# Let's Just See What Happens: A Qualitative Case Study of Risk and Uncertainty in the Creative Process

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The nature of the study reported here means that the qualitative data cannot be easily anonymised and so they are only available from the first author upon reasonable request.

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ABSTRACT: Research in creativity often measures creative potential: the number of ideas which can be generated, or the way a novel thought appears in the mind of the thinker. There is much less emphasis on creativity as the realisation of this potential. This paper uses focused cognitive ethnography to explore how creativity is manifest in a complex environment. We report four main findings: that creativity involves a form of "knowing through doing", that creativity requires risk on different levels, that an embodied material sensitivity is required to make ideas appear in the world and that the form of the creative product is often unstable. We end with some reflections on the importance of detailed microgenetic work to expand our understanding of the embodied and responsive skills which are necessary for creativity.

The tracking of the moment of the genesis of a new idea is something which Dennett (2014, p. 13) describes as a "gold rush" area. The moment of creativity is both attractive and elusive. The evidence we present here demonstrates that this moment of a new idea is not *necessarily* located in a mental plan but could rather be discovered and constructed through the interaction between creator, tool and material in a way which is less often considered in psychological studies of creativity (although more common in anthropological research such as Malafouris & Koukouti [ 2022]) . We track the work of a bowl turner and his habitual actions and interactions. The turner in question was in a period of moving from small c creativity to Pro C creativity and the work here represents stage on his journey allowing us to document both professional creative practice and every day creative discovery and learning blending "little-c" and Pro C behaviours (Kaufman & Beghetto, 2009).

Two forms of novelty are discussed: First, a novel product is created and second, the data here track a novel way of working with wood which occurred to the maker over the course of making. This gives an unexpected and unique opportunity to witness the birth of a new creative process and allows a highly granular and ecologically valid assessment of this moment. We draw on evidence from the close observational work to demonstrate that creativity should be measured not only by the skills required to generate novelty *inside* the head – new ideas - but also to conjure novelty outside the head in coordination with material.

This argument is driven by a need to recentre the ideas of risk, uncertainty and lack of full artistic agency that marks creative process. While ideation can be purely internal,the

manifestation of creativity always occurs in a context and often that context is a material one. Working with the sometimes recalcitrant material generates uncertainty and a form of creative unknowing (Glăveanu et al., 2013; Ross, 2022) and therefore requires embodied skill and sensitivity (March, 2019) which are not always tracked when creativity is reduced to a single moment of insight or a set of psychometric properties. Indeed, Bardt (2019, p. 186) suggests that this indeterminacy is what distinguishes creativity from production:

> Creativity needs to proceed with some kind of resistance to or derailing of intent, presumptions and preconceptions. In short, creativity must undo that which is known. After all, to be creative is to bring something new into being, not propagate what is already known.

Uncertainty is key to the creative process precisely because to be creative requires dealing with that which is not already known (Beghetto, 2020; Glăveanu & Beghetto, 2020). Material collaboration introduces a level of uncertainty that requires further investigation.

**The Workmanship of Risk**

When Pye (1968) coined the phrase “the workmanship of risk”, he did so as a way of differentiating between the work that comes off a production line and the work done in a craftsperson’s workshop. For Pye, the phrase “workmanship of risk” means that at any moment, whether through inattention or inexperience, or accident, the workman runs the risk of ruining his work whereas the “workmanship of certainty” stands in contrast to this. Key to the distinction between the two is the question: “Is the result predetermined and unalterable once production begins?” (Pye, 1968, p. 22). If the answer is yes, then the work is not that of the workmanship of risk. This question reveals the requirement to embrace uncertainty which runs through the workmanship of risk. This distinction is again becoming salient as a number of creative processes are automated through artificial intelligence.

On the surface, Pye places the risk firmly on the shoulders of the craftsman and puts an emphasis on their skill but later writers have considered it to be more relational. Schwalbe (2010, p.107) writes about wood turning that:

> There is also the risk of investing hours in turning a piece only to discover rot and cracking that can't be worked around. There is the risk of misorienting the raw wood and failing to make the best use of a grain pattern that is revealed only as a piece is cut. There is the risk of severe

> cracking during the months it takes a roughed-out piece to dry prior to final turning and finishing. Skill reduces these risks but can't eliminate them.

