

DL838 Creative Music Production

Professional Project

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Creating with Constraints

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Abstract

This project is based on three core concepts, the first that any creative endeavour has inherent constraints, the second that creativity is most usually in one of three forms which relate to said constraints, and third the idea that creative problems elicit creative solutions, and therefore results, culminating in the idea that by categorising the inherent constraints present in making music, their understanding can enhance the creative process. To do this a track was made under a 'creative problem' pertaining to each category of constraint and compared and contrasted with a relevant case study to explore their effects in application, and in the real world, and contribute to the proving of the project's founding concept.

Overall, the project was successful in doing so, finding examples of constraints influence in various musical sources, and proving the worth in their application, and the use of their understanding in the musical creative process via the tracks. It contributes to the growing material surrounding constraints and their creative potential, specifically in music, while also suggesting the possibility of further growth.

Intro

The basis of this project starts with the idea of creative constraints; that being how constraints, in whatever form they might take, can be a boon for creativity, enabling the avoidance of things like ‘writer’s block’ or the ‘Blank Page Effect’¹, and also prompting new, unexpected solutions and therefore maximal creativity. As Margaret Boden posits, “far from being the antithesis of creativity, constraints on thinking are what make it possible” (*The Creative Mind*). A lot of the research on the subject of constraints and creativity is regarding constraints like budget or time, and motivation, be it intrinsic or extrinsic and how that applies, but this is not the concept that this project looks at, or at least it is only a small part of the whole. More recently there has been increasing examination of how constraints present themselves, and more specifically within music or other creative endeavours, which has led to the idea for this project. It is founded on three core concepts. One is that any endeavour will have its own inherent set of constraints, which is particularly relevant to music with ideas like how any style or genre can be viewed as an ensemble of constraints, set by norms that the art then conforms to (Meyer). The second is that of Boden, who states that there are three forms of creativity: combinatorial, exploratory and transformative, which involve using the norms or constraints of whatever the endeavour might be to be most creative (*Creativity and Art*). The third, not as core a concept but a key idea that follows is that “what needs to be examined is not only how artists solve problems they are already working on, but how they envisage and then formulate such problems in the first place. For the formulation of a creative problem is the forerunner of a creative solution” (Getzels and Csikszentmihalyi).

It follows then, that by categorising and identifying the different types of constraints one might be presented with during the creation of music, one can be most creative and even develop tools or techniques that can power their creation, with Boden’s concept of creativity types informing how one works with the constraints for the most creative results. Thus, this project aims to explore **"What distinct constraints characterise the making of music, and how can, or does, their use enhance creation?"**.

¹Schwartz, Barry. *The Paradox of Choice*. Harper Collins, 2004.

To do this, after the constraints were categorised, a track was made for each, with a ‘creative problem’ designed for it pertaining to each constraint, in order to explore first-hand the impact of working with, or under them. Then, a relevant case study was chosen for each to examine how the different constraints have applied in real-world cases, with findings combined, applying the use of Boden’s forms of creativity to each, to examine the effect their understanding and use can have (*Creativity and Art*).

Literature Review

To understand both the form that constraints take generally and in music, as well as how musicians may have used them before, intentionally or otherwise, the research of relevant resources as well as the study of specific cases was integral to inform both main aspects of the research question. Due to the bipartite nature of the research question, the literature review will be loosely separated into a section for each. In regards to the first, as mentioned, Hasegawa’s categorisation forms the basis of this project’s, and is also one of few resources which relate to it so closely, so will naturally form an important part of the literature review. The understanding of those that informed his categorisation is also important, however, as well as competing or contributing views on the subject. With the second, there is not so obvious a base, and as will be evident from the first section, multiple fields to research within. Thus, it will consist of Boden’s definitions of creativity and how they have applied to music. Varying resources which showed how the constraints and the types of creativity have been used by artists for creative results, as well as how they might be, will feature throughout in relevant places.

Naturally the first, and arguably most integral resource to the project was Robert Hasegawa’s entry in *The Oxford Handbook of the Creative Process in Music* from 2020. As mentioned, the chapter proposes a fourfold classification of the constraints musicians encounter. For the purposes of this project, however, it was 5, as the first category ‘material’ constraints are divided into two sub-categories, absolute and relative, under which tracks were made and cases examined separately, though without forgetting their similarity. Hasegawa also includes a section on those that appear in collaborative situations, but they will not be included in the project as they are adjacent to the fourfold classification, and the intended categorising of this

project, being that they are constraints that appear under what is another, quite specific constraint, and so are not part of music-making or creative endeavour as a whole.

