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[191] Spotify was introduced in 2008, YouTube in 2005, Deezer in 2006, and Apple Music in 2015.

turn less revenue than they received from the sales of physical copies of a recording. The most significant consequence of this shift to access rather than ownership is that labels' revenue could potentially drop even further. In terms of the effect on recording budgets, it is likely that the labels will continue to have less revenue to spend on signing new artists than in the past, and that recording budgets will be tailored to reflect the realities of the market. "But make no mistake, we are on the cusp of a new era for the music industry, indeed we are on the cusp of a new industry" Mulligan (2014b). Consumer behavior has changed dramatically in the 21st century and the perceived value of music both monetarily and culturally is now very different to previous eras. Due to widespread piracy and the availability of streamed music for no cost a generation perceives music as free.

Another factor that undermines the major label's market share and affects studios is the low barrier to entry for producers, artists and entrepreneurs facilitated by digital technology. The independent label sector now has a larger market share than in the past (Burgess, 2014). "Many of these producers, production companies, and labels, are recording and distributing music inexpensively outside of conventional recording and distribution channels" (Burgess, 2014, p. 60). As explored above, digital technology has radically reshaped the studio sector. It seems likely that the studio sector will contract further to adapt to a scenario of fewer signed artists and further reduced budgets for label projects. It is likely that small-scale music production facilities will become even more commonplace; these effectively offer a form of craft production geared to specialized market niches.

Electronic Music Releases

An interesting result of the growth of home recording and the widespread use of DAWs for electronic music composition is the sheer amount of contemporary releases in the field of electronic dance music. As Hracs (2012, p. 455) observes, "new technology, specifically the Internet, has also allowed musicians for the first time to market and promote their music independently". The low financial barrier to participation in electronic music production, and the possibility to easily distribute it online, has resulted in a vast amount of music that competes for a limited number of buyers. "The decamping of audio production from the exclusive recording facility to the desktop PC means that more music is being made than ever…" (Dennis cited in Edwards, 2011, p. 66). Jopson (2012d) explores this issue and observed that in the 1990s there were around 200 dance music releases a week in the UK. In that decade the costs of obtaining production equipment or studio time were higher, and the costs of manufacturing vinyl or CDs were also considerable. So, there were barriers to entry in terms of accessing production equipment and financing the manufacture of physical products. A combination of affordable software and digital distribution has resulted in there being over "7,000 releases a week on Beatport and 3,000 on Juno, the online stores specializing in electronic dance" (Jopson, 2012d, p. 48). The Beatport website suggests that in 2010 there were between 7,000 and 15,000 releases a week, so Jopson's figures may well be conservative (Beatport, 2010). This phenomenon extends to other genres, access to production technology and online distribution means that there is a vast amount of music available commercially. However, much of the online catalogue of popular music sells in small numbers. Based on Nielsen Soundscan data of digital sales, "94 percent – 7.5 million tracks – sold fewer than one hundred units, and an astonishing 32 percent sold only one copy"

(Lefsetz, 2013). Hracs (2012) considers that "technology serves to democratize the music industry by lowering entry barriers and redistributing power". However, it is questionable how much power has been redistributed if the majority of independent releases sell in minute quantities. Despite the profusion of dance music releases that do not sell significantly, electronic music has considerably increased in popularity in recent years. As an example of the growth in popularity, Electronic Dance Music (EDM) – which encompasses elements from a number of European dance music styles – has broken through in the US in the last five years. The global EDM business was worth \$6.9 billion in 2014, almost \$2 billion of which was from music sales (Jopson, 2015). [192] The majority of EDM releases will have been produced outside of the professional studio sector, as a traditional studio complex is of little relevance to contemporary electronic music producers whose music is written, recorded and mixed using a DAW. EDM producers will either utilize a laptop computer and work in a variety of locations, or work in their own facility, a conventional studio will rarely be used.

As can be seen from the above discussion, the significant changes in the market for popular music in the 21st century have considerable implications for the financial survival and structure of the studio sector. There is far less revenue available for recording projects, which obviously impacts on the business model of studios. Due to the economies of scale of the contemporary recording industry small-scale production facilities are the pragmatic response to the current financial problems faced by record industry.

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[192] The highest individual earning DJ in 2014 was the British DJ Calvin Harris with earnings of \$66 million, this was a greater sum than most established recording artists accrued in 2014, only seven of whom earned more worldwide.

Technology and Innovation

As has been explored in the previous chapters, recording technology has developed constantly and 21st century recording technology is radically different to that of the 1960s. Prior (2008, p. 922) considers that "the growth of music software applications in the early 2000s heralds one of the most dramatic transformations in music". DAW technology is now central to the composition, recording and mixing of popular music in all types of studio and in every genre. The majority of the physical equipment found in traditional studios is now available as software emulations, either running as native plugins (processed within the host computer) or running on DSP platforms, such as that offered by UAD (Universal Audio). Software plugins reduce the need for investment in physical hardware, especially as much recording and mixing occurs entirely within the computer (in the box). Arthur (2009, p. 88), considers technology is not a fixed thing with a few variations or updates, but should be viewed as fluid, "dynamic, alive, highly configurable, and highly changeable over time". Technological innovation since the millennium has predominantly occurred in the realm of software, there has been little (or no) innovation in hardware-based recording technology. The pro-audio journalist John Watkinson (2015) considers that there have been no significant developments in the audio industry in the 21st century, and that any technological progress has been merely incremental improvements to established 20th century technologies. Nevertheless, years of incremental improvements to software and digital conversion have had the result of radically improving the tools available to a greater number of practitioners. Manufacturers have developed numerous innovative software products that can perform complex audio processing tasks. For example, 'Melodyne DNA', a program that can separate the individual notes from a chord in a segment of recorded audio, which then allows

the individual notes to be re-pitched. Other commonly used software products allow audio parts to be quantized or tuned (Beat Detective, Vocalign, Autotune). The quality of audio plugins has increased to the point where there is in practice little difference between software emulations of hardware devices and the actual hardware.

> There has been a huge increase in quality. I bought the Universal Audio 1176, 2200 quid it cost me, the black one, I bought it brand new, a couple of years later they brought the UAD 1176 emulation out and all of a sudden you could have ten of them running at the same time. I've A and B'ed those, and they sound exactly the same. (Bias, 2013) [193]

There are numerous other innovative software products that can process audio to achieve results that cannot be achieved with physical hardware. The sum result of all these developments has been an overall increase in the audio quality and sophistication of production attainable in a home studio. Burgess (2014) observes that in terms of audio quality it can be difficult to tell if a piece of recorded music has been produced in a home or project studio, in a professional studio, or on a laptop in a variety of locations. The DAW has now effectively replaced the physical studio for many practitioners. The contemporary DAW [194] offers the ability to record hundreds of audio and MIDI tracks, as well as offering emulations of analogue processing equipment and software synthesizers and samplers. As noted by Theberge (1997), DAW software offers a greater level of integration and standardization than was possible with earlier recording technologies. Different DAW platforms can easily share audio files, an example of this standardization is the introduction of AVID's Open Media Framework (OMF). This is a common file interchange framework

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[193] Personal Communication (12/6/13)

[194] Logic, Cubase, Nuendo, Pro Tools, Reaper, Sonar, Ableton, Studio One, etc.

developed in response to an industry-led standardization effort (Pitt, 1999). It is straightforward to move a DAW project from one location to another and between software platforms and this standardization of file formats also facilitates remote collaboration.

Developments in Mixing Console Design

Due to the changes in the market discussed above, studios have less income to reinvest in expensive hardware, and as DAW technology is now so widely used demand for large format consoles has declined significantly. Effectively, development and innovation in large format consoles for music recording has ceased. This is due to the rapid decline in large professional studios, which were one of the main customers for large format consoles. The only significant developments in mixing console design (for music recording) have been a resurgence of digitally controlled analogue equipment, which features the incorporation of microprocessors and touchscreens. It is common for modern consoles to include some degree of DAW control, and integration with a DAW through on-board AD/DA conversion is also common, even at the budget end of the market. The most recent innovations are in touchscreen technology, where a large touchscreen surface acts as a controller for the DAWs mixing functions. Due to the realities of the modern studio sector, there has been a trend towards manufacturers releasing small high quality consoles (such as the SSL XL-Desk or the SSL Matrix) aimed at professional users, who often own their own small-scale production or mixing facilities nowadays.

Slate Raven Touchscreen Controller (2013)

Once the DAW became the dominant production technology in the early 2000s, many engineers considered the mouse-based interface clumsy. As a result, a number of manufacturers introduced control surfaces that mimicked a console layout whilst offering tactile control of the DAW; these controllers provided an interface that was familiar to engineers who learned their skills on a traditional console. This technology has been developed further and will now integrate tightly with a DAW.

Avid S6 (2015)

All the major innovations in analogue or digital console design occurred in the 20th century, 21st century console innovation is only evident in terms of touchscreen technology and DAW controllers that replicate a console's layout.

The Pro-Audio Sector in the 21st Century

The overall market for products designed for professional studios continued to decline in the 21st century and addressing the home or project studio market became the primary focus for the majority of manufacturers. The phenomenon of corporate takeovers in the pro-audio sector continued in the 2000s. A number of companies ceased trading in the early 21st century, or were taken over by conglomerates; and the majority of manufacturing now occurs in China. The pro-audio sector has consolidated into a smaller number of significant companies than in its heyday and is now dominated by two large corporate companies, Harman and the Music Group, who both operate internationally. These large corporations have had an impact on the structure of the UK pro-audio sector. For example, political alliances within the parent company Harman brought about Amek's demise. The current oligopoly in professional audio manufacturing is a similar phenomenon to the consolidation of the major record companies. In keeping with this pattern of ownership three British console companies (Calrec, Digico and Allen and Heath) have recently combined their resources and formed the ProAudio Group with the help of private equity finance (Schoepe, 2014b). In terms of independent manufacturers, Focusrite's primary focus is now on the home studio market, reflecting the realities of the current market for studio technology products. Many of the company's products are now manufactured in China. Allen & Heath has changed hands a number of times, initially with a management buyout; in common with other manufacturers much of

their product range is now manufactured in China (LSI Online, 2001). In 2005 Neve started trading as 'Rupert Neve Designs', other companies had been profiting from his name and reputation for some years (there is a thriving industry in clones/reissues of his older designs), by using a variation of his name he could profit from his own reputation, as he does not own the Neve brand name. SSL are still trading successfully, the musician Peter Gabriel and the US entrepreneur Dave Engelke acquired the company in 2005 (Solid State Logic, 2014g). SSL still manufacture a large format analogue console (The Duality), which can integrate with a DAW and includes display technology developed from the company's digital consoles. The Duality is the company's flagship product and costs in excess of £100k (less than their earlier E, G, J or K series consoles); the smaller AWS console costs over £40k. The AWS console is aimed at "mid scale commercial recording and production facilities" (Solid State Logic, 2014b), the company has sold over 550 of these consoles worldwide. According to SSL they have sold over 200 Duality consoles, a success in the modern era but a much lower volume of sales than their earlier large format consoles, this reflects the global decline in the studio market (Solid State Logic, 2014a). The company also manufactures smaller consoles and outboard equipment specifically aimed at the project studio market, by diversifying into this market the company can trade on its reputation and survive in a market where large format console sales are much lower than in the past. According to SSL's website there are "more than 3000 SSL-equipped studios and facilities operational today" Solid State Logic (2014f). A considerable number of those facilities will be using products that SSL manufactured in the 20th century, as the company's older consoles are still popular with many mix engineers. The decline of large recording studios and the popularity of recording and mixing using a DAW has transformed the mixing

console market. SSL and AMS-Neve are the only UK companies who still manufacture large consoles aimed at music recording. Apparently AMS-Neve sell very few of their flagship console the Neve 88RS, which can cost well over £300,000.

> The big desks like the Neve 88RS, I thought they sold a couple a month but I was corrected by someone that knows better than me, they sell up to 3 or 4 a year apparently. I know there has been one order in the last twelve months or so as demand is practically non-existent. (Adshead, 2013) [195]

AMS-Neve also manufactures a digitally controlled analogue console (The Genesys) aimed at mid–level recording studios. According to Robjohns (2014a), AMS-Neve has sold 115 of these consoles since its introduction in 2007. They also sell classic Neve outboard equipment, as they own the brand name and rights. Other surviving UK console manufacturers have through necessity diversified into related areas such as live sound, broadcast or post-production, or aimed their products at the home studio market and educational establishments.

Many of the consoles from the 1960s and 1970s have been refurbished and are still used nowadays (Harris & Burns, 2012). Arguably in part because, "The association of multitrack studios with the sound of much classic rock has, in the digital age, resulted in its own form of nostalgia for 'vintage' analogue gear" (Theberge, 2012, p. 81). This fetishisation of vintage audio technology is related to fashions in the studio sector and the perceived qualities of digital audio:

> Two or more decades ago, engineers were constantly looking for cleaner, lower-distortion analogue equipment and consoles, since the tape coloured the sound so much. In the last 10-15 years, as digital recording technology continued to become more accurate and transparent, the fashion has drifted in the opposite direction. (Nehra, 2012b).

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[195] Personal Communication (19/02/13)

Some engineers and producers consider the analogue studio equipment of the past –
whether valve or transistor based – to be superior to modern audio equipment. "The
state of the analogue art in terms of hi fi audio quality was hit with the 2-inch sixteen
track recorder and discrete consoles" (Thompson, 2011). [196] As a consequence, a
small-scale industry exists in the UK manufacturing 'boutique' items of studio
equipment, or renovating vintage equipment.

There was some concern in the equipment manufacturing industry that the impact of
file sharing on record company budgets – which has in turn affected the viability of
commercial studios – would damage the pro-audio sector. The buying power of large
studios had largely driven demand for pro-audio equipment before the project/home
studio became ubiquitous. In fact, demand for audio equipment has increased
considerably in recent years, as outside of the broadcast and post-production sector,
musicians and producers have become the main customers of the majority of pro-
audio companies (Jopson, 2014a). A respondent who runs a company that sells
studio equipment commented on the changes in his customer base over time: "My
main market nowadays is musicians or wannabees, rather than professional studios"
(Thompson, 2011). [197] A home or project studio isn't solely the province of the
hobbyist, as many professionals now own a studio setup due to the economies of
scale in the current sector. This blurs the boundaries between amateur and
professional recording and production: "And this breakdown is also evident in the
equipment itself: manufacturers now rarely distinguish between 'professional' and
'domestic' products" (Warner, 2003 p. 20). Although there is still a small market for
high-end studio equipment aimed at small professional studios, there is now a far

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[196] Personal Communication (17/08/13)
[197] Personal Communication (17/08/13)

bigger market in equipment aimed at home and project studios. Some industry analysts consider this to have affected innovation in the industry.