A similar point is made by Baber et al. (2014) who go on to emphasise the lack of determinacy in this form of materially engaged workmanship much like the discussion on uncertainty discussed above. In this sort of work, the outcome is not guaranteed and the sketchy plan that may be present in the mind of the craftsperson (in this case a jewellery maker) is one "which crystalizes through the developing interaction between craftworker, tools, and materials being worked" (p.6).

Thus, it is these moments of uncertainty and risk that creativity emerges from engagement with material that marks creative engagement. This creative uncertainty clearly echoes the understanding of the workmanship of risk outlined by Pye and it has even been argued (Glăveanu & Beghetto, 2020; Sennett, 2009) that the management of uncertainty and unpredictable moments can reveal creativity more clearly than the final product .

Navigating these moments requires different attributes than those often addressed in current psychological research. Material skill and knowledge is employed to reduce the risk and uncertainty[1]. For example, in the domain of woodcraft, kiln dried timber, which has had its materiality stabilised by the controlled reduction of moisture content in the grain, increases certainty in the working of the material..This control of the material is also supported by the use of certain tools; ban saws further reduce risk by cutting grain at a predictable and consistent rate in any direction. The combination of artificially seasoned materiality with the industrial precision of a ban saw counter the negotiable interaction between, say, green wood (that which is not dried and still high in moisture), a chainsaw and an axe. The work we present here demonstrates research in the skills required for creativity must encompass embodied and tacit knowledge.

## The Need for Qualitative Observation in Creativity Studies

In an overview of empirical research studies in creativity, Long (2014) suggests that only 13% of all the published papers in creativity involved qualitative work and it is unclear how many of those involved observations. Katz-Buonincontro and Anderson (2020) conducted a review of observation studies in research on creativity in education and found 37 studies from almost a forty-year span (1980 -2018). As they conclude there are few

[1] Artistic creativity often embraces and encourages risk but as we shall see this is different for the craftsperson

qualitative studies and even fewer observation studies yet existing studies "do not account for the creative process, which is to say how individuals produce and develop ideas leading up to creative solutions or products." (Katz-Buonincontro & Anderson, 2020, p. 508).

This paper discusses creativity from a process perspective however process is not seen as the internal cognitive mechanisms which generate an novel idea as originally theorised by Rhodes in his 4P model (1961), rather process here is the manner in which this idea, this abstract thought is made real, and in turn how reality leads to abstract thoughts in a co-constructive relations: the manner in which something is created and creativity turns from an abstracted concept into an action. The observation here aims to unpick the relationship between the person, the creative material and the tools that he uses to work with the material. It comes from the theoretical perspective that creativity is necessarily an unfolding, heteroscalar process that emerges from the relationship between the maker, the tools and the material. Such a position *requires* the use of detailed ethnographic techniques to generate a full picture of the underlying dynamic interaction (Malafouris & Koukouti, 2022). The themes distilled from this form of work can then be tested in wider populations. This form of research does not aim to replace but rather complement laboratory-based studies.

**Methodology**

In this paper we present a focused cognitive ethnography of the process of making a wooden bowl. Cognitive ethnography is a field-based approach to understanding cognition as it arises in situated action, often with a focus on artifacts and the role they play in social cognition (see for example Alač, 2011; Hutchins, 1995). The work here constitutes a form of focused ethnography (Knoblauch, 2005). This form of research replaces the temporally extensive data collection in traditional ethnography with a more time intensive form and the researcher is positioned as observer rather than participant, so the subjective nature of the reporting is dampened. The focus shifts to singular events which are recorded with video cameras (Knoblauch et al., 2013). The participants are invited to view the subsequent recordings alongside the research team, just as the environment is selected strategically to focus on the research question, so the participants are also strategically selected as experts in the subject (Bikker et al., 2017). The work also follows the advice from Katz-Buonincontro and Anderson (2020) to focus on discrete moments of creativity. The data are not laced with the same level of reflexivity as traditional ethnographies (Ball & Ormerod, 2017) but equally,

the videos are not analysed with a standardised coding frame but rather through an interpretative lens.

Additionally, we report evidence from a single case study. Case studies are rare in creativity research (although see Hanson & Glăveanu, 2020). The work presented here challenges some of the established scientific practice which requires both replicability and the possibility to predict events (Cummins, 2000; Neves-Pereira, 2019) by drawing some inferences from a single case. Predictive causality is hard to infer from single cases however, this does not mean the descriptions outlined here are either non-scientific nor non-informative. We follow Sutton (2010) in suggesting that a narrative and non-predictive framework do not diminish rigour. As Robinson (2011, p. 36) argues, the idiographic approach to scientific research is an approach to understanding a single thing:

> Science is not just the development and testing of theory, it is also the endeavour to describe and explain objects and events. Events, by definition, only happen once, and objects, by definition, are singular.