Hasegawa defines a material constraint as one that limits what is used, like the medium a sculptor uses, or limiting oneself to a specific set of instruments or notes. Absolute material constraints are an exact limit, like only using A, C, G and F when composing, or writing a novel while eschewing the letter ‘e’ like with Georges Perec’s “La Disparition”, while relative material constraints govern the relationship between things, such as the Oulipo’s “apéro constraint”, where, when writing, vowels and consonants must strictly alternate, or only allowing certain intervals, like Elliott Carter’s “Esprit Rude/Esprit Doux”, where the flute may only move by 3, 4, 5, 6, 10 or 11 semitones, and the clarinet 1, 2, 6, 7, 8 and 9. Every letter in the alphabet or note is theoretically still available, but not every combination. Hasegawa mentions how Perec uses the brand name ‘Jaz’ instead of the French word for ‘watch’, which has an ‘e’, a small example of Getzels and Csikszentmihalyi’s creative problems and solutions working, and also how, as the novel was still grammatically correct and had a coherent narrative, there were style/genre constraints at play as well. This is an important point to make, if a little pedantic, as there is rarely only one constraint active in any endeavour.

His next categorisation is ‘formal’ constraints. While similar to material constraint, there is a significant difference in the influence on the content. Where a material constraint allows only certain content that fits the rules, formal constraints govern the ‘box’ that the work is made in, like how long the song would be, or how big the canvas is, but is essentially neutral on content. Thus, Hasegawa describes material constraints as governing the construction of work ‘from the bottom up’, and formal constraints, ‘the top down’. There are more obvious examples like the 23 minutes a side available on 12” vinyl governing song length, but Hasegawa also mentions things like James Tenney’s ‘Postal Pieces’, where he limits the size of the score, as it must fit on a postcard, this produces really interesting results, as he introduces non-traditional notation and other methods to get around the constraint, and though they are each small enough for a postcard some performances are 40 or more minutes long. With a formal constraint, the general layout, length, or concept of something may be governed, but not what’s in it.

Third is style/genre constraints, which is one of the most relevant. As Becker says “Writers are constrained whether or not they acknowledge it —not just by the strictures of poetic forms like the sonnet or the haiku [formal constraints], but also by the conventions of their chosen genre, the format in which they publish, even the grammar and lexicon of their native (or adopted) language” (qtd in Hasegawa). As Meyer suggests, this can mean any artist, and the grammar or lexicon, the norms of any musical style (*Style and Music*). A similar form of constraint is posed by Thor Magnusson in his entry in *The Computer Music Journal*, “Designing Constraints: Composing and Performing with Digital Musical Systems” (2010), known as ‘cultural constraints’. This could refer to a genre or style but also what a given instrument’s intended use is. This lines up excellently with Boden’s notion of creativity, most specifically exploratory, as by exploring the bounds of an instrument’s intended use, one can come up with something genuinely new, and Magnusson gives the example of the table-top guitar, a creation formed from the misuse of a prior one. However, something so significant as that may be argued to be transformative. Potentially such a constraint, or use of one, should have its own category, as it arguably has aspects of all four others, particularly material and style/genre, but is also specific in its own right, in any case, Magnusson provided an excellent contribution with the concept.

Leonard Meyer’s “Style and Music: Theory, History, and Ideology” (1996), where the aforementioned concepts attributed to him come from, was naturally another important resource, especially to this category of constraint, as in it he describes, how musicians learn the constraints of style almost automatic, and subconsciously, due to things like such norms having been come to because they work, and therefore such learning is natural. It, and he, are mentioned by Hasegawa several times but further investigation proved essential to furthering the understanding of the constraint, and how it manifests and comes to be.

The last is process constraints, which “constrain how it is that the work is done” (Rosso qtd in Hasegawa). To an even greater degree than formal, the resulting content of work made under such a constraint may have no recognisable evidence of the constraint whatsoever, though its influence may have been substantial. Examples of this include Dogme 95’s Manifesto and “Vow of Chastity” (Vinterberg and Vontrier, 1995), where, in reaction to the ever-slickening big-budget films of the time, they constrained their process in ways like using only diegetic music, or only a handheld camera. As a resource, it is an excellent source of inspiration for

process art and ways to be creative under process constraints. Other examples include limiting revisions or more traditional time or budget constraints.