> One symptom by which it is possible to recognize that the golden age of an industry is over is when products start getting worse. This indicates the technology is mature, the innovators have retired and the dead hand of marketing is steering the ship onto the rocks. (Watkinson, 2015, p. 58)

In terms of the ubiquity of home recording technology, Bennett (2012b) observes that MIDI and other digital technologies may have brought about an apparent democratization of music technologies, but questions whether this democratization is real or merely perceived. Studio technology is marketed largely to a group of hobbyists who are not part of the professional music industry, as the amateurs considerably outnumber the professionals. "Let's be blunt about it, 90% of the people who get a studio space aren't earning money from it" (Bias, 2013). [198] In many cases there is little real production being undertaken with this equipment, "rarely is there any real purpose or outcome, but once again, this is rarely part of the marketing strategy" (Bennett, 2012b, p. 141). The equipment is marketed as a separate entity to music itself, which reinforces a disconnection between the technology and its intended purpose, reducing the technology to an "object waiting to be interacted with" (Bennett, 2012b, p. 125). Although recording technology offers considerable productive possibilities for some of its users, for many consumers music production is a hobby: "The consumption of music technologies has been reduced to a hobby, a game or a fun pastime…" (Bennett, 2012b, p. 140). Gibson (2005, p. 199) also shares this viewpoint, "new magazines, 'how to' books and websites democratized technology and made sound engineering a hobby". It seems that Attali's (1985) prescient comments on composition have now been realized, as

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[198] Personal Communication (12/06/13)

music composition and production using digital technology has become a common leisure activity. This new activity is not undertaken for its exchange or use value, it is undertaken solely for the pleasure of the person who does it (Attali, 1985). The consumer market is now the primary focus of the majority of pro-audio companies, which reflects the decline of the professional sector.

The Decline of the Traditional Studio

The introduction of MIDI technology and the growth of home/project studios impacted on the business models of professional studios, but the widespread adoption of DAW technology has had a radical impact on the viability of the professional sector. When Battery Studios in London closed in 2001, the commercial director blamed the rise (and audio quality) of project studios and the lack of A&R investment in new bands as the record industry started to decline post-Napster (Walsh, 2001, p. 3). The adoption of DAW-based production was extremely rapid, the engineer Ed Cherney observes, "the tools we use, the advent of computers–it's mind-boggling how quickly it has changed" (Cherney cited in Walsh, 2001, p. 3). Some professional studios had adopted Pro Tools by the early 2000s, but within a few years Pro Tools became standard equipment in the majority of professional studios. Other DAWs are more common in home studios as they are more affordable and include features that specifically appeal to DJs, electronic music producers or songwriters. A respondent noted that he first encountered Pro Tools in 2001 when a freelance engineer his band were working with used the system to record all the tracks for one of their albums.

> Pro Tools didn't enter our world until the early 2000s. The first time we came across Pro Tools was when we were recording the 'Last Broadcast' *(released 2002, recorded 2001, 2002)*. The engineer Max Hastings would rock up with his Mac Tower and a Pro Tools rig, and 'hey presto' we had a studio wherever we were. (Goodwin, 2015). [199]

Another respondent, who first encountered Pro Tools in 1998, considered that the software became widely used by 2005. Before purchasing a Pro Tools system many studios initially hired a complete Pro Tools system and often an operator, as their engineers would unfamiliar with the software.

> It wasn't until around 2005 that I saw widespread adoption of Pro Tools. To begin with a lot of the studios hired Pro Tools rigs and sometimes an operator from hire companies such as FX Rentals and Dreamhire. The equipment was difficult to operate and engineers at this point in time often did not have the necessary skills or IT competence. (Thompson, 2015) [200]

The same respondent suggested that a Pro Tools system and an operator would cost around £500 a day to hire at this point (Thompson, 2015). [201] The transition to DAW technology had a considerable impact, as the traditional studio became less integral to contemporary record production once much of the composition, recording, arrangement and mixing of popular music could take place outside of the professional sector. The project studio sector also changed in function in the 2000s as, once the DAW became the primary recording and production medium, hiring studio time to clients was no longer a viable business model for these small-scale operations. Most of the potential clients for a project studio obtained their own DAW setups and could then record and mix their own material. Nevertheless, small studios proliferate in the 21st century, as many industry professionals such as songwriters/composers, bands, producers and mix engineers run their own facilities

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[199] Personal Communication (14/8/15)
[200] Personal Communication (14/8/15)
[201] Personal Communication (14/8/15)

to keep down costs. This cottage industry of professional individuals working in their own facilities comprises the contemporary project studio sector as they undertake commercial work. Theberge (2012) observes that once American record company-owned studios were undermined by the growth of independent studios it became more appropriate to consider the recording studio sector a 'cottage industry'. However, early independent studios in the UK were often large-scale enterprises, the UK sector studio became a cottage industry in the late 1970s when small studios started to proliferate. The 'cottage industry' term certainly applies in the 21st century as music production takes place in a variety of small facilities and unusual locations, rather than solely in what I've referred to above as a 'traditional' or 'professional' studio environment. Although many large studios have closed there are actually far more studios than ever, but they are usually much smaller than in the past and largely based on digital technology. Theberge (2012, p. 78) notes, "we are perhaps witnessing another stage in its evolution, a reconfiguration of the studio as a technology, a means of production and a form of musical practice". A DAW-based studio may not necessarily be tied to one place, and 'working in the studio' is now a practice that can take place almost anywhere, and very often not in a purpose-built recording studio.

As noted by Theberge (2012) there is a certain amount of romantic nostalgia associated with traditional recording studios:

> This kind of studio, with its large, purpose–built recording rooms and professional staff: these 'temples of sound', as they have been called, serve as a model of what a recording studio should be… (Theberge, 2012, p. 79)

The popular conception of a recording studio is of a complex that features banks of technical equipment, a large format console and sizeable recording spaces. Indeed, a visual cliché that features in many music documentaries is the interview with an

artist or producer filmed in front of a large-format mixing desk. The journalist and ex-record company owner Paul Morley summed this mindset up coherently in a radio documentary on recording studios. Despite a discourse that privileges the traditional studio, the reality nowadays is that for many musicians and producers a studio will primarily comprise a computer running DAW software.

> There's an almost sentimental even superstitious attachment to the idea of making the sounds in traditional studio buildings. Even though to some extent they could be made in new facilities, some of them shrunk into a laptop operated in hotel rooms and airport lounges, some of them set in anonymous sealed-off workshops adrift in soulless industrial estates. (Morley cited in Metropolis, 2012)

In contrast to any empirical evidence pointing to a need for more traditional studios, substantial new studios are still being built, which demonstrates the power of discourse. The growth of DAW-based production has also affected studio designers considerably, as without the need to house a large format console, tape machines, and accommodate the staff to operate and maintain the equipment studios can be much smaller: "There's not so much demand now for designing large, ground-up commercial facilities. The market simply isn't there" (D'Arcy cited in Evans, 2008, p. 127). Smaller studios are often based in a domestic environment or in managed workspaces. "But you tend to be working at home more these days because you can. Technologically you've got the same platform, which has had such an impact on studios" (Pela cited in Shilling, 2012g, p. 29). A composition may be entirely produced in a domestic environment, as in electronic music genres it is unnecessary to use a large studio at any stage of the production process. The ease of production enabled by DAW technology particularly facilitates electronic music composition, which has become prevalent in the 21st century. Further investment is required to

record acoustic instruments or rock bands, whereas a DAW such as Logic is bundled with a variety of virtual synthesizers and a software sampler, the DAW can be immediately used to produce electronic music without further outlay. This financial logic extends to the realities of paying for rehearsal space and instruments, working with a DAW is far cheaper than forming a band: "The economics of it make a being in a band more difficult. People write on a computer and then when that is successful they address it with a band" (Massey, 2010). [202] Although a wide range of studio facilities currently coexist, Theberge (2012, p. 83) considers that "aesthetic, technical and economic conditions may lead to some studio configurations becoming dominant at any given time". Consequently, due to the prevalence of electronic music, the adoption of sophisticated DAW technology and the economic constraints of the record industry, small DAW based studios are now the dominant studio configuration.

DAW technology such as Pro Tools has increased the possibility of achieving professional results in a home or project studio and a professional studio is often only used nowadays to record certain instruments, for commercial releases the mixing process often takes place in a freelance mixer's personal facility. Walsh (cited in Hearn, 2013) notes that the role of the professional studio is now limited: "The professional studio business that remains today is what cannot be done at home: live recording and mixing". There are a variety of scenarios where a professional studio still offers the optimum recording environment, such as orchestral recording, recording drums, or any live ensemble recording. While developments in digital technology have undermined the relevance of large recording studios, it would be inaccurate to state that home/project studios have killed off large studios completely.

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[202] Personal Communication (06/04/10)

However, assuming a traditional studio is used at all, they are often only used for specific parts of a recording project, unlike the period between the early 1930s to the mid-1980s where the entire process of recording and mixing took place in a professional studio: "The costs of making a record are substantially lower than they used to be. You don't need to do all the work in a studio; technology has allowed us to do that now" (Pasquariello, 2012). [203]

The process of decline of the iconic large professional studio that was evident in the 1990s accelerated in the 21st century as record label budgets shrank further due to declining album sales; the sector is much smaller than in the past, "once there were 120 recording studios in London. But now there are only three places where you can record a full orchestra" (Smith, 2011, p. 47). [204] The studio designer Philip Newell (2008, p. xxii) considers that "the financial pressure on recording studios is great. Competition is fierce, and what was once seen as a genuine industry is now often seen as a glorified hobby." Newell's (ibid) comments on running a studio as a glorified hobby were to an extent confirmed by my own research, a point that will be explored further below. Recording projects now attract much lower investment from record labels, which is a global phenomenon in the record industry and has obvious implications for professional studios. "With the downturn in major label fortunes and the advent of project and home studios, budgets have, in many cases, fallen to a fraction of what they were ten years ago" (Burgess, 2008). This observation was confirmed by the Rockfield studio manager Lisa Ward, who notes that in the past an album project would usually take around two months, the length of the booking consequently brought in significant income. Now due to budgetary constraints and pre-production in a home studio, "they are doing an album in a week" (Ward cited in

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[203] Personal Communication (25/08/12)
[204] (AIR, Angel and Abbey Road)

Making Tracks, 2012). Another factor in the decline of the larger studios is that in many cases the steady rise of property prices in urban areas over a period of time can mean the studios are worth far more as redevelopment opportunities than they are as actual businesses. Olympic Studios in Barnes is now a cinema, bar and private members club, and Townhouse studios has been converted into up-market accommodation (NME, 2014). The singer David Gray attracted some criticism when he applied for planning permission to convert his studio complex The Church into five flats and office space. The following quote is from a planning application submitted by the architect employed to oversee the conversion of the premises.

> Church Studios were converted into a music recording facility some 25 years ago. However, due to the technical developments in the music and recording industry, these facilities have been rendered obsolete and do not present a viable future for the building. (Ruthven, 2013)

Despite the architect's astute comment on the obsolescence of the studio's technology and the viability of the studio, the producer Paul Epworth subsequently purchased The Church. Epworth's investment is contrary to current developments in the industry, but his considerable success as a producer has provided the finance for the significant investment he has made into developing what is the most highly specified new UK studio.

Studio prices are often negotiable and the actual price a studio can be booked for will not be widely advertised, as it would undermine the perception of the studio's value. Even very highly specified large studios are available for a fraction of what they could have charged in the past.

> Real World Studios is available for £350 a day including accommodation and catering for six people. You don't get an engineer for that price. It's near Bath,

for £350 you wouldn't be able to get a hotel for six people for that! (Thompson, 2011) [205]

The engineer Phill Brown also observes that many studios are struggling financially. "In the UK at the moment studios are winning if they financially break even – not a great way to run a business" (Brown, 2010, p. 363).

Real World Studios (2014)

To gain work, a significant number of UK studios use the services of Miloco, a company that initially started trading as a studio, the company now owns or manages a considerable number of studios. The owner of Miloco suggests that to make their studios work financially they have to book them out consistently and for relatively low rates, the market has decided that London's professional studios are worth less than £500 a day, a rate which is much lower than in the past, especially if inflation is factored in.

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[205] Personal Communication (11/08/11)

> But studios have to be run extremely efficiently now. We tend to keep them
> constantly busy – high occupancy rates versus low income. A top-end studio
> should be charging £1,000 or £1,200 a day. We're getting £450. Because that's
> where the market is. That's what record companies are prepared to pay.
> (Young cited in Lamont, 2014).

Miloco list fifty two studios on their website, these range from high end studios abroad to more affordable studios in the UK. In the case of the studios they manage, the company will organize studio bookings and then take a commission. Miloco's owner commented that if studio rates do not increase more studios will fall by the wayside (Young cited in Lamont, 2014). Miloco also offer studio design and build services, and equipment repairs, as only a few large studios will now have a full time maintenance staff.

> Miloco manage a lot of the studios on their website and take a share of the
> profits from the work that comes through. But there is also a contract where the
> studio itself can't book things directly; everything has to go through Miloco.
> (Pasquariello, 2012) [206]

A similar but less hands-on service is offered through the 'Allstudios' website, who also charge commission on any business they refer to a partner studio. These web-based services are a fairly recent development in response to the challenging market in which recording studios now operate. Even the larger studios use these services to source clients. The 'Allstudios' website lists 423 UK studios, [207] some of these are individual rooms in a studio complex (like AIR, or Rak), and some are no longer trading. Another website 'Studio Filter' lists 1551 facilities, although the total number includes mastering studios and some rehearsal facilities. Nevertheless, it seems the UK studio market is vastly over-saturated.