Creativity is the generation of something novel (Runco & Jaeger, 2012) whether that novelty is objective or subjective (Kaufman & Beghetto, 2009). We argue that in becoming manifest such thoughts become idiosyncratic and individual and so thethat the study of creativity in practice seems to require conceptually such a granular, idiographic and non-generalisable approach. In addition, the research carried out here examines professional creativity (the subject of the case study is a professional craftsperson) but uses techniques more often reserved for the study of in the moment creative action (or small-c creativity; Kaufman & Beghetto, 2009).

## Method

### Participant

MG is a male wood turner. At the time of the research, he was 32 years old. He started woodworking in 2014 but then switched to specifically turning in 2020. The Covid-19 lockdown allowed him to hone his craft and at the time of the research he was using wood

turning as a form of (supplementary) income.[2] MG initially approached WR to work on understanding the role of his body in the creative process. MG and WR had several meetings before three data collection sessions were planned. The project received full ethical approval and the British Psychological Society's code of ethics was adhered to throughout.

**Data Collection**

WR visited to MG's workshop three times over the course of March and April 2021. Video recordings were taken from a point of view camera (GoPro). One initial review session was scheduled soon after the workshop visits during which WR and MG filtered the collected recordings and agreed on the one which was most of interest. This was followed by three video elicitation sessions held over zoom. These were recorded and transcribed and acted to enrich the observations from the videos.

The final data set consisted of field notes taken by WR, transcripts from the dyadic video reviews and the recording of the making of a set of rice bowls which was selected because it reflected a pivotal moment in the way MG worked with wood and the discovery of a new skills.

**Analytical Procedure**

WR first watched the video and extracted themes of interest which were used to create the first interview schedule. Four key concepts were extracted from this initial review of the data which structured the interviewing: Knowing through doing, the workmanship of risk, material agency and extended possibilities. These were developed after the interviews and repeated visits of the video data were carried out by WR. Three dyadic video review sessions took place during which MG and WR commented on the process. As outlined in Yokochi and Okada (2005) the use of think aloud protocols is not always possible in moments of great concentration and in this way, the use of video data as a form of elicitation to generate thoughts about the creative process can support understanding (Kimmel & Hristova, 2021). The content log of the video (CL), the transcripts of conversation during the time of the video (VT) and the transcripts of the dyadic video review (DR) were uploaded to Quirkos 2.4.2

[2] Since the research was carried out, MG has taken up the opportunity of a scholarship co-run by the Worshipful Company of Turners and Cockpit Studios (the scholarship ran Sept 2021-Sept 2022). This has led to him being featured in a BBC1 series called 'Make It At Market' - chronicling the transition to be a full-time craftsperson. Currently (30/9/22) woodturning provides 40% of income. With the benefit of the scholarship, the exploratory side of craft has given way to a much more structured and economic approach.

where they were analysed together to extract underlying themes (Braun & Clarke, 2019). This analysis then informed WR's subsequent further close watching.

[INSERT FIGURE ONE ABOUT HERE]

## Findings and Discussion

The video selected for close analysis is 44 minutes and 38 seconds long and goes from the start of the turning the wood once it is on the lathe to the final production of two small rice bowls. Woodturning has several distinct phases which are demonstrated in this video although these do not encompass all the aspects of creating the final wooden product which starts even before the blank is carved. These phases and their timings for this project are summarised in Table 1 but essentially involve initial roughing out of the wood to achieve a smooth round cylinder which turns true and allow more detailed work, followed by shaping of the exterior of the bowl before the interior of the bowl is hollowed out. In this case a longer blank was chosen, and two small rice bowls or cups were created from one piece. This was an unplanned use of the final product: "It was only right at the last minute we realised we could get two out of it." (MG, DR: 891) The making process is illustrated in Figure 2.

[INSERT FIGURE TWO ABOUT HERE]

The nature of the final product throughout was unstable. It is not clear if the receptables were intended as bowls or cups and their proposed use shifted throughout the course of the video. Further, the nature of the sold objects means that their final use cannot be controlled. For the sake of ease, we shall refer to them as bowls while retaining an understanding of this indeterminacy. Figure 3 illustrates the bowls before they have been hollowed out in the left panel, when the turning has been completed in the centre panel and the final pieces in the right panel.