There is a second category of examples here, however, that is different enough almost to warrant a sub-section of their own. That is those not made under a process constraint but in a sense made *by* one, where one sets things up a process, and lets it carry it out, committing to the result, with no editing past the starting point, the difference being the process governs the result much more strongly. While not an inherent constraint to be recognised, it is still worthy of examination for its creative potential alone, as it of course most creative of a problem and therefore may exact a most creative outcome (Getzels and Csikszentmihalyi). Examples of this are things like the work of Steve Reich or John Cage and generative music like Mozart's musical dice game.

It doesn't necessarily mean they are entirely random, but often almost unreproducible, as with another vital resource of this project, for inspiration and its creative use of constraints, as well as forming part of the case study for 'process constraints': John Cage's "Imaginary Landscape 4" (1951), where he uses 12 radios and 24 performers, one dialling in the frequency and the other the tone and volume. The result is that things like the time of day or year, geographical location, current affairs and more could all change the result each time. It is worth mentioning though that like some of his other work the arrangement, as it is notated on a score with traditional notation, was decided randomly, in this case with a coin toss, but once that was decided the score was fixed, meaning the result is always indeterminate, but not completely random (López).

To summarise these categories differences as succinctly as possible, a material constraint would be a sculptor using wood, a formal constraint, the amount of wood he is allowed to use, a style/genre constraint, what he might be expected to sculpt, and a process constraint, the tool he uses to do it. Naturally, an element of all of these is likely present in any given endeavour. Still, the project aimed to find out the potential of the recognition of what they are and the ability to combine, explore or transform with, or within them. Hasegawa's definitions are persuasive, and sufficiently non-competing as to be easily understood and applied, and warrant it's following for this project. Though there is some overlap, there likely will always be as interpretation varies and instances with multiple considerations appear. As mentioned at

times so far, and to come, there are certain potential modifications but overall, though it is the first resource to attempt such a complete classification of constraints in music, it is impressively complete, comprehensive and clear, and provided an excellent base for this project.

Once the classification was understood, and the relevant constraints recognised, the next step was to understand how interacting with them can inform creativity. The understanding of the forms of creativity and how they may have been used with constraints in music was therefore another integral part of the project. The key resource for this was Boden's aforementioned "Creativity and Art: Three Roads to Surprise", and the three forms of creativity it defines. The first is combinatorial creativity. This involves the recombining of existing ideas, concepts, or elements in new and original ways, or taking existing knowledge, breaking it down into parts, and reassembling them to generate new and innovative combinations. This means it doesn't necessarily produce something entirely new but rather creates new connections or variations by reorganising existing elements. In musical terms, sampling could be considered combinatorial creativity, as people take parts of already existing music and change and recombine them to come up with something new. Sampling and interpolation are a huge part of music, especially in today's increasingly nostalgia-driven musical landscape, so the concept of combinatorial creativity is especially relevant, to music in this project, and music in general.

The second is exploratory creativity. It refers to the process of exploring and discovering new territories, ideas, or possibilities within a particular domain, or in this case constraint, curiosity-driven investigation, experimentation, and the pursuit of uncharted avenues. Exploratory creativity involves venturing into the unknown, often without a specific goal in mind, and embracing the process of discovery and learning through exploration. As mentioned this links into cultural or style/genre constraints well, as in music it is most often the constraints set by the norms of the genre the musicians play with, or the expected use of their instruments and tools that they explore and expand to get the most creative results. The Beatles are the perfect example of this in music, as they experimented heavily with instrumentation, production, musical styles and recording techniques, pushing the conventions of what pop music could be at the time (Turner). So significant was the Beatles' exploration and expansion though, it could be argued that it was more than exploratory and,

as it caused such big, and lasting changes in music, particularly popular music, it is therefore really transformative creativity.

This is because transformative creativity requires going a little beyond the other two, as it involves making substantial and fundamental changes to existing ideas, concepts, or paradigms. It goes beyond mere recombination or exploration and involves a radical shift or transformation that alters the way we perceive or understand something. Transformational creativity should lead to significant breakthroughs and paradigm shifts, introducing new ways of thinking or approaching a problem.

“Beatles ‘66” by Steve Turner (2016), formed another resource for the project, as so creative were the Beatles, and varying the constraints, with quite high-level time constraints, constraints presented by the limited equipment of the time and others apart from that of their genre being present, it provides inspiration for and information on both main aspects of the project, in many different ways, with its level of detail proving particularly helpful as well. In comparison to Hasegawa, Boden’s definitions are as persuasive and even more inarguable, likely why they have become so well acknowledged. While additional forms or changes have been suggested (Solomon), hers stand as the most complete and apply perfectly to the purposes of this project, without noticeable fault. Overall, these varying literatures provided excellent resources for the understanding and inspiration that was required for this project's success.