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[206] Personal Communication (25/08/12)
[207] This number was calculated on 14/08/14

A significant number of larger studios have gone out of business since the 1990s. Studio running costs have gone up considerably over the years, but studio rates are similar in 2015 to those that could be charged in the early 1980s, "The cost of doing business has quadrupled, but the actual rate is no different than it was in 1981" (Sides cited in Crane, 2015, p. 26). The proliferation of home/project studios and the impact of mobile production technology have combined to undermine the financial viability of the already highly competitive studio business, when this factor is added to the impact of reduced recording budgets the result is a sector that is often no longer profitable just on studio bookings alone: "Times have changed for recording studios, and studio owners are no longer able to rely on ample production budgets to keep their businesses thriving" (Hearn, 2013). So, although the overall number of recording studios is apparently increasing, "the status of the large, high-end studio is in doubt" (Theberge, 2012, p. 89). The surviving larger studios have responded to the challenges of the contemporary market through a variety of business strategies, which will now be explored.

Large Studio Business Strategies

The three largest London studios, Abbey Road, AIR, and Angel still undertake orchestral recording sessions for film scores and advertisements. This kind of work attracts a premium rate, which cannot be charged for other studio projects. As discussed above, a respondent suggested its owners (a publishing company) run Angel Studios as a tax loss, so it isn't necessarily the profitable business it seems from the studio's promotional material. AIR Studios were briefly put up for sale in 2012, but the studio is trading normally at the moment, with a focus on orchestral recording and film score mixing. Gibson (2005, p. 203) commented that Abbey

Road had resisted exploiting its historic cachet: "Somewhat stoically, staff at Abbey Road have refused to transform the complex into a formal tourist attraction". But ten years after his article was published the studio has started trading on its reputation and is actively seeking to develop non-traditional income streams. Abbey Road has developed a number of alternate income streams, such as online mixing and mastering. More recently, the studio has introducing branded educational courses as a way of gaining extra income by trading on the studio's reputation. A one year course will cost the prospective students £11,250, initially these courses will be run in a number of cities, (Berlin, Munich, Melbourne and Sydney) with further locations to be added. "The London Institute will be housed in Abbey Road's north London studio complex and will provide students with access to brand new, purpose-built classroom and studio facilities" (Music Business Worldwide, 2015). Abbey Road also hires the studio spaces for corporate events, such as conferences and corporate dinners, again trading on the studios' nostalgic association with iconic bands and recording projects: "Abbey Road Studios offers truly unique event spaces with legendary appeal, and the chance to hold an event in the very rooms where history has been made" (Abbey Road Studios, 2015). The studio also offers a 'record a song day' where the studio supplies its facilities and staff and a group of session musicians, essentially this an upmarket version of the 'studio experience' days offered by some small studios. This attracts a premium price, with the fee starting from £8000 plus VAT (Abbey Road Studios, 2015). Abbey Road also works closely with Waves, Native Instruments and Chandler, as those companies market software and hardware products that recreate some of EMI's most celebrated equipment, again, this trades on Abbey Road's reputation.

Abbey Road Event Hire (2015)

Gibson (2005, p. 192) notes, in a digital era where much music production is carried out in home studios, *"studios have re-orientated themselves towards other non-music industries..."* In common with Abbey Road, Metropolis Studios has also adopted new business models. Ian Brenchley, the manager of Metropolis (cited in Metropolis, 2012) commented that when he took over running the studio it wasn't evolving, "it was stuck in 1993". He considered that the studio's business model wasn't reflecting the realities of the current studio market and their studio rates were far too high. "There were obvious holes in what they were doing to diversify, broaden their services, their client base, be more flexible with pricing, fairly straightforward things, growing new revenue streams" (Brenchley cited in Metropolis, 2012). Some of the bigger studios (such as Metropolis) with multiple control rooms and studio spaces rented control rooms permanently to producers or mix engineers, as this could guarantee some regular income without having to constantly source clients to fill the rooms. This was a useful income stream for some larger complexes; however, the trend towards producers and engineers working in their own spaces has undermined

this business model. To bring in additional income Metropolis promotes events where an audience will pay to see a producer or artist demonstrate how they recorded or mixed a specific track or album. Tickets for these events can be relatively expensive but such events provide a predictable income stream for the studio. They also put on small concerts, which can bring in revenue from ticket sales, sponsorship and TV deals. Metropolis's current business model includes sourcing new artists and developing them, which was always a possible income stream for a studio as it offers a way of monetizing studio down time. This type of production deal would in the past have meant that the studio would try to sign the artist to a label once the development was successful. Metropolis takes this model a stage further, and they now offer artist management, publishing, and label services themselves. The studio still gets some high-profile recording and mastering clients and has diversified into offering video production; in common with Abbey Road–and trading on the studio's reputation–they offer online mixing and mastering. They also offer a 'VIP package' where a client can record a song written by a professional songwriter, work with an established award-winning producer, and are then guaranteed a commercial release through Universal Music. This is an upmarket version of the 'recording studio experience day' that some small studios offer to gain business.

Public Enemy Advert (2014)

Soul to Soul Advert (2015)

Metropolis has recently entered into a business relationship with the Academy of Contemporary Music, a London music college, who will use Metropolis as a teaching resource. All of these activities are a pragmatic response to the demands of running a large studio complex in the 21st century. Metropolis Studio's approach to coping with the current challenges faced by studios has been to develop a range of

new products and services to generate income. Another possible income-generating option is to run recording and mixing master classes; these are geared at advancing the production and engineering skills of the attendees and will feature tuition by a well-known engineer or producer to attract customers. These events may last several days and can include accommodation costs, making use of a studio's residential facilities if they have them. The residential studio Rockfield, one of Britain's longest established independent studios, runs master classes and rents the studio's accommodation as income-generating schemes.

> We've had to look for other income streams as well because of the way the budgets have gone down. So again, we looked at what do we have here? One of the main things we've got here is accommodation; we had 44 people staying here over the Jubilee weekend, nothing to do with recording, but it worked because they tend to only come for weekends. (Ward cited in Making Tracks, 2012)

Local attractions such as golf courses and scenic local countryside are advertised on their 'Rockfield Leisure' website. The accommodation is marketed using the most famous artists who have recorded at Rockfield to add cachet to the accommodation. "Come and stay at the world famous Rockfield Recording Studios where artists like Queen, Oasis, Julian Lennon, Paul Weller, Robert Plant and Paulo Nutini have all recorded" (Rockfieldmusicgroup, 2014). This is again the kind of musical tourism that Gibson (2005) explores, where studios become transformed into tourist sites. Rockfield is still a working studio, but the new income streams they have introduced are necessary to keep the studio operating, as recording sessions alone will no longer keep the studio afloat financially. Another residential studio Sawmills has also identified a market for rock music based tourism: "Sawmills opened up its

accommodation to guests who might not be able to put three chords together but fancied an affordable taste of the life of those who can" (Wills, 2011).

The London studio Strongroom was established in 1984, and opened a suite of programming rooms aimed at producers in 1990. This was an innovative business model at the time, and one that other studios later adopted through necessity; Strongroom now operate eight programming rooms. In 1997, as part of a phase of expansion, Strongroom opened a bar and restaurant which were open to the general public. The 2014 UK Music report celebrates this diversification, and again Strongroom seems to have been ahead of other studios in seeking new income streams.

> While the revenues that are earned by the bar/restaurant are outside our definition of the core music industry, the diversification of a recording studio into the bar/restaurant space is indicative of the capacity for innovative uses of space shown by businesses within the music industry. (UK Music, 2014, p. 10)

The image below shows Strongroom are putting on similar music-related events to Metropolis, offering a Q&A session with the engineer that mixed an iconic Kate Bush album. This follows an event in June 2015 where an AC/DC album was the event's focus. It seems highly unlikely that studios would need to run these events if they were fully booked with recording and mixing sessions. So, it is increasingly necessary for larger studios to diversify their activities, as there is no longer sufficient demand for their core services to make a large professional studio financially viable from recording and mixing custom alone.

Hounds of Love Q&A (Kirby, 2015b)

Mid-level and Small Studios

In common with larger studios, smaller studios are attempting to survive in a challenging business environment; they are also substantially discounting the rates they charge. Despite this financial handicap, smaller studios are expected to offer a wide range of equipment, including vintage audio equipment, which creates a particularly challenging business model. Brian Young, who has run CaVa Sound in a converted church in Glasgow since 1974, notes that the squeeze began about 10 years ago. "Primarily because records weren't selling any more... Our staff numbers

at CaVa are way down now – but we're still here" (Young cited in Lamont, 2014). A significant investment is still needed to compete with other studios in terms of equipment, yet the rates a studio can charge are limited by the market. One studio owner commented that when they attempted to increase their daily rate by £50 a day, their business suffered, despite the level of equipment and service they offer. "We've been really busy but we tried to push the rates up £50 a day but the market won't stand it, the work is not there" (Thompson, 2011). [208] In common with the larger studios, bookings are much shorter than in the past and may possibly be just to record drums.

> I think it's a given that budgets are smaller and people aren't booking studios as much, they'll book this just to do drums or piano; 90% of our work is people coming in to record drums for an album, they book three days, and then they take it away. They take it home and do the rest, even the mix, at home. (Pasquariello, 2012) [209]

It is relatively unusual for an entire project to take place in studio environment nowadays as editing and mixing are often completed in a home or project studio: "I still record bands, but use commercial studios for that bit and then mix back at my place where I can take as long as I want, no more clock watching" (Brierley, 2014). The studio sector's marketing has often tended to focus on equipment rather than staff; omitting to observe that the reputation of the staff is what will actual them gain bookings: "So anybody opening a studio nowadays, you'll only get clients from the reputation of the staff or the team. It's madness at the moment" (Thompson, 2011). [210] In confirmation of the comment by the above respondent a small local studio that I visited is consistently booked months in advance, entirely on the owner-operator's

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[208] Personal Communication (17/08/11).
[209] Personal Communication (25/08/12)
[210] Personal Communication (17/08/11)

reputation, as the studio's equipment is relatively basic. This studio consists of a DAW running an old version of Pro Tools, some basic microphones and pre-amps, and a guitar amp modeler. His customers come solely from personal recommendations and the relationships he has built up over time, and he is consistently busy. "From early November through to early February I only had four days off" (Kettle, 2012). [211] So, it is possible for a smaller studio to survive and prosper in the current market, but the focus cannot be on accumulating equipment and competing with other studios on technical specifications. Yet the prevailing discourse that surrounds recording technology means that many studios focus on accumulating vintage equipment and boutique outboard equipment. The key consideration for a studio, particularly when working with young or inexperienced artists, is to make the client sound more proficient than they actually are, as this will then gain the studio further work through word of mouth promotion.

> The customer always thinks it's the fault of the studio if it doesn't work out; of course it's not. I invest so much into making artists sound better than they actually are, through performance enhancement and coaching, that's what the other studio didn't do. Therefore they recorded the reality of the artist. (Kettle, 2012) [212]

Another reason for the success of that particular studio was the low price it can be booked for. "Commercially though, I think the reason that I'm full is the price is low, £150/160 a day, for an eight hour day. I'll do it for less for a long booking" (Kettle, 2012). [213] Obviously, such low prices can only work if the studio's overheads are low and the capital investment is minimal. This particular studio was the exception in the

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[211] Personal Communication (12/04/12)
[212] Personal Communication (12/04/12)
[213] Personal Communication (12/04/12)

current economic climate, as all the other studios I visited and monitored were far less busy.

A strategy adopted by many small studios resort is to offer 'studio experience days' aimed at capitalizing on the popularity of reality TV and talent shows in contemporary culture.

Singing Experience (2015)

Studio Experience (2015)

These services are offered by many small studios, and can provide an income stream in a market where there is much less 'traditional' recording work in comparison with previous eras.
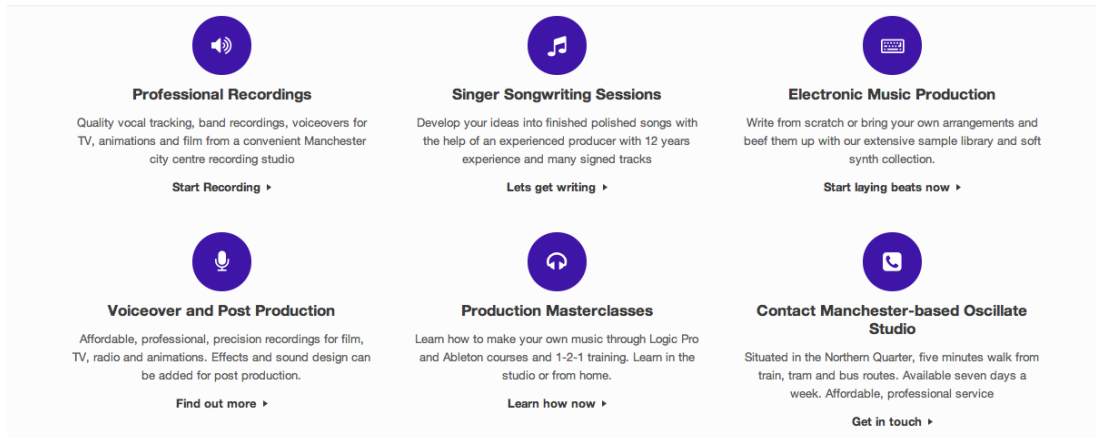
Oscillate Studio (2015)

The image above is an advertisement for a small Manchester studio that offers a range of services in an attempt to gain steady business. In the past a small studio would have concentrated on recording demos and independent releases, those activities will no longer support the majority of small to mid-level studios who now have to diversify their activities. As well as any recording work they may attract smaller studios generate income by offering training, rehearsal space, music production services, songwriting, online mixing and mastering and studio experience days. In contrast, the (now defunct) Rochdale studio Cargo was often booked for two separate sessions a day in the early 1980s (Cargo Studios, 2105b). Cargo's studio booking planners for 1981 to 1983 are available on the website that commemorates the studio's activities from 1978 to 1985. [214] Unlike the modern era, the studio had no difficulty finding enough recording work to run the studio seven days a week and as mentioned above, they were often running two sessions a day. This level of business is rarely possible nowadays; hence the increasingly common focus on 'experience' days and other services as a potential income stream.