[INSERT FIGURE THREE ABOUT HERE]

**The Workmanship of Risk**

The risk evident in the work presented here operated on several levels. From a pragmatic perspective, during the first visit to the workshop MG spoke about the importance of subsistence when it came to his craft work: Collecting wood, storing it, turning it, finishing it and the final selling of the product are all an investment of energy with a small profit margin. Once the bowls are made, MG is concerned about whether they will sell and so breaking or splitting the wood carries a very real financial cost. Additionally, he became concerned over the course of the video analysed here that that he had made bowls which would not be able to hold liquid. This led to a level of uncertainty about their usefulness which was not resolved until they were dried and tested several weeks later. MG worried about this with both bowls, holding them up to the light and using both callipers and his fingers to judge whether the base was thick enough.

MG often expressed anxiety about what a prospective purchaser would think. Following Csikszentmihalyi's (1998, 2014) systems model, the final creative judgement lies not in the intentions of the maker but in the understanding of the audience. In craft and other subsidence creative processes, this instability and unknowability of value also shapes the process: 'I would usually sand things because I know that people love that texture that that kind of interactive, silky texture. (DR 1603-1604). Sanding becomes a part of the process which changes the final form and is wrought not by a creative insight but by the very real need to create a product which appeals to its final audience. This anxiety about a future audience is also a psychological risk. In later correspondence MG explains this by saying that "I invests a lot of myself, my thoughts, morals and own tastes into my work. A critique by a potential customer is a critique of my personality, technical intelligence and any flaw in the product represents a failure within myself." (Groves, personal correspondence) The balance between creativity as something which breaks the constraints of social norm (novelty) but is also accepted by the that same society (usefulness) is also a financial and psychological balance for a craftsperson (Ross et al., forthcoming; Runco & Jaeger, 2012). Alongside this turning itself carries with it a level of physical risk. As MG notes: "And there's a huge physical risk that goes with it in not being able to perform a body technique efficiently" (DR 114-115). This encapsulates the intimate relationship between risk and skill in the video extract that was also expanded on in the dyadic reviews. The video showed MG deciding to just "freestyle it" (DR 903) however the faith and confidence in freestyling came from a sense of his own skill. It is notable that during the video extract and

in the early dyadic reviews, MG is still uncomfortable working with the newer lathe which was recently acquired. He says that “the new one was really heavy, really powerful but on relatively thin legs, which weren’t pinned down so the vibration is, like genuinely quite terrifying before you’ve turned it perfectly round and it is still rough” (DR 299). This shapes the interactions with the wood because in order to control the power of the lathe, MG will sometimes use suboptimal tool strokes to avert the risk of the blank spinning off.

With woodturning, as with other forms of unmalleable material, mistakes take additional skill to be rectified and as these can be generated both by the maker and the material, a high level of skill is required. It is the mitigation of this risk which requires the complex interaction of body, tools and material which is the focus of this analysis. However, despite the appearance of irreparability mistakes can be changed during the process of turning by changing somewhat the design and it is this dealing with error which MG suggests is key to understanding skill engagement and which for him only developed through the discipline of creating a large volume of bowls.

> Yes or I know how to add a feature just to if something's a bit boring, or the wood's a bit boring, or if it's not going, right, I know how to add a feature that will accentuate a different part of the bowl in order to draw your eye to the rim or to the way that it swoops outwards, anything like that anything to give it a bit of character. (DR 477-481)

This risk extends beyond the actions of the turner. Once the bowl has been turned, it is still full of moisture. Drying requires both a slow and careful process but also the correct state of the initial material which is unpredictable. This unpredictability generates part of the artistic nature of the craft experience but also carries with it risk. As MG explains in relation to a warped bowls (Figure 4)

> There's like this weird sort of grey area in bowl turning, for example, where if you turn them completely green, and they do that, [warping], which is [..] beyond function for me now personally, or beyond the intended function. But then you have the upper end of the spectrum where you work with seasoned wood, and everything stays completely true as it was. There's this grey area in between where you dry it for long enough to be reliable, but not so long that it doesn't sort of twist a little bit and do its own sort of unique, exert its own sort of character. (DR 1702-1709)

[INSERT FIGURE FOUR ABOUT HERE]