Methodology

The aim of the project was to examine how understanding the inherent constraints that appear when making music can be utilised to achieve increased creativity, or more creative outcomes during the process.

It is clear from the literature reviewed in the previous section, that occasionally great creativity can occur due to constraints musicians were working under at the time, but the hope with this methodology was that by approaching each constraint directly and imposing relevant ‘creative problems’ on the making of music, it could be seen how they elicit ‘creative solutions’, and develop techniques that would carry onto future unconstrained creation.

Alongside this, were more in-depth case studies, relevant to each constraint and corresponding ‘creative problem’, in order to see in more detail how particular creative works were impacted by their constraints, and how that relates to each problem's ‘creative outcomes’, and inform the understanding of their impact further.

There were five main stages undertaken to do this:

- Categorisation of constraints, as explored in the literature review.
- Construction of a ‘Creative Problem’ for each track, pertaining to each constraint.
- The making of said tracks.
- The selection and research of a relevant case study for each.
- The analysis, comparison, and contrasting of the findings from the case study and the making of the tracks, as found in the analysis section of this thesis.

The categorisation of the constraints was settled in January, deciding to stay with Hasegawa's definitions, as they offer the most concise differentiation between each of them, though as mentioned there is rarely ever just one constraint at play at a time. Next, the construction of the creative problems commenced, and following this, the making of the tracks. Due to the differing natures of the constraints applied, and therefore the ‘creative solutions’, no one approach or method was used during the making of the tracks. However, Ableton was the

DAW employed for all of them, with some tracks being made entirely within it, like ‘Style/Genre’, others composed in MuseScore like ‘Formal’ or without software at all as with ‘Process’, and then finished in Ableton for the sound. Similarly, technical aspects like the mix and master quality of the tracks had differing levels of importance, for instance, the formal constraint’s ‘creative problem’ is foremost a compositional challenge, while with the style/genre constraint, the sound is inherently important. In any case, efforts were made to ensure the sound of everything was to a high standard, and thus such skills were still applied.

After completion of the tracks, and conduction of the case studies, each constraint, with the corresponding track and case study, was examined under these two main headings:

- **Identification of Constraint** - Description of the ‘Creative Problem’ constructed for each, the case studied and how the constraint applies to them.
- **Analysis of Solution** - How the constraint was worked with, around or otherwise, during the project and in the case, and the impact that had.

These will follow in the analysis section of this thesis, and combine to provide insight into the research question.

Analysis

Material Constraint

Absolute Material Constraint

The first constraint to be explored is ‘Absolute Material’, referenced by Hasegawa as the ‘must include x’ constraint or that which forbids or compels the use of something,

Identification of Constraint

The case studied for this constraint was that of the artist J Dilla, with a specific focus on his albums ‘Donuts’ and ‘The Shining’. J Dilla is famous for ‘humanising’ his AKAI MPC3000 sampler², with things like his time-feel, extremely delicate and precise chops and his

² Vox. “How J Dilla Humanized His MPC3000.” *YouTube*, YouTube, 6 Dec. 2017, www.youtube.com/watch?v=SENzTt3ftiU.

embracing and use of the limitations of the machine leading to some of the most well-regarded music in the history of hip-hop. This naturally falls under the category of Absolute Material Constraint, as his tracks were largely made solely using the MPC, with many aspects of the music and his creativity being linked to its use or ‘misuse’.

The creative problem constructed for this was to create a track using only sounds from the Korg Volca Beats drum machine. There are natural parallels with J Dilla of course, but it was also decided upon as it offers a contrasting element to most of the other constraints, being that it is a physical, tactile constraint, rather than a compositional, stylistic or theoretical one.

Analysis of Solution

In his book ‘Dilla Time: The Life and Afterlife of J Dilla’, Dan Charnas explains how for the most part, the pulse, or rhythm of popular music for the last hundred years had either been straight or swung, but largely one or the other, until the invention of what he calls ‘Dilla Time’. While this feel has been largely attributed to his eschewing the use of the quantisation features of the MPC3000, it is almost the exact opposite that is true, as Charnas explains:

“If the “J Dilla feel” could be achieved simply by turning off timing correct, it stands to reason that another producer might have arrived at that feel long before James Yancey”, and that “the sheer regularity with which elements like the rushed snare appear is not the result of error or reflex. It is the unmistakable product of his particular use -or misuse, if you prefer - of the MPC.”