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[214] See appendix two

Studio Clusters

A recent business model that reflects developments in the contemporary studio sector is the introduction of clusters of small purpose-built units; these can then be rented on a long-term lease to clients. "Now what you get is a huge market in 'white' rooms where you rent a space" (Pasquariello, 2012). [215] There can be some useful synergy when a number of studios and related businesses are in close proximity. Hesmondhalgh (1996) suggests flexible specialization is characterized by the presence of specialized firms in the market, and that these firms are often geographically concentrated, forming a network of production. Watson (2015) notes that research on the music industry has highlighted the significance of geographical proximity and face–to-face interaction in the development of personal and social networks. The deliberate development of clusters of creative businesses is an acknowledgement of the benefits of agglomeration. "Agglomerations of any sort represent not just spatial accumulations of physical capital, but also evolving pools of human skills and aptitudes" (Scott, 1999, p. 1974). Cultural-products industries often operate most effectively when the individual establishments that make them up exhibit a degree of locational agglomeration (Scott, 2004). Storper and Venables (2003) consider that face-to-face contact is enhanced by co-location, and that it is important in terms of the formation of informal networks. The term 'buzz' is used by Storper & Venables (2003) to refer to these networks of information and communication that can develop through face-to-face contact within a cluster. This proximity and interaction also allows for the transfer of tacit knowledge, which in a studio context has predominantly taken place through face-to-face contact (Watson,

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[215] Personal Communication (25/8/12)

2015). Creative hubs aren't a new idea, but the concept of soundproofing, acoustically treating and air-conditioning spaces to make them specifically suitable for use as a recording studio is a more recent development. As mentioned above, the London studio Strongroom was an innovator in this area, and this business model has been adopted by a number of other studios, and more recently by property companies. The Tileyard Studios complex in North London is an example of this kind of development, as are Atomic Studios and London Music Space, although Tileyard are operating on a particularly ambitious scale with a large number of small studios operating in their complex.

> At Tileyard, most of the studios are small, with room for a computer, a few bodies and a smattering of instruments. Out of the 70-plus studios here, there are only four with the old, big SSL consoles. (Keynes cited in Lamont, 2014)

Atomic Studios have eighteen soundproofed and acoustically treated spaces available for rent in a recording studio complex. London Music Space offers twenty-two soundproofed rooms. Some of these spaces in creative clusters are operated as commercial studios, the majority are used as personal studios for producers, mixers, recording artists and songwriters. It is becoming increasingly common for bands to aspire to have their own studio, particularly if they have a record deal; purpose-built spaces offer an ideal way of realizing this ambition.

> Bands would have gone into commercial studios in the past, but now want their own set ups, they are buying equipment off eBay and putting their own thing together. So there is a whole private studio sector that wasn't there in the past. (King, 2012) [216]

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[216] Personal Communication (20/02/12)

Tileyard Studios is situated on an industrial estate and is owned and managed by a property company who have established a complex of studios and office suites for music related businesses. "Tileyard is offering the creation of private and/or commercial self-contained studio facilities for clients with the additional benefit of all being housed within a wider creative community and environment" (Evans, 2013, p. 12). Tileyard's rooms are built by studio design companies and are acoustically optimized, their clients range from small studio facilities, to producers, songwriters, editing suites, mastering suites, and music management and production companies. The studios are purpose-built with the client's specific needs and budget in mind and are then leased on a long-term basis: "We build each studio to spec for each client, so they are highly personalized" (Keynes cited in Evans, 2013, p. 13). Tileyard's management are renting spaces to a cross section of industry practitioners, in an attempt to build synergy between the tenants, they are essentially trying to manufacture a creative cluster from scratch. Zheng and Chan (2013, p. 606) consider that successful clusters are usually based upon "organically growing inter-actor networks", whereas unsuccessful clusters tend to lack these inter-actor linkages and consequently have few benefits from their location and agglomeration. The manager of Tileyard acknowledges that most production work can be carried out in a domestic environment, but the possibilities of collaboration are enhanced if there is a community of practitioners in close proximity.

> There's not a lot you can't do at home these days – but you need to mix a bit of work at home with studio time where you have access to individuals skilled in other areas. In these scenarios, collaboration is crucial. (Keynes, 2012)

There are numerous advantages to be gained from renting a purpose built recording space in a complex; working in a domestic environment will often introduce issues

with noise and many home studios have poor acoustics. An acoustically designed and soundproofed space will lend an air of professionalism if clients attend the facility.

> I can work whenever I like, and the room presents a professional image. The complex also has a runner to look after the clients' needs. As the room is professionally designed the acoustics are really good, so it's easier to mix in here. It's got windows and natural light, but its acoustically insulated from the outside world and it is also air-conditioned. (Kingslow, 2015) [217]

The above respondent rents a studio space in a London complex geared at media composition, although he mainly works as a collaborative songwriter and a producer. He sources prospective media composition work from within the complex where his studio is based whenever he has free studio time. There are clearly potential benefits in terms of networking and liaising with other businesses in the local cluster. This producer is paying £1,600 a month for his workspace, and considered renting a similar studio space in Tileyard, which would have cost him £2,000 a month. So, renting a purpose built workspace may be a significant outlay, but it is an option that is increasingly commonly adopted by industry professionals.

There are clear economic reasons for the popularity of studio clusters. Producers often have their own facility nowadays, partly as their income has been affected by the reduction in album budgets and sales. A producer can carry out much of an album project in his or her own facility, reducing the overall album budget and in some cases allowing the producer to charge for the use of their studio. "Because budgets have shrunk they've got their own rooms. So 90% of a record, particularly the writing side of it, is done in their little room" (Pasquariello, 2012). [218] A purpose built studio available on a lease arrangement is an ideal option for many producers and mix engineers. A respondent charges his production clients for the use of his

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[217] Personal Communication (14/3/15)
[218] Personal Communication (25/8/12)

studio and includes his ability to play a number of instruments on their material as part of the fee.

> I need to cover my overheads so I try to get £500 a day for the studio when I work on production with artists. I'm being paid to finish tracks and I'll play on them too as part of the fee. (Kingslow, 2015) [219]

Production space in Soundtree Music (Kirby, 2015a)

The other key factor for producers needing their own space is that in many cases their favourite studios have closed. "We've all had to get our own setups because all our favourite places are closing down – Eden, Townhouse, Olympic – are all gone, these are all places I lived in" (Supple, 2011, p. 36). Some of the more comprehensively equipped spaces owned by producers are hired out commercially in the same way producer-owned facilities were in the 1970s and 1980s. "I was in Ben Hillier's studio the Fishpool *(managed by Miloco)* the other week and he hires that out for sessions. It's all esoteric gear but a lot of it wasn't working properly" (Kingslow, 2015). [220] Unlike a traditional studio a smaller facility won't have a full time maintenance engineer. The largest producer-owned facility in the UK is Paul Epworth's Church Studios complex, which is also managed by Miloco. The

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[219] Personal Communication (14/3/15)
[220] Personal Communication (14/3/15)

economies of the modern record industry lend themselves to the post-Fordist flexible production discussed by Hesmondhalgh (1996), or the 'cottage industry' mentioned by Theberge (2012).

The role of music producers has changed considerably in an era of reduced recording budgets, it is becoming much less common for a producer to oversee a recording project from start to finish. "There is only a tiny group of artists who are prepared to pay for a really experienced professional just to record them, there are so few of those jobs now" (Comber cited in Jopson, 2014b, p. 31). The same producer referred to his job role as a 'finishing' operation. The producers' job role is separating into producer-mixers who will complete a project as a 'professional finisher', or songwriter-producers who will work on the inception of the actual musical material and in some cases mix it as well.

> Nine times out of ten the artist comes to my studio, just because it's quicker that way. Lana del Ray came to the UK for a four-week writing period, she went round what I call the writing carousel: there's ten to twenty pop writers in London. I can almost predict who the artist will go to after me! (Howe cited in Jopson, 2014c, p. 35).

Burgess (2014, p. 156) notes a similar trend in the USA, "songwriter-producers, in the top ten of the *Billboard* Hot 100, increased from 0 percent in 1960, to nearly 100 percent in 2011". The reason for this is partly financial and relates to record sales. As well as a reduction in recording budgets, the reduced sales of recordings post-Napster have affected producers' incomes quite significantly. This means the per-track advance fee for producers is lower and their sales-based royalty income is much reduced. As a result many producers are attempting to ensure they obtain a writing credit on any material they produce, as performance royalties have been much less affected by the impact of file sharing. "For producers and artists who write, royalties

from use of the compositions can compensate for the reduced royalty income from the sound recording due to diminished sales" (Burgess, 2014, p. 157). A producer with less musical ability will focus on technical aspects such as additional production and mixing. Both types of producer will need their own facility, as will mix engineers, bands and mastering engineers, hence the current popularity of studio clusters, or individual facilities.

Newly Opened Studios

Despite the challenges facing the recording studio sector discussed above, new studios are still being built; growth is driven by the discourse that privileges traditional studio spaces as the optimum creative environment, effectively this is nostalgia for the rock recording aesthetic. In many ways building and equipping new facilities goes against common sense and in some cases demonstrates spectacularly poor business judgment, but the sector has not been run on rational financial principles since the 1970s: "I would say that anybody who goes into recording studios now, and invests the sort of money that's needed to make a good studio, and expects it to be a business, would be crazy." (Young cited in Lamont, 2014). When asked about the profitability of the studio he manages (Snap) a respondent commented, "You can't really make money out of it, we just make a small profit. But the actual money spent building the place, will never be made back" (Pasquariello, 2012). [221]

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[221] Personal Communication (25/08/12)

Vintage equipment Snap Studio (Kirby, 2012b)

This was a recently built, well-equipped and busy studio in London. Due to the market-based ceiling on studio rates a studio can only charge a certain amount, "Most bookings are £500 a day plus VAT including the engineer's wages. Which leaves the studio with £350" (Pasquariello, 2012). [222] The cap on the rates that can be charged for studio time explains the manager's comments on the likelihood of recouping the cost of the studio build, as once the studio's overheads are met there is little profit remaining. This particular studio was funded by a business that sells and installs studio equipment, and can act as a complement to the core business.

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[222] Personal Communication (25/08/12)

Vintage Neve Console Snap Studio (Kirby, 2012a)

Snap Studios vintage equipment including a Fairchild Compressor and Otari tape machine (Kirby, 2012c)

Nevertheless, there are few industries where entrepreneurs will operate without the possibility of making money from their investment and labour. I explained this particular scenario to another respondent who commented that the large studio where he had once worked was run as a tax loss for a library music company.

> He's doing what they did with Angel, subsidizing it from an already existing business. I think that is how studios keep going, people involved in them don't have good sense, as the business model is flawed. You need these people who are millionaires. (Leader, 2013a) [223]

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[223] Personal Communication (26/02/13)

Building a studio involves a considerable investment in terms of constructing a soundproofed acoustically treated space, installing air conditioning, a specialized electrical supply, equipping the studio, and then maintaining and constantly updating the equipment. The need to upgrade constantly is partly driven by the professional audio industry's marketing efforts, and by continual advances in digital technology. The perceived need to upgrade continually applies to every level of the studio sector; the following quote is from the owner of a medium sized facility in the North West. The respondent also commented on rival businesses offering their services at unrealistically low rates considering the amount of outlay they had invested in equipment.

> We've just spent a massive chunk of money replacing our computers and upgrading our Pro Tools, which will be our outlay on gear for the year. But you see some studios advertising with very extensive gear lists and selling time for £350 a day and that doesn't work either. (Stewart, 2011) [224]

The visual impression a potential client gains of a studio from advertising materials or a visit is also important in attracting work and will also increase the initial costs. One studio owner commented on a rival business, "bands look at the décor, the space, the building and the location and get wowed by it, then they see the big desk and they get the business" (Atkins, 2011). [225] In reference to the flawed financial logic evident in the studio sector, it seems that in some cases people become involved with building and running a studio primarily as they love the environment, the technology and process of recording and mixing. Again, this is largely driven by a combination of techno-utopian discourse and nostalgia for the processes of recording in the rock era. The difficulties associated with running a studio as a

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[224] Personal Communication (19/04/11)
[225] Personal Communication (13/04/11)

profitable business venture are often overlooked. Watson (2013, p. 334) notes that in common with other creative sectors, "record producers and engineers have a strong and emotional attachment to their work". The motivation for working in the recording sector isn't necessarily money but the chance to be involved in making music on a regular basis. Watson (2013) also notes that for many engineers and producers their work plays an important part in their self-identity. As the sector has changed over time and the chances of a 'traditional' studio apprenticeship have declined, working as an unpaid or badly paid intern is one of the only ways to gain experience. The sheer number of music technology courses that are available in further and higher education exacerbates this situation. Students will leave a course with some technical ability but little actual experience and are often unaware of the financial realties of their chosen profession. "Both for new and experienced producers and engineers, the sector is revealed as an increasingly difficult one in which to find and maintain gainful employment, and for many an exploitative one" (Watson, 2013, p. 335). Despite the problems of gaining work, the low pay and the long hours involved in studio work the profession is still "an attractive and much sought-after career" (Watson, 2013, p. 335). Alternatively, young engineers and producers may feel that starting a studio themselves is their only option to gain employment in the sector, despite the economic challenges faced by studios and practitioners

> I wrote to hundreds of studios; literally hundreds and I probably got a reply from maybe ten. I got an interview at one, a good London studio; they were offering to pay maybe £50 a week. The only conceivable way to do that would be if your parents lived in London and you could stay with them. The fact that it was so difficult to get a job in the industry meant that even before we started this I thought I'd have to get my own thing off the ground. (Stewart, 2011). [226]

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[226] Personal Communication (19/04/11)

As part of this study a number of recently (or about to be) opened studios were visited, two of these were built by young engineer/producers as a way of becoming involved in the sector. Another studio was built and operated by a working jazz musician and the most highly specified studio was financed by an amateur musician with a successful business outside the music industry. Two other studios were operated by more experienced practitioners and were offering a wide range of vintage or rare 'boutique' equipment, effectively trading on 'technostalgia', although one of these studios recorded using Pro Tools: "Every studio now is a bit boutique-y. Because of the necessity of having to be a little bit different, they sell themselves by having an unusual desk, or unusual equipment or mic amps" (Supple, 2011, p. 36). One studio was entirely analogue and didn't use a computer at all, offering not only vintage equipment but an old-fashioned working method. One of the new studios (Snap) has been mentioned above and was the most pragmatically run of the studios I visited, although this was the studio where the manager considered that they wouldn't recoup the building costs. Snap has integrated a considerable amount of vintage recording equipment with their digital recording tools. The two large studios opened by younger engineer/producers have not attracted the business their owners expected, although at the moment they are still trading. Neither studio could charge the rates their owners expected to be able to charge when they were building the facilities. "We changed our prices about six months ago, and dropped them quite a bit. We were trying to get £600 excluding VAT for the main studio. The rates were geared to labels, but it was too expensive for local bands" (Stewart, 2011). [227] Despite reducing their rates the studio is still not used as often as the owners had hoped when they were building it. In this case a number of rehearsal rooms subsidize

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[227] Personal Communication (19/04/11)

the studio complex, the studio is also hired to educational establishments to produce a regular income, and the studio also rents a large recording and rehearsal space to a successful Manchester band on a long-term let. One of the owners commented on the challenges they face competing with local project studios.