MG could not know in advance the nature of the wood and how it would respond to the drying process. The uncertainty of the creative process extended beyond the moment of creation. This is in spite of  mechanisms are put in place to manage this uncertainty. For example, sealing the exposed grains on a bowl blank with PVA glue while they air dry for conditionally determinate periods of time, or covering a turned bowl in its own wood shavings in order to minimise exposure to the air; allowing it to dry in a more controllable way.  As MG has become more established in the 18 months since these data were collected, he mitigates this risk by only using fully seasoned wood. Seasoned wood is more stable, much less prone to warping, which makes it more predictable. The reduction in risk here allows other risks to be taken and the subsequent product carries the mark of this material reduction in risk by being thinner and carrying greater risk in the execution.

**Whole body knowing: Controlling the system.**

There was a clear multisensory play in the steadying of the creative process. First, the role of sound was mentioned on several occasions. The riskiest moment of turning a bowl is once the outside shape has been shaped and the inside is being carved out. At this stage, mistakes become more difficult to remedy because there is less material to play with. The risk at this point comes from the nature of the matter, the wood flexes as it turns because of its moisture and takes on a slightly oval shape which means that the tool can ‘bounce’. This leads to a lack of control. In addition, the pressure from inside to outside can mean that the wood can be pushed outwards and you can “tear the whole thing off” (DR: 1416). Alongside the juddering feeling, MG knows when the turning is reaching a critical point because of the sound which is made. This is a “hollow percussive sound because it’s actually a tool bouncing off of the side of the material instead of cutting it cleanly” (DR: 1459). This high pitched is recognisable to even the untrained ear as unpleasant and acts as a natural warning system. As MG says:

> It's alarm bells ringing basically, it's quite, it's quite helpful, actually. Because it's like, it's telling you to back off.. (DR: 1508 -1509)

A way to mitigate this kind of risk is to work more stratigraphically into the inside of the bowl. This means shaping the uppermost parts of the inside of the rim into its final diameter before hollowing out too much of the inside; more material inside the bowl retaining the structure of the wood means there is less risk of the gouge pushing the circular shape into an oval and creating that awful sound. This methodological approach to successful turning comes from trial and error over the course of experience; it is one of those tricks of the trade that only emerge out of risk and failure. Learning from failure is the cornerstone of embodied craft knowledge.

Beyond the warning role of sound, other senses come into play. Of course, vision is one and in this case the role of the eyes is again a steadying one. When the blank of wood is turning at high speed the overall shape appears smooth, the trick is to look for a smooth line along the top edge. The difference between the two can be seen in Figure 5 where the right panel shows a blank which is considerably more turned than that on the left. The difference between a blurred and smooth line across the top is the main visual marker of success at this stage.

[INSERT FIGURE FIVE ABOUT HERE]

In this case, vision is used not as an artist or sculptor might do to assess the aesthetics of the finished work but as a measure of a dynamic process, assessing something which is in motion. It takes great skill and concentration. However, a times this line of sight is also unreliable:

> But it might be spinning so fast that you can't pick up on it. And that's why you stop and touch it up, basically. (DR 785-786)

This is one aspect of touch: The stroking of the block of wood to assess to what extent it has been fully shaped. In this way, touch is an active and generative sense which creates and responds to the sensations which are generated. This form of touch occurs at several points during the video. For example, when MG turns the blank to check for cracks. Here fingers stroke the blank alongside the eyes. Later, when he is checking the width of the material at the base of the bowl, he quickly discards the callipers to feel with his finger and thumb.

However, there is a more fundamental form of bodily touch which is required to work with the dynamic system and arguably it is the process of bodily steadying which plays a role during the shaping itself. During this moment, the hands are not in contact with the wood the

sense of touch is fully embodied and so while it is mediated through the hands, it is not mediated through the fingers in active touch (Gibson, 1962) . Rather the hands act as a conduit between the tools and the rest of the body. This is also whole-body touch. MG tells us that "the way you learn to do or learnt to know is ultimately sort of felt and registered through the body" (DR: 113 -114). This sense is akin to a form of intereospection only rather than a monitoring of internal states to maintain equilibrium, here the emphasis is on the monitoring of the constant changing state of the tool-lathe-wood-maker system to maintain a *creative* equilibrium. This is necessary because all four aspects are in constant movement and which at times threatens to pull away from each other thus great embodied sensitivity and control is necessary.