‘Dilla Time’, is in fact the combination of straight and swung time, with elements carefully displaced using a form of quantisation via the MPC’s ‘Shift Time’ feature. Audible on tracks like ‘E=MC²’ from ‘The Shining’, it shows how Dilla used the constraint of the MPC3000 to create something new, by subverting a feature used to aid in perfect quantisation, to create exquisite decoherence.

For the track, a central aspect of the constraint was that the Volca Beats is a drum machine, and therefore seemingly lacking in melodic possibilities. During the creation of the track though, similar examples of ‘misuse’, like using the tom sounds, and even noise from the machine to create melodic elements were found to get around this, leading to sounds and

textures that would not have been ordinarily come upon if the usual wealth of instruments and sounds were available.

Dilla's music is an example of 'exploratory creativity' as defined by Boden. He explored the bounds of both what the MPC3000 could do, and what hip-hop and even music could sound like, using the constraints of the MPC3000 to achieve creative results. The same is true to a degree with the piece, with the similar 'misuse' mentioned constituting exploratory creativity as well. Such was the success of Dilla's exploratory creativity it can easily be called transformative, as he changed both hip-hop and music with his 'Dilla Time'. So significant was its impact that he changed physical drumming with his programmed drums, something truly unusual. Questlove of the Roots cited him as his greatest influence³, with evidence of this on albums like D'Angelo's 'Voodoo' on which he played drums and employed elements of 'Dilla Time', like the snare hitting slightly early. 'Donuts' now sits at number 366 on Rolling Stone's Top 500 Albums of All Time list, a testament to the lasting impact of the music made on that MPC. To attribute his extreme creativity to the constraint would of course be foolish, but there is evidence of the constraint having an impact.

When it comes to the piece it is clear that the constraint elicited the discovery of new textures and sounds that wouldn't have been usually appeared, and techniques to create them.

Relative Material Constraint

Unlike absolute material constraints, relative material constraints don't govern the use of anything completely but only the relationship elements have with each other, regularly allowing the use of any note, letter or the like, but only in circumstances allowed by it. Relative material constraints are everywhere in music, such as chord function, and even the keys and 12-tone chromatic scale with which most Western music is made are examples, as they govern the relationship between notes and chords to maintain our concept of harmony.

³"500 Greatest Songs of All Time." *Rolling Stone*, Rolling Stone, 18 July 2023, www.rollingstone.com/music/music-lists/500-greatest-songs-of-all-time-151127/the-beatles-hey-jude-32958/.

Identification of Constraint

As ubiquitous as they are, relative material constraints are often not as noticeable as other types, save for more extreme examples like those mentioned in the literature review. However, those times where their impact is significant but not so noticeable are often when they have the biggest impact. Thus, the case study for this was ‘modal interchange in pop music’, specifically that of the Beatles. While also something of a case of style/genre or Magnusson’s ‘cultural’ constraint, being that it’s pop music, the initial keys and expected harmony of music like the Beatles’ constitutes relative material constraints at play, the subverting, exploring and expanding of which through things like modal interchange often leads to the best results, like on songs like ‘Eleanor Rigby’ and ‘Norwegian Wood’.

The ‘creative problem’ constructed for this was similar: to explore relative constraints via modal interchange and rotation, and write a piece that plays with and cycles through modes smoothly and without attracting attention, in an effort to be ‘not so noticeable’ but ‘have the biggest impact’.

Analysis of Solution

With the Beatles, it is likely, bordering on certain that they had no idea that they were doing it. Paul McCartney has stated multiple times that neither he nor any of the Beatles could read music⁴, making it extremely unlikely that they were carefully placing such harmonic techniques into their songs, but the prevalence of things like modal interchange in some of their most popular music still makes a case for how the exploring of the bounds of the relative constraints of a pop songs harmony can yield significant results. The 8th best song of all time according to Rolling Stone⁵, ‘Hey Jude’ is an example of this, with its famous ‘Nah Nah Nah’ outro more closely resembling F Mixolydian than Bb Major, as though the main melody sticks to notes in the major scale, the chords recontextualise it, with the progression resolving on the F chord, belying its modal properties (Bennett). As well as the prevalent use of modes, mainly Mixolydian all over ‘Revolver’, specifically on songs like ‘Within You Without You’, and ‘Tomorrow Never Knows’, another Beatles classic in ‘Eleanor Rigby’ shows another example. Similarly to ‘Hey Jude’, on ‘Eleanor Rigby’, one element remains in

⁴ Wallis, Adam. “Paul McCartney Admits He and the Beatles Can’t Read or Write Music - National.” *Global News*, Global News, 1 Oct. 2018, globalnews.ca/news/4503916/paul-mccartney-cant-read-music/.