> The thing that is difficult for us there are people with bedroom setups offering to do demos, and other people with fairly decent studios offering to work for £120 a day. That doesn't work as a business though. You have to pay yourself out of that and you couldn't grow a business from it as your equipment will wear out and need replacing and you'll have other overheads. (Stewart, 2011) [228]

The original intention when they opened the studio in 2010 was to start a label and use the studio and rehearsal rooms as an asset for the label. The reality of the market has led them to seek other income streams to stay in business. Leyshon (2009) comments that although using a studio's assets to run a management or production company may seem a viable strategy, it is often necessary to have considerable financial reserves. Few recordings recoup their investment and it can be expensive to sign and develop new artists. In this instance the finance to buy the building and build the studio was provided by one of the studio partners' parents. Another local studio opened by a young engineer was also a quite highly specified multi-room studio, which took over a year to build.

> The amount of money that has gone into the studio isn't as much as it may appear when you walk in. I have killed myself, and rinsed all my PRS income, all the savings I'd built up over the last four years. But I'll have to get finance to purchase the desk. (Atkins, 2011) [229]

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[228] Personal Communication (19/04/11)
[229] Personal Communication (13/04/11)

The owner was fairly realistic about the likely use of his studio by clients, and in common with Pasquariello's comments above on clients using the studio he runs primarily to record drums and piano, he wasn't expecting whole projects to take place in his studio.

> As far as who I want in, I want people to get a good recording and then be able to take it away and edit it and maybe do overdubs themselves, and come back and mix in an acoustically accurate space with a Neve desk. (Atkins, 2011) [230]

This studio has also had to adapt its rates to the market, when I first interviewed the owner he was expecting to be able to charge £600 a day when the studio opened. In a subsequent interview I found that many sessions have been charged at £200 a day, this figure is obviously far lower than the rate the owner expected to be able to charge before he opened. A lack of experience will have made the sector look more profitable than it is in practice, and most studios are available for less than their advertised rate, which makes assessing the market problematic for new businesses. Leyshon (2009) notes that the 'day rates' advertised by studios are rarely the actual price the studio can be booked for, particularly as record companies are aware of the level of competition between studios, and routinely expect a discount. The studio is a multi-roomed complex, and the owner rents space to other businesses as well as offering mastering services and audio post-production services. The majority of the studio's recording work has been local bands that will not be able to afford high studio rates. "The recording and mixing work is mostly from the local catchment area" (Atkins, 2011). [231] The key selling point of the studio is its large recording area, which facilitates live recording rather than the more common contemporary

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[230] Personal Communication (13/04/11)
[231] Personal Communication (13/04/11)

method of building a recording from individual performances. This ethos had influenced the design of the studio from its inception, "most studios haven't got a big enough room or the isolation. I've now got a space that lends itself to creativity" (Atkins, 2011). [232] Again, discourse from the rock recording aesthetic is evident. In common with the other local studio set up by ex-students, the business has not evolved as expected.

80Hz Studio Neve Genesys Console (Kirby, 2012d)
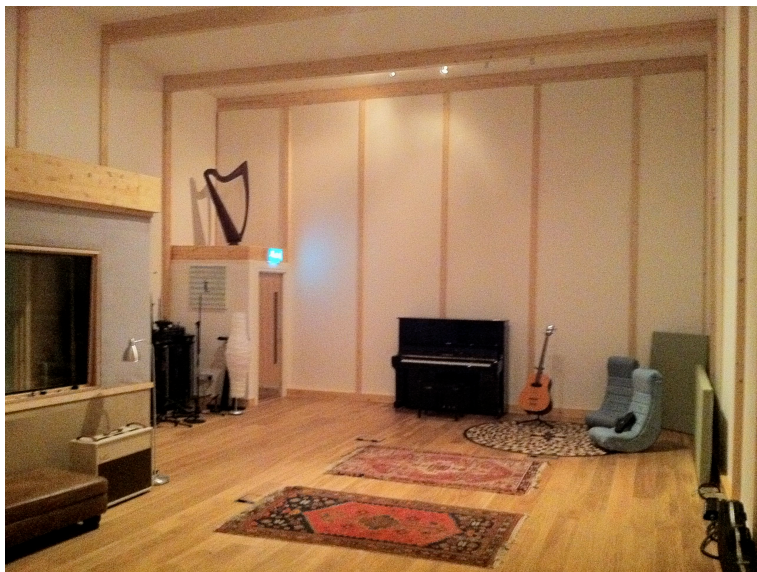
80Hz Studio Live room (Kirby, 2012e)

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[232] Personal Communication (13/04/11)

One small studio I visited is run by a jazz musician and is based in his home, which reduces the overheads considerably, although this has resulted in some compromises in terms of his living space. "It took a long time to get used to that being a public space, [*he uses the large living room as a live area*] as that used to be my living room. I haven't had a lounge for four years, which has been difficult!" (Ellis, 2010). [233] The motivation for this business was entirely altruistic, as the owner was more interested in encouraging local creativity: "The motivation was partly from playing around Manchester for so long, you see all these great people, and you also see people stagnate. So it was to get these people going and to document their work at least" (Ellis, 2010). [234] The owner's ethos was to help the local music scene, both in terms of allowing musicians an opportunity to document their work and to allow them to record their music to sell at gigs at an affordable rate. "For a band you can double your fee in a night if you have something to sell. A lot of people who have come in here have done that with it" (Ellis, 2010). [235] The studio owner was also interested in encouraging communal music making, possibly due to his background in jazz music and collective improvisation. So, there was a philosophical dimension to his business that was relatively unusual.

> I believe in the human scale, the more people involved the richer it is. It turns everyone into a megalomaniac, if you are making music own your own, you are following these paths, your own ideas, I think when there is a number of people involved it washes away some of the ugliness of ego. (Ellis, 2010) [236]

The owner also made some interesting comments on the benefits of recording in a studio environment rather than at home. "Sometimes due to time constraints, you

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[233] Personal Communication (18/08/10)
[234] Personal Communication (18/08/10)
[235] Personal Communication (18/08/10)
[236] Personal Communication (18/08/10)

know that you have to get it done, sometimes there is nothing better than that. That's one thing about paying for it, paying for a studio gives you a focus" (Ellis, 2010). [237] This business has survived for some years due to its low overheads and the fact that the studio isn't the owner's sole source of income. The two studios I visited that featured significant amounts of vintage equipment were both exploiting the current fascination (or obsession) that many artists and producers have with vintage equipment and recording techniques. As noted by Bennett (2012a) in an industry dominated by digital technology and 'in the box' production, a focus on vintage recording technology can separate a studio from the more standardized computer-based studios. "Ultimately, these technological anachronisms work as important sonic differentiators in an industry dominated by standardised, computer-based technologies" (Bennett, 2012a). Both of these studios were trading heavily on their idiosyncratic equipment, the current fascination with vintage equipment is referred to as form of nostalgia by Theberge: "The association of multitrack studios with the sound of much classic rock has, in the digital age, resulted in its own form of nostalgia for 'vintage' analogue gear." (Theberge, 2012, p. 81). Vintage equipment is associated with the iconic recordings of the past and a common perception (or misconception) is that by using vintage equipment a contemporary artist can sound like the artists they are influenced by. "You record onto 2-inch tape and put it through a Trident desk and it sounds like those records from the '70s and '80s" (McLarnon, 2010). [238] There is also a backlash against the clarity of digital recording, which is sometimes referred to as 'sterile' in opposition to the perceived 'warmth' of analogue recording. Both of these studios made a point of prominently listing their equipment on their websites, and in one case referencing it against a

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[237] Personal Communication (18/08/10)
[238] Personal Communication (26/08/10)

successful studio from the 1970s that used a similar console. One of my respondents astutely commented, "Back then people didn't care about the gear they went into a studio to make music; now people are more interested in the gear than they are in making the music" King (2012). [239] Vintage equipment is often fetishized. The same respondent commented that to survive in the modern studio market you either had offer something you can't get anywhere else, such as a range of vintage audio equipment and instruments, or to offer a very specialized mixing environment (King, 2012). [240] Essentially, vintage equipment may attract clients, as due to its expense few musicians can equip and maintain a home studio with similar equipment. There is also current discourse that privileges vintage technology over digital tools. Again, in common with the other newly opened studios it was noted that it was likely that only part of a project would take place in the studio.

> It's a new trend, people like Danton Supple [*a noted producer*], they couldn't do what they can do here in their project studio, but they can take it back and save a lot of costs. They can make a limited budget work that way. (King, 2012) [241]

Eve Studios Calrec Console. (Kirby, 2012d)

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[239] Personal Communication (20/02/12)
[240] Personal Communication (20/02/12)
[241] Personal Communication (20/02/12)

Eve Studios Vintage Equipment (Kirby, 2012e)

This was a recurring theme in my interviews, due to budgetary restrictions and the availability of digital technology; the process of recording and mixing will now rarely take place solely in one location. "Projects are done partly at home, partly in places like this and if there is a budget mixed by a pro mixer in their own place" (King, 2012). [242] The entirely analogue studio (Analogue Catalogue) I visited did not use a DAW and was based around a Trident console and an Otari 24-track tape machine. The owner considered that "by 2003 or 2004 that everyone had enough stuff at home to make music but we'd lost all those spaces that allowed a band to record together and build a track the way we used to do" (McLarnon, 2010). [243] This was also the rationale of one of the other new studios I visited, although that studio integrated digital recording equipment. The proprietor of the tape-based studio had been trained at Strawberry Studios as a teenager and preferred the working method of analogue recording. "I prefer the working method when using tape. The endless

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[242] Personal Communication (20/02/12)
[243] Personal Communication (26/08/10)

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tweaking you can do in digital recording is the end of creativity." (McLarnon, 2010).
[244]

Analogue Catalogue Vintage Trident Mixing Desk (Kirby, 2010a)

Analogue Catalogue Otari Tape Machines (Kirby, 2010b)

This observation on the advantages of recording to tape also occurs in Bennett's (2012a) research, analogue equipment has a sonic quality that is preferred by some practitioners, but the actual process of analogue recording is by necessity far more focused on performance than digital recording.

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[244] Personal Communication (26/08/10)

> Additionally, the reasoning is one relating to process: fewer tracks create limitations, which in turn demand 'whole' performances from the musicians. Certain technologies have become iconic and, as a result, ownership can attract clients. Bennett (2012a)

The tape-based studio was geared at live recording and allowed a group of musicians to record together at once whilst maintaining eye contact, but still have suitable acoustic separation of their instruments to facilitate their individual equalization and mixing. "So that's what we did here, because that was what was missing, a lot of big recording spaces in London have gone as they've been redeveloped" (McLarnon, 2010). [245] Interestingly, the computer-free environment had attracted clients from a wide area including China.

> People come here from all over really, New York, China! We've bought a cottage a few hundred yards away because we had to hire holiday cottages constantly for accommodation. Almost all of our clients are not from Manchester, and they find us on the Internet after typing in analogue recording. (McLarnon, 2010) [246]

This studio was situated in the owner's substantial home, which will have considerably reduced its overheads. In common with the other recently opened studios it was not particularly busy although it clearly appealed to a niche market that venerates older recording equipment and methods. Although this was the only studio that was entirely analogue, the majority of the newly opened studios I visited offered analogue tape recording in addition to Pro Tools.

> People demand it because it's the golden age of gear from a golden age of recording. Analogue tape is in demand because it's the best, sonically. It's also to do with the process, the limitations of tape. There is romance involved to an extent. (Pasquariello cited in Bennett, 2012a)

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[245] Personal Communication (26/08/10)
[246] Personal Communication (26/08/10)

Again, the above quote indicates nostalgia for an earlier era of recording. The most highly specified studio I visited (Analogue Baby) was funded by a musician with considerable financial resources from another business. The studio's range of equipment was particularly extensive, and also featured two 24-track tape machines as well as digital recording. The studio manager commented that the owner hoped to attract film-mixing clients who would normally use a London studio such as Abbey Road, AIR or Angel. Consequently, he had invested heavily in a mixing space that was built to specifications designed by the consultants Recording Architecture and had equipped the studio with an extensive range of high-end equipment including a large format Neve 88RS console. "The desk on its own was £400,000" (Burnell, 2013). [247] Building the control room alone would also have cost around £250,000.

> The build's not cost as much, because we've done it over quite a long period. Umm, well it's been a lot, and we've used some exotic materials. And there's been a lot of attention to detail, as a base, RA say it's normally about £500 per square foot, to do either a control room or a studio area. So, our control room is 500 sq ft. (Burnell, 2013) [248]

The studio also had an extensive collection of esoteric outboard equipment that clearly represented a very significant investment. Apparently the acoustic designer had suggested they stopped continually adding equipment to the control room as it was compromising the room's acoustic properties.

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[247] Personal Communication (21/02/13)
[248] Personal Communication (21/02/13)

Analogue Baby Neve 88RS Console (Kirby, 2013a)

This focus on equipment had been a feature of the owner's previous project studio, which had been based in the same premises. "And what happened was because of both of their obsessions with equipment it got out of hand" (Burnell, 2013). Coveting and collecting audio equipment can become an obsession, and is an area worthy of further examination. "I had been addicted to gear for many years, and I had accumulated way too much" (Augunas cited in Tingen, 2013). This studio was a clear example of the fetishisation of high-end audio equipment that is one of the potential pitfalls of the studio sector. A more pragmatic studio owner noted, "the gear doesn't produce the result" (Kettle, 2013). [249] Again, the investment is inappropriate to the financial realities of the sector and the owner (in common with another new studio mentioned above) didn't expect to recoup all the investment.

[249] Personal Communication (12/04/12)

> He wants to make the money back on the desk, and that's it. So over an eight or nine year period he wants to recoup the money he has spent on the console. As long as he gets the money for the console back in the bank over a reasonable period. (Burnell, 2013) [250]

So, the costs of the studio build and all the other equipment are being ignored as long as the single largest investment is recouped. Again, this isn't a rational approach to running a business. I mentioned this approach to another studio owner who commented that this kind of facility could be detrimental to other local studios.