This tacit embodied knowledge is built into the way that MG communicates about his craft. Initially, he explains to WR what he plans and uses wide gestures to explain the shape before narrower gestures to support his thinking. He also uses his hands to help him understand the size and shape of the prospective bowl in this planning stage (see Figure 6). Later in the dyadic review he expresses his frustration with trying to explain the process through words alone: "visual prompts and like, tangible objects are so much easier to communicate these things with." (DR: 1431-1432). The knowledge of how to work with the complex system is learnt through the body and communicated best with objects and gestures.

[INSERT FIGURE SIX ABOUT HERE]

**Uncertainty and knowing through doing**

It is noticeable that after this embodied planning and discussion of what he wants to do, MG says "let's just see what happens (VT)" before selecting a tool. MG did not start out to make two bowls – instead he wished to experiment with end grain turning. Once the blank is smoothed, as he goes back to see what he could do, the idea of two bowls is instantly dismissed: "No, I couldn't get two out of that (VT)". However, 30 seconds later he wonders, "maybe I could get two out of that" before stopping the lathe and sketching on the wood what the dimensions would look like (see the right panel of Figure Four). Finally, he makes the decision not to decide and rather do the first bowl and see what happens – "I'll just freestyle it to be honest (VT)". There is a point when so much theory has passed and yet nothing has

happened, and so the only way to test the theory is to put words into action. This is the practical intersection between risk and result.

It is unclear at what point MG 'decided' to make two bowls. Indeed, it is unclear if he 'decided' or if he saw the possibility not only unfold in front of him but also be constructed by his actions. In other words, the decision was made by the interaction of the possibilities and constraints of the maker-lathe-tool-material system as it unfolded across time. It is only after the top bowl has been done that he can "see" the possibility of a second. The realisation takes place in the world.

> I'll definitely remember the point where I was like, fuck it, let's just see if it works […] I've finished doing this top bowl, I suddenly realised that I've actually got enough room to play with, that I can make two.

However, it is not satisfactory to establish this as the moment of creative "insight". In part because insight carries with it the feeling of certainty (Ross & Vallée-Tourangeau, 2022) and despite the realisation at this point, MG is by no means certain that the process will work. Even after he starts to work on the second bowl, he is unsure whether the process would be a success. At 23 minutes and 47 seconds, after he has started work on the second bowl, he says "if this does work it will be...amazing" (VT) and at 33 minutes and 8 seconds he says "what I am going to have to do now might fuck it all up anyway" (VT). The uncertainty wrought by the complex interaction of internal hunch, embodied skill and material constraints generate the pleasure and the tension in the creative process.

**Form, categorisation and function**

Form is an important part of the parameters of making for MG. In the dyadic video reviews, he was clear that his skill has developed, and he now had "a kind of set of parameters" (DR: 451) that he liked to work in. These parameters developed from different sources. First, the overarching culturally determined nature of the form – cultural normativity underlies all the work produced. Second, a personal and recognisable style that was an important part of the brand that lay behind a successful crafts business. Third, inspiration from (mainly) Japanese and Chinese ceramics, the aesthetics of which MG is a great admirer.

However, MG resisted a rigid sense of form. He is concerned that by starting out with an idea of the ideal form he is "superimposing a category on it before it's even become an

object (VT)". Indeed, rather than this, he aims for the category to be imposed by the form the object takes so that there is a mutual co-creation of form and category which emerges from the interaction of skill and material:

> where we have to just make the objects and you know, there's let skill do its thing, and you let the material and skill interact. The integrity of the object, or the essence of it is, is what speaks, it's not the idea that we go in saying, this is going to be a rice bowl, it's actually what you then get from it, what the object lends itself to that creates the category later on, you know? (DR: 1619 – 1623)

The form was also directed in part by the material. Not only the shape of the initial wood: "doing this kind of style is like, having too many options in a way, 'cause the shape has already leant itself in the circular form of the log" (TR: 3:14) but also because of the nature of working with wood which constrains what is possible. This is clearest in the nature of imposing a preconceived form on the wood. The ceramic work which provides the inspiration for MG's work is formed in a different way. Notably the inside and the outside of the bowl are shaped at the same time. This forces a symmetry between the inside and outside which cannot be easily mimicked in woodwork something which MG realises after the recording which is the focus of this analysis and refers to in the final dyadic review session when he realised he had to lose the idea of matching the internal and external profiles. Losing this allowed him to create a substantial yet elegant base. As mentioned above, in end grain turning there is in fact more of a need for the interior of the base to be more substantial than the rim – to counter the risk of liquids seeping through gravitationally into the grain. With regards to materiality in this case, symmetry in the profile is actually more of a risk than a measure of certainty and skill.