⁵ “500 Greatest Songs of All Time.” *Rolling Stone*, Rolling Stone, 18 July 2023, www.rollingstone.com/music/music-lists/500-greatest-songs-of-all-time-151127/the-beatles-hey-jude-32958/.

a traditional key, in this case, the chords, which stay in E Minor/Aeolian, while the use of the sharp 6, C# in the vocal melody introduce Dorian. It seems likely that it is the subtle use of modes in this way that kept the music palatable to the average listener while introducing that little bit of intrigue that made the songs so successful, so a similar method was also used in the piece, having certain elements like the piano hold a natural key, while others like the clarinet induce other modes, and vice versa.

It is not quite so seismic of a ‘solution’ in comparison to those prompted by other constraints, but constitutes a valuable alternate view, of how careful subtle application of the understanding of your constraints can too elicit creative and successful results, as seen with the Beatles’ music and in the piece. This approach was surely successful for them, as ‘Revolver’ is considered one of the 25 most influential albums of all time (O’Gorman), and as it employs some of the most liberal use of techniques like that at least some success can be attributed to their creative work with relative constraints.

Formal Constraint

Hasegawa defines formal constraints as those which govern content from the ‘top down’, meaning that its influence on the content within is effectively neutral, but draws a particular ‘box’ in which it must live.

Identification of Constraint

The case studied for this constraint was that of Brian Eno, specifically his album ‘Ambient 1: Music for Airports’. While not as concrete or definitive in its constraint as the previous two, by setting out to make music for a place, and for it to be as ‘ignorable as it is interesting’⁶, he is governed by formal constraints, as the content of it may be anything as long as it is that. Contrary to what you might think, it is not quite style/genre constraint, as such constraints may be “freely *chosen*, in the sense that it is up to the artist whether to submit to the laws of the genre,” but “are not *invented* by the artist” (Elster qtd. in Hasegawa), as they are here.

The ‘creative problem’ constructed for this, was to compose a piece for 5 instruments, in this case, clarinet, drum kit, contrabass, piano, and viola, where each element has different measure lengths. For ease of composition and legibility, the piece is in 2/4, with the elements

⁶Eno, Brian, Liner notes. *Ambient 1: Music for Airports*. Polydor, 1978. LP.

‘looping’ every 3, 4, 5, and 6 measures throughout the piece. This applies to the constraint as there were no rhythmic, melodic or textural elements excluded totally or relatively, as in the previous two constraints, with the challenge being to have the elements go in and out of ‘phase’ with each other and still sound coherent.

Analysis of Solution

It is clear that the goal, and therefore the formal constraint, shaped the sound and outcome of ‘Music for Airports’ considerably, through his application of minimalism and slow shifting of elements intended to induce a state of calm and blend into the bustle of an airport. Techniques or ‘solutions’ to the problem like his use of differing lengths of tape loops, and careful selection of sounds to be as non-abrasive as possible were applied to this end on tracks like ‘1/1’ and ‘2/1’, allowing elements to go in and out of step with each other, while never being too dissonant or attractive dynamically to disrupt the tranquil state created for the listener.

In the track made under this constraints ‘creative problem’, a similar, but not identical challenge arose as mentioned, where to ensure a coherent piece, elements had to be almost modular, being that any one measure of each would have to be able to sound alongside most any other, as they go in and out of step with each other. This enacted creative solutions rhythmically and melodically, such as in the consistent drum part throughout the track, with its syncopated kicks being placed in such a way to effectively emphasise the contrabass and clarinet parts, even as their pulses moved through the measures.

Eno’s work on ‘Music for Airports’ is another example of exploratory creativity, as he thoroughly explores what falls within his formal constraint to create it, and even before that explores the traditional notions of music with the concept. The track engages in exploratory creativity too to a lesser extent, by experimenting with rhythmic patterns and the like under the constraint to find solutions. ‘Music for Airports’ qualifies as transformative creativity as well, as it moved the boundaries of what music was supposed to be for, with its concept and it's not being intended to necessarily be interesting, and what it could be with its innovation and contribution to the ambient genre.