> The thing that worries me about builds like that is somebody will put a studio together like that, try and get £800 a day for it, and at the end of the day fail, then they'll be booking it out for £200 a day just to keep it busy. Then it will hit the local professional studios, I've seen that happen so often to people who have built up their own business over time, because they are good at what they do and they are passionate. (Thompson, 2011) [251]

Analogue Baby Machine Room (Kirby, 2013b)

[250] Personal Communication (21/02/13)
[251] Personal Communication (17/08/11)

Analogue Baby Studer Tape Machine (Kirby, 2013c)

More than two years after I visited the almost completed complex the studio still wasn't open, the construction and installation process had already been under way for two and a half years at the point I visited it. The owner is still posting pictures of newly acquired high-end equipment on the studio's Facebook page. It remains to be seen if the facility, which is in an industrial estate in Runcorn, can attract the high profile film mixing clients they see as their target market. Leyshon (2009, p. 1317) comments on the phenomenon of wealthy individuals setting up studios. He refers to these as 'vanity projects', "where wealthy individuals set up recording studios not so much based on coherent sustainable business models but more as glamorous ventures".

To summarise, despite the closures of many large facilities, studios haven't died out, but they have evolved and in fact proliferated. The large-scale studio still has a role in the contemporary recording industry but is no longer the locus of the bulk of music recording and production. Few album projects are now completed in one location unlike in the rock era, when a whole album project would often take place in

one studio. Although much modern recording and mixing work can take place in a home or project studio, the physical size of the recording space determines the type of projects that can be undertaken. However, for many projects utilizing the services of a traditional professional studio has become an outmoded concept, or an unnecessary luxury. Tileyard's management commented that their business model of renting small studio spaces to practitioners relies on the ubiquity of DAW based studios: "Without the technological advances [that allow a small studio to be built around a computer], our model wouldn't exist" (Keynes, cited in Lamont, 2014). Due to the challenging business environment faced by new studios it seems that the owners often consider some kind of Unique Selling Point (USP) based around their studio's technology; however, this forethought doesn't necessarily transpose into the business being successful. Returning to Watson's (2013) comments on why people get involved in running a studio, all the owners of the recently opened studios had sacrificed considerable amounts of time, money or personal space in pursuit of their desire to be involved in the creation and recording of music. Watson's (2013) article is titled '*Running a Studio's a Silly Business'* it seems that in many cases the studio owners that were interviewed for this thesis were more interested in being involved in creative production, or accumulating recording technology, than in running a viable business. Theberge (2012) considers that the large professional studios of the past may have a limited role in contemporary music production.

> The adoption of smaller, more flexible and mobile recording facilities, all potentially connected via the Internet, may well be the best model of 'the studio' that we presently have for confronting the new economic and cultural realities of music-making at the beginning of the twenty-first century. (Theberge, 2012, p. 90)

For relatively little outlay the DAW has greater capability to record and process audio than any pre-nineties technology (Burgess, 2014). Apart from a minority of producers who prefer the working method of analogue tape, the DAW is now the dominant technology in studios of all types. In many cases music is recorded and mixed entirely in the box, consequently the impact of this technology has been considerable. "The digital audio workstation revolutionized the art of music production" (Burgess, 2014, p. 134). A small, DAW based, Internet connected studio is the pragmatic response to the challenges faced by contemporary industry professionals. The large studio facilities from the rock era are no longer viable businesses in the 21st century.

Conclusion

This chapter has explored the recent impact of digitization on both the recording studio sector and the record industry; I have argued that the relevance and financial viability of professional recording studios was specific to a particular mode of cultural production. Many of the traditional studios in the UK were built in the rock era and were designed for the live (or overdubbed) recording of rock bands; recording in the 21st century is far less reliant on a traditional studio as my research has explored. I have also argued that the studio sector has been radically reshaped by the decline in record sales, as this has reduced the revenue available to record labels to reinvest in new artists and recording budgets. The studio sector has always had a symbiotic relationship with the record industry.

As Warner (2003) argues, the adoption of digital technologies has played a significant role in how popular music has evolved since the 1980s, as digital technology now supplies most of the sounds heard on pop recordings. Electronic

music production blossomed after the introduction of MIDI equipment in the 1980s. The use of sequencers and samplers in the 1980s and 1990s, and the contemporary use of DAWs, has invalidated much of the rock era's focus on individual instrumental dexterity (Watson, 2015). As Prior (2008a) suggests, technologies can enable but they can also constrain; without insinuating determinism, users adapt to the facilities offered by technology, but often in unpredictable ways. Despite the fact that virtually all styles of music are now produced using DAW technology, it can be considered that the DAW has driven the contemporary rise of electronic music. As the DAW's facilities and virtual instruments facilitate or afford the production of electronic music styles such as grime, techno, house, hip hop, electronica, etc.

Initially, the integration of digital technology into recording studios offered producers and engineers' new tools to use alongside analogue recording and mixing technology. This was driven by developments in the electronics industry, particularly the miniaturization of integrated circuits and the introduction of microprocessors: "As the 1970s and '80s progressed extraordinary advances were made in extending the capabilities of digital technology" (Gere, 2008, p. 113). Home and project studios often adopted the emerging digital technology before the professional sector, which impacted on professional studios. Gradually the professional sector became ever more reliant on digital technology and it became possible to record and mix entirely in the digital domain by the late 1990s, although at the professional end of the market the technology was still specialized and expensive. Subsequent increases in computing power and the development of innovative software have enabled the composition, recording and mixing of music to take place solely within a DAW environment. The cost of entry to participation in music recording and production is now lower than ever. This has effectively democratized access to music production

technology and further undermined the business model of traditional recording studios as small DAW-based facilities have largely supplanted the role of traditional studios: "Software and code have ushered in a regime of distributed musical creativity, which is having a significant impact on the organisation of the musical economy" (Leyshon, 2009, p. 1309). As well as the adoption of digital tools by professional practitioners, there has been a huge rise in amateur music production; Prior (2008a) refers to self-sufficient amateur producers – and other types of digital production (video, blogs, etc.) – as 'digital folk culture'. "Huge swathes of the population are making, filtering, editing, and distributing digital culture" (Prior, 2008, p. 401). Musicians and producers are now less reliant on traditional recording studios and music production can take place anywhere using laptop technology. I have also explored the evolution of the pro-audio industry which developed in tandem with the studio sector and that the home/project studio owner is now the primary market for recording technology.

I have argued that a combination of digital technologies have proved to be highly disruptive for the record industry, which for many years funded the studio sector, either directly or indirectly. The Internet has undermined the record companies' historical control of the distribution of music, and as a result of the diffusion of production technology, labels have lost their dominance in terms of controlling access to recording facilities. Leyshon (2014, p. 120) observes that recording studios were once "highly privileged sites" that only those with suitable resources (such as a record deal) could access. Nowadays musicians are far less reliant on record company funding to finance a recording project, as the ubiquity of digital recording technology and the possibilities of online distribution means that it is possible for artists to record and potentially find an audience without label support. Ryan &

Peterson (1993) note that since the beginning of the recorded music industry access to the equipment necessary to create professional-sounding recordings has been beyond the means of most musicians, a situation that has been transformed by digital technology. Where once record labels controlled the whole production process in a classic example of vertical integration, digital recording technology has enabled far more people to record and release music independently of a label (Hracs, 2012): "There's never been a time in which so much music was produced and released as today. That's because the entry barriers have become much lower" (Tschmuck, 2013). Burgess (2014) considers that the power of large corporations (such as the major record labels or their parent companies) operating as an oligopoly lies in their financial strength and ability to manipulate market conditions. In a high cost environment – such as the record industry prior to the rise of digital production, marketing and distribution in the 21st century – the labels could control production, manufacturing, promotion and distribution and also control the timing of the supply chain. The labels' historic control of the market has been radically undermined by digital technology. The introduction of the MP3 software format resulted in unforeseen consequences for record companies, as this undermined music sales and caused a funding crisis in the recorded music industry, "in which the recording studio sector is embedded" (Watson, 2015, p. 135). A significant reduction in the revenue available from labels for recording projects has impacted on the incomes of studios, session musicians, engineers and producers. Burgess (2014) notes that disruptive technology has the greatest impact when appearing in pairs or combinations. Disruptive technologies are difficult to identify in advance, they do not happen often, and they are not a sustaining improvement of existing technology. The combination of affordable PCs, widespread Internet access, MP3 compression technology, MP3

players and digital music distribution (legal and illegal), has presented the record industry with a huge disruptive challenge to its business model. Burgess (2014, p. 151) refers to this as "the music business equivalent of a large meteorite slamming into the earth, launching an ice age and making the dinosaurs extinct. In a keynote speech at a 2015 music conference the managing director of the independent label group Cooking Vinyl suggested the UK Government should direct tax relief in the direction of recording studios, who he suggested had suffered the most in the post-Napster years. "Record companies have been hit hard, but recording studios and their workers have been hit hardest" (Goldschmidt, 2015). In practice, digital recording technology is now widely diffused, and its ubiquity and sophistication enables the home or project studio to supplant the traditional recording studio for most purposes, which has left the traditional studios struggling to survive, as they are now largely an anachronism.

The production-of-culture perspective suggests that when a new technology emerges, roles change, new opportunities arise and established careers are lost, organizations and industries experience radical change, and the "content and aesthetic evaluation of cultural products are transformed" (Ryan & Peterson, 1993, p. 175). Presciently, Ryan and Peterson foresaw that digital technology was likely to have a greater impact on popular music than any technology since the introduction of phonograph records or radio in the 1920s. Over twenty years ago they argued that digital technology was revolutionary, as they considered it would change every aspect of the production and consumption of music. "Technology provides the tools with which people and institutions augment their abilities to communicate, and changes in communication technology profoundly destabilize and create new opportunities in art and culture" (Peterson & Anand, 2004, p. 314). Previous technologies influenced the

development of popular music in the twentieth century, such as the introduction of electrical recording, radio, vinyl discs, tape recorders etc., but digital technology has precipitated radical change in the recording industry at every level.

Conclusion

This study has explored the development of the UK recording studio sector, a topic that had previously received little direct academic attention, as studios have often only been discussed in passing in music industry texts, artist biographies or production histories. Iconic large studios associated with successful artists have received some attention from researchers, but their work does not specifically explore the overall development of the studio sector (Kehew & Ryan, 2006; Cogan & Clark, 2003). Furthermore, although Horning (2004, 2012, 2013) explores the culture and development of studio sector and Theberge (1992, 1997, 2004, 2012, 2015) has written extensively on music technology and home recording, their work is focused on the US. Specific aspects of the contemporary studio sector have been explored in some depth by academics working in the fields of human and economic geography, rather than by scholars working in popular music studies (Hracs, 2012, 2014; Leyshon, 2001, 2006, 2009, 2014; Watson, 2012, 2013, 2015; Gibson, 2005). Some of the recent work by geographers covers the contemporary UK studio sector, although their focus was considerably different, and somewhat narrower, than the approach to the topic used here. This study sought to bridge the gap between the work of popular music scholars and geographical researchers by utilizing a holistic approach, which examined the evolution of the sector using the production of culture perspective, specifically the six-facet model. Consequently, this study offers a unique insight into the forces that have shaped the development of the UK studio sector. The thesis explores the long arc of change from the early corporate studios of the 1930s, to the current era, where a laptop can function as a recording studio.

Other theoretical perspectives utilized alongside the six-facet model included Christensen's (2003) research into the introduction of innovative new technology; this was useful to explain the adoption of digital technology in the studio sector and to explore the evolution of the pro-audio manufacturing sector. In many cases home and project studios adopted innovative digital technology before the professional sector. This factor gradually changed the focus of the audio manufacturers, as a significant market for domestic or semi-professional digital music technology developed rapidly from the 1980s onwards. Digital technology has proved to be disruptive for the entire recording industry. Theoretical perspectives from technology studies were integrated where appropriate, notably actor network theory, SCOT and other material that explored the role of users in technological development. Many of the significant innovations in recording technology were the result of input from users, and innovations in UK studio technology were commercially exploited resulting in a significant indigenous pro-audio industry.

Kealy's (1990) research, which explores changing roles in the US studio sector, was utilized as a way into the discussion of similar changes to the job roles of engineers and producers in the UK sector. Kealy's (ibid) work on the US sector does not precisely map onto the development of the UK studio sector, but there are some broad similarities. Unlike the USA, where job roles began to change in the 1950s, it was not until the 1960s that significant changes in the practices of producers and engineers began to take place in the UK. Kealy's (ibid) research offered a way of framing the changes in production practice that occurred in the UK sector in the 1960s. For example, the practices and innovations introduced by the early entrepreneurial producers in the UK initiated changes to the organizational structure

of the recording industry and to the occupational careers of producers. However, the main theoretical framework used throughout this study was the production of culture model.

The production of culture perspective was adopted as it provided a more nuanced theoretical framework through which to explore historical change. The six-facet model allows us to account for continuous threads of change within the market, technology, industry structure, law and regulation, occupational careers, and organizational structure, which Kealy's (1990) limited framework cannot, as it only explores job roles. Kealy's (ibid) work has the effect of prioritizing one specific aspect of changing practice in the recording studio but, as the thesis has suggested, we need to account for simultaneous factors that impact upon the development of the sector.

The six-facet model thus offered a useful prism through which to examine the evolution of the studio sector in a more holistic way, as the production of culture model revealed the interplay between the external forces that impacted on cultural production and consumption in the period studied. The production perspective has been successfully applied to a range of different situations in which the manipulation of symbols is a by-product rather than the purpose of the collective activity (Peterson, 2009). However, in this instance, the main purpose of recording studios is to create symbolic elements of culture. Cultural products change slowly over time, but occasionally such drift can give way to rapid change, which can alter the aesthetic structure of a cultural expression (Peterson, 2009). The six-facet model offered a theoretical framework through which to examine the factors that cause or influence such transformation. Rapid change to the nature of the cultural products produced in recording studios, and to the associated production aesthetic, was

evident at certain points in the historical narrative presented in the thesis. Notably, in the 1960s, as multitracking became commonplace, and again when digital technology impacted on recording and production from the 1980s onwards. The six facets are sufficiently coupled that a major change in one facet can start a cycle of destabilization and reorganization (Peterson, 2009).