Despite the ideal of leaving the object free to vary, MG is often dissatisfied with the final product because it failed to match the form that he envisaged. Indeed, the mismatch between internal form and final product led to much frustration for MG and was the reason why he was often unhappy with what he created. This disappointment reflects a wider dissatisfaction with the creative product; MG expresses disappointment in the bowls that he made during the video period at several points during the dyadic review. He was careful to make the distinction between the process and the product.

> All of the process was fucking great to start…exploratory. When they were actually done, I just really wasn't happy with them…the process was the most significant part of the actual result. I am glad other people picked up on it and they liked them but I just wasn't happy with it.

However, this dissatisfaction with the finished product is part of moving forwards. It is notable that the first try of this technique which we captured on camera and increased skill and comfort with both the lathe and the process increased his satisfaction with the work he produced. "But yeah, it took this basically, you know, it took being discontented for me to have to readjust and figure out what to do better" (DR 1898 -1900)

## General Discussion

Over the course of the observation period, we were able to capture a double moment of creativity: The creation of a new artifact and the moment a new technique is generated. This offer an unusual and important opportunity to chart the moment of a new thought is generated. The close description of the process here suggests that an understanding of creativity will be incomplete if we ignore the embodied skills which allows the maker to control a complex system. These skills cannot be clearly mapped using the tools currently available to psychologists. The research here also suggests that internal plans and potential may shift when process is taken into account and research needs to move away from a model which relies on an unproblematic imposition of form onto matter.

### Creative Cognition

Baber (2003, p. 66) questions "the extent to which […] decisions are made prior to performing an activity, or whether they are an integral part of performing that activity. In other words, is cognition an exercise in planning and preparation or is it the moment-by-moment coordination of activity?" The evidence we have presented here suggests that the cognitive moments that make up the creativity displayed are the result of in-the-moment co-ordination of tools, materials and maker. There is a complex mix of knowing-through-doing and tacit knowledge and learned skill: The willingness to embrace the risk stemmed from a confidence in the skill to support it.

What we demonstrate here is that decision making and creativity are embodied and relational processes which unfold over time and through engagement with materials. The skills required to co-ordinate the different aspects of the creative system – in this case the tools, the lathe and the material itself – reflect learned embodied gestures which can not be easily explained. Rather they need to be tracked through observational methods such as those employed here.

Tracking these movements suggests that skill can be marked by the combination of different senses steadying the dynamic system which consists of two moving parts (the maker and the lathe), the tool (which has its own characteristics) and the material (again with its own form of agency) leads to form of what we term "choreospection"[3] to describe the dance of these different parts through movement. While MG is centered in the system, the moves he makes are not ones of a human imposing a preconceived idea on matter but one co-ordinating and responding to moments of uncertainty and unexpected changes (Ingold, 2007).

This relationship, between worker and machine, is significant as it is integral to contemporary hand craft in multiple ways. First, the automated lathe (powered by electricity and spinning the work piece by motorised automation) represents a contemporary tool kit appropriate to contemporary demands. This embodies the organic evolution of craft work as necessary for its continued relevance to society. Second, the lathe embodies a form of post-modern symbiosis whereby "machines have become appropriated by the craft tradition, aiding and abetting craft consumers rather than robbing them of their traditional autonomy" (Campbell 2005, p. 28). With increased certainty in the automated rotation of the wood comes equally increased risk. The work is dangerous and potentially costly if misjudgments are made (see above). This tension between machinery and hand skill is of huge significance for the study of contemporary craft (in all its guises). Similar to the chainsaw techniques mentioned above, the electric lathe gives the impression of ease and a relinquishing of skill in favour of automated action. But this is not the case. The increased power requires increased delicacy of touch, soundness of judgment and respect of technology. Further to this, body techniques are renewed and updated in accordance with developments in technology. The unfolding object, the technological advances and the acting body are combined. This promotes that very organic evolution of techniques in line with novelties in design – the body

[3] This neologism was suggested by Marek McGann on a twitter thread: https://twitter.com/MarekMcGann/status/1432717532482441217

and technology evolving together in subtle and intricate ways – which is, we argue necessary for the development and survival of the craft itself.