Style/Genre Constraint

Style/Genre constraints are the rules and norms that build up over time from continuous contributions from various sources, or as Hasegawa says “evolving cultural agglomerations with no single author or creator.” Unlike other constraints they are not necessarily one themselves, but more like a specific combination of material, formal, and other constraints that are consented to under the name of ‘rock’, or ‘hip-hop’.

Identification of Constraint

The creative problem constructed for this was to combine two different styles to make a track, using elements of one within the style/genre constraints of the other, in this case, shoegaze and electronic music. The challenge of the constraint was to work with the ‘norms’ or genre constraints of shoegaze music while integrating those of a reasonably disparate genre in electronic music to create a coherent track.

The case study chosen for this was Radiohead, specifically their album ‘Kid A’. This case was selected as it saw the band depart from their more traditional rock sound after their critically acclaimed album ‘O.K Computer,’ and play with the style/genre constraints of their previous work.

Analysis of Solution

‘Kid A’ is famed for Radiohead’s experimentation and embracing of jazz, electronic, and ambient music elements, like the minimalistic electronic instrumentation and reversed vocals, dissonant chords and atmosphere on ‘Everything in Its Right Place’, non-traditional song structures, like on the title track, ‘Treefingers’ and ‘Motion Picture,’ and innovative instrumentation like the brass and strings juxtaposed with distorted guitars and electronics on ‘The National Anthem’. All of these, and most of the album, are influenced by Radiohead’s relationship with the style/genre constraints they’d made for themselves with their previous work and their desire to experiment within and without it.

For the style/genre piece, elements like the slow building structure, washed-out guitars, atmosphere and effects of shoegaze were combined with the skippy, pulsating drums and synthesisers of electronic music, particularly inspired by artists like Burial and Four Tet, working with elements of both, and using and subverting each one’s style/genre constraints to

create something new. Careful consideration was required to blend the two, retaining enough of both to be recognisable while maintaining coherence, by using the typical pillars of shoegaze music mentioned, to create a bed for the electronic elements to go on top of, creating similar lush soundscapes to those heard on the music of the likes of Burial from a different stylistic source.

‘Kid A’ is an example of all 3 of Boden’s forms of creativity in many ways, but chiefly combinatorial, as though it shows great exploratory creativity as they experimented and pushed the boundaries of their sound, it is a perfect example of combinatorial creativity as they combined elements of existing things into one cohesive product that transcended their style/genre constraints, as well as traditional style/genre constraints as a whole. Such was their success in doing it; it also constitutes transformative creativity, as they changed the conventions of their genre and others, and influenced countless subsequent works. ‘Kid A’ went No.1 in the UK and US, and though it was met with some division⁷, has since been hailed by many as one of the best albums ever⁸, and in no small part for their subversion of style/genre and cultural constraints, which stands a testament to their success in doing so. Combinatorial creativity is also visible within the track made for this constraint, as existing elements of shoegaze and electronic music were combined to create something new.

Process Constraint

Process constraints do not govern the not the content of the endeavour, similar to format constraints, but differ in that they govern *how* the content is created, but not the ‘box’ that it is to live within as they do. Often this means a different relationship for the artist with the constraint than with the other types, as the constraint doesn’t *influence* how the endeavour is carried out, it *is* how the endeavour is carried out.

Identification of Constraint

For the ‘creative problem’, inspiration was taken from music like John Cage’s ‘Imaginary Landscape No.4’, and the concept of abandoning the ‘composer’s prerogative to choose specific sounds, accepting instead the results of chance’ (Hasegawa). The ‘creative problem’

⁷ “Radiohead’s Kid A: Still Not Much Cop.” *The Guardian*, Guardian News and Media, 11 Oct. 2010, www.theguardian.com/music/musicblog/2010/oct/11/radiohead-kid-a-10-years.

⁸ Schewitz, Brett. “#20 Radiohead, ‘Kid a’ (2000).” *Rolling Stone 500 Greatest Albums Of All Time*, Rolling Stone 500 Greatest Albums Of All Time, 22 June 2021, www.rs500albums.com/50-1/20.

was to score a piece for a non-specific loop, with multiple instances of it played back at different speeds, with the composition only governing when to start or stop, the volume and how much faster or slower to play it, with the sound itself to be filled in by any prospective reader and performer, therefore having the inputting of said loop make the piece, or having the process make the art.

John Cage's work was a natural case study for this piece, with his embracing of chance operations and aleatoric elements in pieces like 'Indeterminacy' falling perfectly under the umbrella of process constraints, as he set up frameworks to generate the music and accepted the results.