The interplay between the six facets varied decade by decade, and was explored throughout the thesis. During the 1950s, the market for popular music began to grow considerably after the emergence of rock and roll; this growth was a factor in the emergence of the early independent studios at the end of the decade. There was change to the structure of the record industry in this period, as the duopoly of EMI and Decca was broken by the entry of Pye and Phillips to the UK market. In terms of technology, the advantages offered by tape recording, and the introduction of multitrack recording at the end of the decade, were significant in terms of studio practice and the creative possibilities the technology offered. In terms of law and regulation, the relaxation of import restrictions in 1959 impacted on the development of an independent studio sector as it became far easier to access US manufactured recording technology. Prior to this the restricted availability of recording technology contributed to the relatively slow development of the UK studio sector, especially if the sector is contrasted to the US studio sector of the same period. Throughout the 1950s union regulations shaped the organization of recording sessions, and contributed to a strict demarcation of job roles within the studio.

The 1960s was a period that saw numerous developments and innovations in the studio sector. Technology was again a significant agent of change, as the widespread

adoption of multitracking changed the production process and facilitated greater experimentation in the studio; 8-track recording became commonplace in the 1960s and 16-track recording was introduced in the UK, initially by Trident Studios in 1969. By the end of the decade, the leading independent studios were more technically advanced than the corporate studios. The UK pro-audio manufacturing sector grew in this period, and the increased availability of recording technology contributed to the growth of the independent studio sector. Occupational careers changed in the 1960s, and these changes contributed to a reorganization of production practices, as independent producers supplanted corporate producers and the first freelance engineers emerged.

In terms of organizational structure, as Peterson (2009) notes, there are three main forms of organization in the cultural industries. In the first, there is strong bureaucratic control with a clear-cut division of labour, geared towards organizational continuity. This arrangement was evident in the organizational structure of record companies until the mid-1960s, and this consequently shaped the structure and practices of the studio sector from the 1930s until the mid-1960s. The second model of organization is the entrepreneurial form, where there is a less clear-cut division of labour and less hierarchical control, this model was adopted in the mid-1960s, when the emergence of entrepreneurial producers, freelance engineers, and the growth of the independent studio sector reshaped the industry. The third model of organizational structure is a form of large firm that takes advantage of flexible specialization and tries to maintain control by acquiring creative services through short-term contracts (Peterson, 2009). This gradually became the standard record company model from the late 1960s onwards.

In terms of law and regulation, there was some relaxation of union regulations once self-contained groups became the common production format in popular music. These changes combined to undermine the vertically integrated industry structure of the major labels. Driving the expansion of the independent studio sector was the rapid growth of the market for popular music in this period, by the end of the decade album sales had almost doubled as the long playing record became the dominant medium for rock music consumption. UK artists also started to sell significant numbers of records abroad; this resulted in increased revenue for UK record labels and this growth in the industry meant that more bands were signed, which then created more work for the studios. In terms of industry structure, a number of successful independent labels emerged in the 1960s, which also provided work for the expanding independent studio sector.

In the 1970s technological development was again a significant driver of change, as 24-track recording was widely adopted. A degree of standardization started to occur around key technological items, and by the end of the decade early digital technology was introduced into the recording studio, notably computer-controlled mixing consoles, which allowed engineers and producers greater control over the mixing process. The UK pro-audio sector expanded rapidly throughout the decade as demand for studio equipment increased, and the UK manufacturers developed significant export businesses in this period. The increased availability of recording technology encouraged further growth in the studio sector. Affordable home recording technology started to be introduced in the 1970s.

In terms of industry structure, the independent label sector grew considerably in the 1970s and in the latter part of the decade this provided a regular source of income for

smaller studios, notably as punk became a popular genre. Record sales doubled in the UK in the 1970s, and British bands sold significantly worldwide, building on the international success of the 'British Invasion' bands of the 1960s. Although there was change and considerable growth in the studio sector in the 1970s, the decade was a consolidation of the radical changes that occurred in the 1960s.

In the 1980s, technology was the most significant of the six facets, as digital technology was the key driver of change in the studio sector in this period. Digital technology was widely adopted in the recording studio and reshaped production methods, and the introduction of the CD was a significant development in terms of the consumption of music. Digital technology was widely integrated into the home studio, and home recording became a significant market for the pro-audio sector in this decade. The consumption of digital recording technology – by professionals, amateurs and hobbyists alike – drove rapid technological innovation in this period. The project studio emerged in the 1980s, facilitated by relatively affordable new technology, and these small studios began to have some impact on the organizational structure of the studio sector. The pro-audio sector expanded throughout the decade and started to specifically address the needs of the burgeoning home studio market. Digital technology affected occupational careers in the 1980s, as the producer's role became even more technical, and specialist job roles emerged, such as dedicated mixing engineers and programmers/operators of digital equipment. The market for popular music continued to expand, and in common with the previous two decades, virtually doubled again during the period. This growth in the market was driven by cassette and CD sales, and substantial new markets for electronic music started to develop. There were changes in industry structure in the record industry, and UK

independent labels achieved considerable success throughout the decade. Despite the growth in sales of popular music, the studio sector began to suffer financial difficulties as competition for lucrative record label work resulted in destructive rate cutting, which reduced the profitability of the sector.

During the 1990s, technology was again the most significant facet driving change in the sector. There were further advances in digital technology, and in many cases home studios adopted these developments more rapidly than professional facilities, a factor that further undermined the professional sector. In this period there was a transition from hardware to software, as the DAW began to impact on the production process. The DAW eventually transformed the recording, processing and mixing of popular music; this paradigm shift began in the 1990s. Pro-audio manufacturers became even more focused on the home studio consumer, as the market for products aimed at the professional sector declined considerably. Digital studio technology has been represented as a democratizing force, but this view was problematized in the later chapters of the thesis.

In terms of the market, CD sales drove record profits for the labels throughout the 1990s, and the worldwide sales of popular music were buoyant prior to a peak at the end of the decade. After this point file sharing and other factors contributed to a spectacular decline in sales from 1999 onwards. The growth of the market for electronic music continued to undermine the relevance of the 'traditional' studio geared at the recording of rock music. In terms of occupational careers, specialist Pro Tools operators emerged at the end of the decade. The growth of project studios and the ubiquity of home recording affected the organizational structure of the recording sector and its financial viability. In terms of law and regulation, widespread

copyright abuse became a significant issue at the end of the decade as file sharing became prevalent.

In the 21st century, technology was again a significant agent of change, as digitization impacted on recording studios and record labels. The DAW became the dominant recording and production platform in both home and professional studios. This further undermined the role of professional studios in the production process, as home recording technology was now in many ways equal to that offered by the professional sector. File sharing, the iTunes store, and then streaming, all impacted on the business model of the record industry. Although digital technology was introduced in the 1970s and 1980s, during the 21st century digital technology proved to be highly disruptive to the business models of both studios and record labels.

The primary market for pro-audio products became the home studio market as the professional sector declined significantly. There were considerable changes to industry structure as the major labels suffered a drastic loss of income in the 21st century and by 2015 there were only three major labels worldwide. There was a similar process of consolidation in the pro-audio industry, as numerous takeovers occurred. Due to a reduction in recording budgets and the widespread diffusion of DAW technology numerous large studios closed, further reducing the number of large professional studios. Through necessity, many of the surviving studios adopted business models that were not solely based on selling recording time.

The emergence of the modern multi-skilled recording industry professional has its origins in the introduction of digital technology, and this conflation of job roles was also influenced by the reduction in studio recording budgets explored in the thesis. Changes in career patterns can evidently have a significant impact on the cultures of production and the organization of production. For example, although DAW

technology has facilitated the emergence of a considerable number of small studios in the early 21st century, many of these small-scale facilities are often owned by producers, songwriters, musicians and engineers, and are solely used for their own professional activities. These small DAW based facilities demonstrate that flexible specialization is now commonplace in the recording industry, and to a greater extent than was evident in previous periods.

Although there are currently numerous studios offering their services commercially, very few of these facilities are actually profitable. The market for large studios geared at recording rock bands is now much reduced, as electronic music has gained a considerable share of the market for popular music and does not require the services of a large commercial studio. As Peterson (2009) observes, "markets are constructed by producers to render the wide range of consumer tastes comprehensible". Once consumer tastes are reified as a market, those active in the cultural field then tailor their actions accordingly. Consequently changes in consumer taste, technological change and a reduced market for recorded music have combined to radically reshape the contemporary studio sector. The application of the six-facet model revealed some interesting perspectives on the contemporary recording industry. For example, the phenomenon of 'free' music in the 21st century is often explained as a result of the demands of consumers. However, the thesis explains this shift in consumption, and the resulting loss of revenue to labels and studios, to be a simultaneous result of a combination of technological change and changes in production practice and employment. Overall, of the six-facets of the production perspective it seems that technology and the market have proved to be the most

important facets in terms of initiating a cycle of destabilization and reorganization within the recording industry.

The market for popular music was a key factor that shaped the overall development of the studio sector. This was explored chronologically in the thesis, as the financial success (or failure) of the record industry has evidently shaped the studio sector throughout the time period examined. Useful sales data was sourced from the BPI to explore the chronological growth of the sector. Technological innovation was also a core theme throughout the thesis. As well as an examination of the evolution of the professional studio sector and its tools, the thesis examined the development of home recording and home recording technology. The introduction (and aggressive marketing) of sophisticated home recording technology eventually impacted on the business model of professional studios. The growth of the consumer market for recording technology has led to a gradual shift in the utility of studio equipment, a transition from its original function as professional tools, to effectively becoming another category of electronic consumer goods. The marketing and consumption of recording technology is undoubtedly an area worthy of further investigation and analysis, as product marketing has certainly shaped many of the discourses that have emerged within the sector. As was explored throughout the thesis, technological change also impacts on the market, the growth of the album as a consumer product was to some degree the result of multitrack technology impacting on the production process; which then shaped the production aesthetic of popular music. The steady rise in popularity of electronic music since the late 1970s is clearly a result of technological change impacting on musicians and producers, consumer taste, and

then the market. This underscores the impact of the interplay between the various facets of the production perspective.

As noted above, the overall development of the studio sector in the UK was relatively under-researched and the development of the mixing console and the professional audio industry were topics that had received scant attention in academic studies. The UK pro-audio industry grew in tandem with the studio sector, and in some cases directly from the sector. This study offers a valuable addition to the field, as both the chronological development of the mixing console and the growth of the UK pro-audio industry were explored in some depth in the thesis. As the culture and technologies of popular music production were changing so rapidly in the 21st century it seemed prescient to develop a historic overview of the studio sector before the sector was entirely transformed by the impact of digitization. Consequently, a subtext of this thesis was to examine how we have arrived at the point where a laptop computer can perform the majority of the functions of a 'traditional' recording studio. The general aim of this thesis was to construct a narrative arc that explored the evolution of the recording studio sector in the UK. Moving from the corporate studios of the major labels, to the growth of an independent sector, and then to the emergence of home studios and the development of the small-scale production spaces of the 21st century. As the studio sector grew and prospered, a thriving UK industry in pro-audio manufacture evolved, and Britain became a world leader in mixing console design and manufacture. The market for popular music provides the financial framework within which the studio sector and the pro-audio sector are embedded. Consequently, the symbiotic relationship between the record industry and the studio sector was a key theme throughout the thesis. This link has been made

explicit throughout the thesis, and again, the application of the six-facet model underscores this interplay.

The thesis explored the contemporary studio sector thoroughly using a combination of primary and secondary research; in the majority of cases it seems that the traditional recording studio environment is no longer financially viable, or indeed necessary, as small-scale networked DAW facilities are the new industry paradigm. The studio sector is clearly shaped by the exigencies of the market. Although a discourse has evolved that privileges the traditional studio space, this ignores the realities of modern music production, as a significant amount of commercially released music is produced without recourse to the use of a traditional studio. Larger studios are consequently resorting to a variety of strategies to survive, ranging from tourism, running master classes, hiring spaces for events, offering songwriting experience days and providing education. The financial viability of the sector was a constant theme explored throughout the thesis, as the contemporary sector often demonstrates an eccentric and unrealistic approach to business, as the technology, space and practices of the rock era studios have become entangled with nostalgia. Despite the difficulties of running a studio profitably, and a relative lack of demand, there are still substantial new studios being built and the UK sector is considerably oversubscribed with recording facilities. The widespread diffusion of recording technology has resulted in a large number of studios operating commercially in a highly competitive environment.

An area that was explored briefly is the current fashion for vintage technology, as vintage studio technology is perceived by some to be superior to contemporary

digital tools. This is an echo of the 'analogue versus digital' debate that has continued since the introduction of the CD in the early 1980s. Vintage studio technology commands high prices on the second hand market, and in some cases is being re-manufactured. The fetishisation of vintage studio technology is certainly an area worthy of further investigation, as 'technostalgia' is an emerging and potentially productive area for further research. Many of the large-format consoles manufactured from the 1960s onwards are still in use, partly as there are limited contemporary options available to replace the older technology, and partly due to the equipment's association with iconic recordings from the past. Again, this is a form of nostalgia, for old technology and for the rock era and its recording practices.

The impact of digital technology on the studio sector and the record industry was explored in some depth, as a combination of computers, software and network technology have proved to be radically disruptive. Decades' worth of music industry practice have been rendered redundant by the emergence of digital technology, as file sharing, online retail and changes in consumer behavior have significantly reduced the record industry's income. A similar disruptive process has occurred in the recording studio, digital technology has reconfigured the studio and radically altered working practices. A mixing desk is now a non-essential item of studio equipment, and is no longer the centrepiece of many studios. A studio can now be based around a DAW-equipped laptop computer running software emulations of hardware devices. Or more often, a contemporary studio consists of a DAW and some additional technology for sound generation, sound capture, processing and playback. Many of these modern facilities are now found in managed workspaces in creative clusters. Laptop technology enhances the possibilities of mobile music production, and the Internet can facilitate remote collaboration, which is becoming increasingly common.

Nevertheless, there is a considerable amount of solo music production, particularly in electronic music genres.

This study has attempted to make explicit the feedback loop between the market for popular music, technology, technology manufacture and practice. At times technology has influenced the course of music, and this is particularly evident in the modern era where electronic music predominates. The professional studio sector is now far smaller than in the heyday of large studios, and the organizational structure has changed. Studio staff are usually freelance, employment in the sector is highly unstable, and the apprenticeship system of training once found in studios has become a thing of the past. Controlled and predictable businesses are susceptible to disruptive change, and digital technology has resulted in significant change for both record labels and recording studios. The six-facet production model offered a useful framework to explore the evolution of the studio sector and the forces that have shaped the current sector, demonstrating the continued relevance of the production perspective as a tool for examining the music industry.