Analysis of Solution

As mentioned in the introduction to this section, process constraints relate differently to the composer than the others, as it is often their design that is the creative solution, rather than the constraint being the problem to be 'solved.' Still, it is clear that working with process constraints like in Cage's work can encourage creative solutions, as one must come up with ways to mould the piece with the process before it happens, knowing it will not be edited. In "Imaginary Landscape 4", Cage guides the piece by strategically placing the radios within the space to create depth and scoring things like volume and frequency to creatively guide the piece while still leaving its result to the process. In "Indeterminacy", he embraces live performers, giving them only where to start and where to finish but not what to do in between, again exerting his control creatively on the structure but not the result. These examples exemplify the relationship between artist and constraint in this type of process constraint.

In the track the challenge is the same, to create a 'tapestry' of dynamics via playback speeds, volume and starting and stopping, in the knowledge that the loop used could be anything. Careful consideration was required then to choose playback speeds which should inherently work together, as for instance double the speed is an octave higher and placed dynamics to try to ensure the piece stays interesting as the input changes. For this reason, the 5 speeds chosen were:

- 100%/ Original Speed
- 200%/ +12 Semitones/ +1 Octave
- 50%/ -12 Semitones/ -1 Octave
- 58%/ Roughly -5 Semitones/ -1 4th
- 158%/ Roughly +7 Semitones/ +1 5th

John Cage's work exemplifies intense exploratory creativity, as with the author relinquishing control of a substantial element of the result he explores the bounds of what a piece of music can be and how it can be made. Works of his like those mentioned and more famously '4'33'" changed the meaning of what music and composition could be, exemplifying transformative creativity.

Overall, it is clear that constraints have prompted some great creative outlay, or at least contributed to it, with the case studies providing excellent examples of and context for this. As mentioned with some, attributing these geniuses' success to the constraints would be a leap but each shows in different ways how they can surely have an impact, and the solutions that they prompt, and the techniques used to do so, can be effective tools to apply to one's own work, as seen in the pieces. Thus, the case studies constitute a successful element of the method as they 'realised' the concepts suggested by Hasegawa and Boden, to aid in their real-world application.

Discussion

The varying sources prove to show the success of the use of inherent constraints in differing levels of application, from the subtle workings of the Beatles' use of modes, to the more total embracing of them with the likes of John Cage and Brian Eno. In any case, while total application, as with the 'creative problems' may not be the best way to go about it, they served to target each one separately, and still surely point towards the validity of the use of understanding inherent constraints, as a creative tool in future, less constrained situations.

The case studies form likely the most persuasive part of the project, as though many aspects of the pieces serve to help prove the theories suggested, and the findings largely align with what was expected, there is a natural bias issue in that the author of the project was the one to create and report them. To that end, a 3rd, third-party element to the methodology would have

helped round out and solidify the theories and conclusions posited. Additionally, as constraints rarely appear on their own, appraising each one directly as done with the pieces does reduce real-world application to a degree, but still serves as a valuable starting point, and the comparison with the case studies helps to add context.

Through the making of the pieces and studying of the literature and cases, concepts, techniques and viewpoints were learned that will surely carry to future endeavours, by enhancing the creative process through the use of learned techniques as well as the different ways to approach music-making taught and inspired by the cases and literature reviewed.

Conclusion

The project was successful in proving or at least contributing to the proving of the theory suggested at its outset and the research question. The case studies and literature reviewed show examples of creativity being influenced and boosted by constraints and the work on the pieces helps to prove the success in their understanding, recognition and purposeful application. While there are certain failings or improvements that could've been implemented, the method still serves to back the theories that form the foundation of the project and provide an answer to the research question, that being that understanding inherent constraints can certainly help power the creative process.

As implied, more research would help to examine and prove more real-world applications in approaching each one less singularly, and also by including a bigger sample size of participants and third parties. Additionally, work could be done to further investigate and add a 3rd dimension, by examining the level of constraint and how differences in things like stringency, and how much one focuses on it could change the outcome, rather than simply whether their understanding and use can be a boon in a binary sense. It also seems clear that Boden's trifold theory of creativity proves true to music, most applicably combinatorial and exploratory creativity, with many seminal works like those mentioned in this thesis consisting of extreme cases of the two, and while this project points to this, further research could be done to explore how its application purposely or otherwise can glean results. At this point, the volume of research in this area related to music is still relatively low compared to other areas, so any further research would prove useful to continue to grow understanding of constraints and their creative potential in music.

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