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Appendix 1

'Great British Recording Studios'

The following list of studios are from the APRS (2014) website and were identified by Howard Massey as the most significant UK recording facilities:

.304 Holloway Road
.Abbey Road (EMI)
.Advision
.Air Edel
.AIR Montserrat
.AIR Oxford Circus
.Apple
.Audio International
.BBC Maida Vale
.Berwick Street
.Brittania Row
.CBS
.Chalk Farm
.Chappell
.Chipping Norton
.Command
.CTS
.De Lane Lea
.Decca
.Eden
.Eel Pie
.Genetic
.Good Earth
.Gooseberry
.IBC
.Island
.Jacksons
.Jacobs
.Keith Prowse Music (KPM)
.Kingsway
.Konk
.Lansdowne
.Levy's
.Livingston
.Maison Rouge
.Majestic
.Marcus
.Marquee
.Matrix
.Maximum Sound
.Mayfair
.Morgan
.Odyssey

- Olympic
- Pathway
- Philips
- Pye
- Pye Mobile
- RAK
- RAK Mobile
- Ramport
- Red Bus
- Regent Sound
- RG Jones
- Ridge Farm
- Rockfield
- Rolling Stones Mobile
- Ronnie Lane Mobile
- Roundhouse
- Sarm
- Satril
- Sawmills
- Scorpio Sound
- Sound Techniques
- Spot
- Star Sound
- Strawberry
- Surrey Sound
- The Manor
- The Townhouse
- Tin Pan Alley (TPA)
- Trident
- Utopia
- Wessex
- Whitfield Street
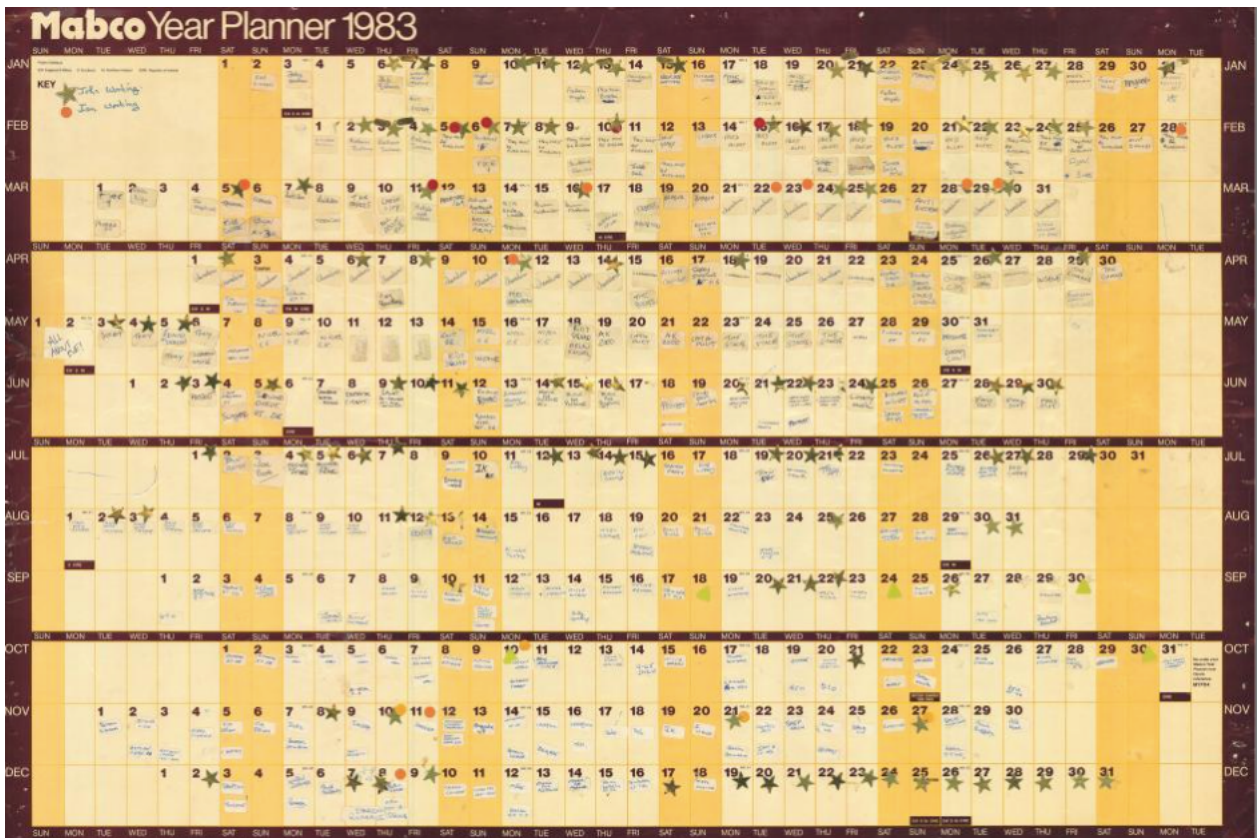- Workhouse

Appendix 2

Cargo Studio Planners
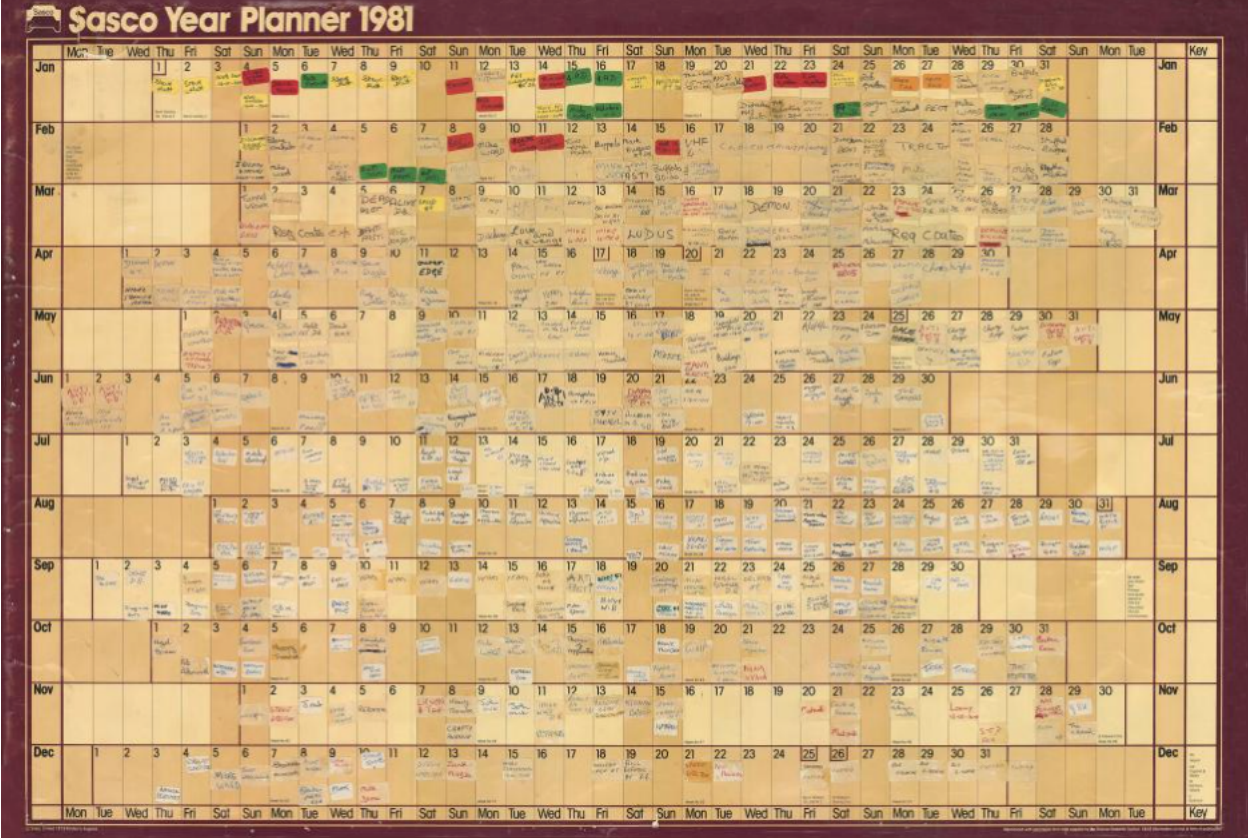
Cargo Studios (2015b). *The Studio Year Planners*
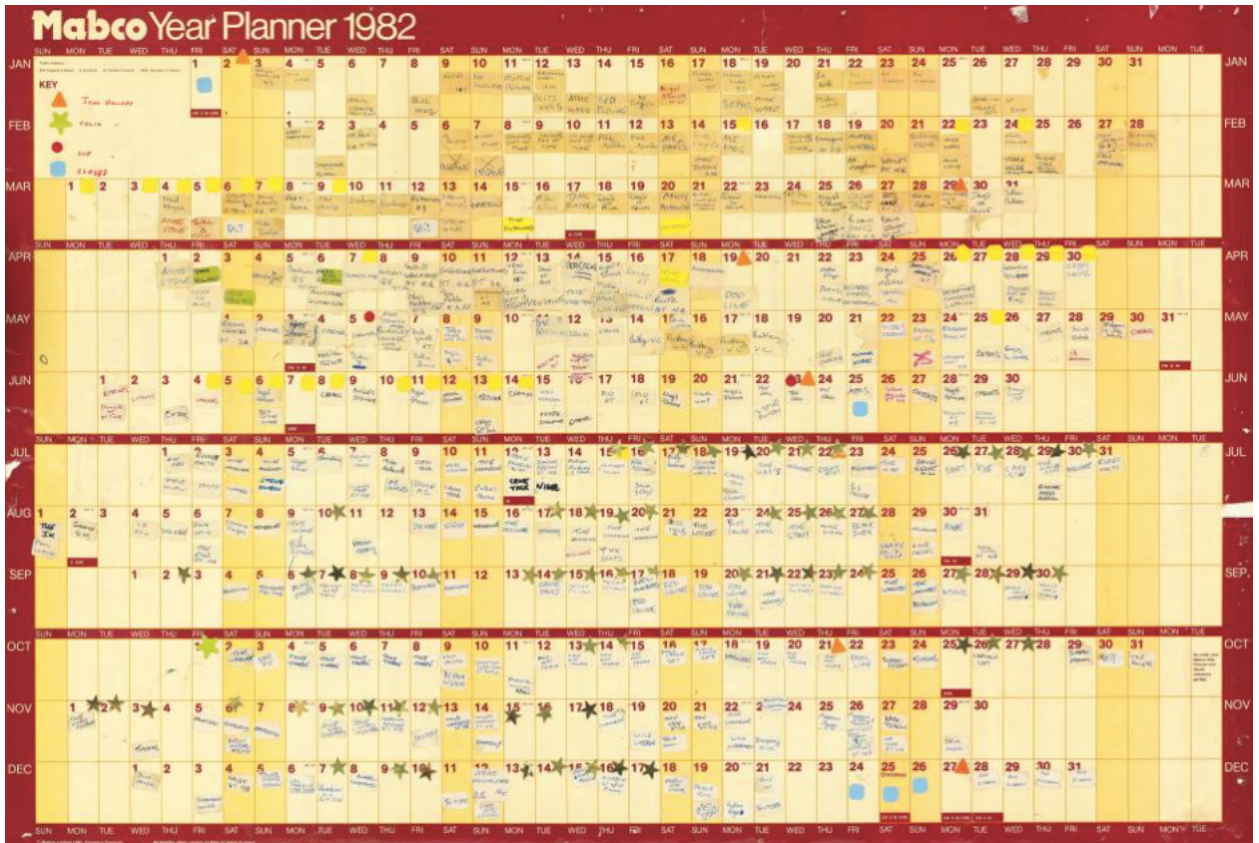
Cargo Studios (2015b). *The Studio Year Planners*

Cargo Studios (2015b). *The Studio Year Planners*

Appendix 3

Interviews

Colin Adshead (technician, manufacturer, Audio Maintenance Ltd, Amek, AMS-Neve) (19/02/13)

George Atkins (engineer, producer, studio owner, 80 HZ Studios) (13/04/11, 01/03/12)

Jonathan Barrett (engineer, Strawberry Studios, Suite 16) (10/04/10)

Zed Bias (musician, producer) (12/06/13)

John Brierley (engineer, producer, studio owner, Cargo Studios) (28/04/15)

Greg Burnell (studio manager, Analogue Baby) (21/02/13)

Mike Cave (mix engineer) (05/04/13)

Tony Cockell (manufacturer, Formula Sound) (18/08/10)

John Ellis (musician, studio owner, Limefield Studio) (18/08/10)

Yvonne Ellis (engineer, producer) (19/08/11)

Neil Fitzpatrick (musician) (27/08/10)

Jimi Goodwin (musician) (14/08/15)

Keith Grant (engineer, Olympic Studios) (17/08/11)

Keith Hopwood (musician, engineer, studio owner, Pluto Studios) (05/08/13)

John Kettle (engineer, producer, studio owner, Jaraf House Studios) (12/04/12)

Martin King (studio owner, Eve Studios) (20/03/12)

Andrew Kingslow (engineer, producer, musician) (14/03/15)

Graham Langley (manufacturer, co-owner, Amek) (03/03/13)

Bill Leader (engineer, producer, Topic Records) (21/02/13)

Tom Leader (engineer, mastering engineer, Angel Studios, Livingston Studios) (26/02/13)

Andy Macpherson (engineer, producer, studio owner, Revolution Studios) (09/04/10)

Graham Massey (musician, producer) (06/04/10)

Julia McLarnon (engineer, producer, studio owner, Analogue Catalogue) (26/08/10)

Bruce Mitchell (musician) (29/04/10)

Chris Nagle (engineer, producer Strawberry Studios) (16/08/11)

Marco Pasquariello (studio manager/engineer, Snap Studios) (25/08/12)

Tosh Ryan (Rabid Records) (19/08/10)

Ian Stewart (engineer, producer, studio owner, Blueprint Studios) (19/04/11)

Mark Thompson (owner of Funky Junk and Snap Studios, ex-producer manager) (17/08/11, 14/08/15)

John Wood (engineer, studio designer, De Lane Lea Studios) (15/04/11)

John Wood (engineer, producer, co-owner, Sound Techniques) (23/02/13)