## Worksmanship of Risk

For Bardt, creativity must involve uncertainty. This uncertainty leads to both the creative and physical risk involved in the craft work that we have demonstrated here, and which takes places on different scales – at times the risk concerns the very immediate nature of the difficulty of controlling a number of various forms but there are also risks which project into an imagined future. The analysis reveals the unknowability of the creative process generated at different moments by the unknowability of the characteristics of the materials and the effect of actions and often of finishing processes (Ross, 2022). An idea is shaped by the process of implementation across different sorts of material endeavours and a deep comfort with unknowing becomes an important part of the skill of working with material.

Glăveanu and Beghetto (2021) argue that process cannot be directly inferred from outcome and the evidence we have presented here supports their argument that an exclusive focus on product will come at the detriment of an understanding of process. As we have outlined, the final product was not the outcome of an intentional plan rather it arose from a complex mix of skill, material affordance and contingent decision making that had no clear motivator. This mix of planning, skill and creativity as it unfolds echoes reports from architects and designers who think through doing (Goldschmidt, 1991; Suwa et al., 2000).

From the perspective of the development of professional creative skills (Pro-c creativity; Kaufman & Beghetto, 2009), the close microgenetic analysis here demonstrates that in this case, the professional nature of the creative process arises from a dialogue between the maker and the material as well as the potential future audience. These constrain and shapes the final product suggesting that a professional creativity depends on an understanding of audience and the risk of audience disapproval. Additionally, the workmanship here while professional in nature was also full of risk and incremental change, suggesting a blurred boundary between different creative categories.

## Conclusion

If we move beyond lab-based studies of creativity and assess the rich empirical data from semi-structured interviews or case studies, these provide supporting evidence for a

model in which the material environment is not accepted as a passive scaffold for creativity but actively shapes the process (Malafouris, 2014). Such results foreground the importance of the material in creativity and invite a more nuanced characterisation of agency than traditional linear models (Glăveanu, 2020; Glăveanu et al., 2013; Malafouris, 2014). Although there have been several calls to recentre the material in our understanding of human behaviour and cognition (Barad, 2003; Orlikowski, 2007), it is perhaps particularly surprising that the relationships with the material is under emphasised in creativity research (Tanggaard & Beghetto, 2015) where there is a necessary entanglement with material; to create is to produce something concrete, the ephemerality of a novel thought moves from imagination to creativity when it is enacted and not before. This paper suggests that creative processes are constituted not by internal computations over mental representations of the artist's materials but through and by those materials (Bardt, 2019; March, 2019; Wheeler, 2018). What we see here is creativity which cannot be understood save through action.

**This is not to suggest that internal processes are erased but rather that they are manifest through the act of creating and it is this act which is necessarily engaged with material. Current psychological research has a strong focus on what it means to be creative, our suggestion is that close qualitative work such as that carried out here leads us to move away from assessing internal fixed characteristics but rather to focus on what actions, what gestures and what relational skills are necessary for creativity to occur. This focus can happen in tandem with analysis more focused on the person but without it, we argue that we are missing fundamental relational qualities. The nature of the material realisation of creative thinking and the embodied skill it elicits to reduce the inherent risk and uncertainty deserves a greater consideration. References**

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Figures

**Figure 1**

*Analytical Procedure*

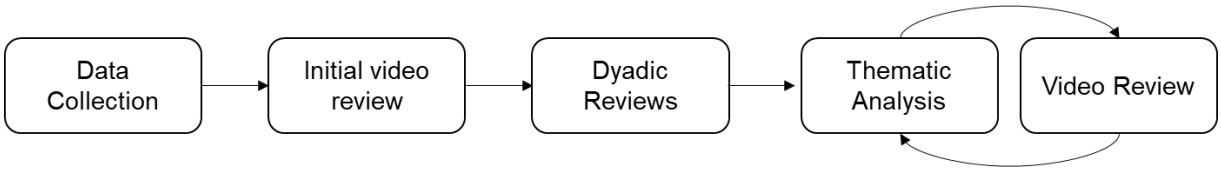


**Figure 2**

*The Process of Making the Bowl*

| | | | |
|---|---|---|---|
| Preparation |  | 00:00 | 00:30 |
| Roughing out |  | 00:30.3 | 04:00.3 |
| Shaping outside |  | 04:00.3 | 23:30.3 |
| Separating the two bowls |  | 23:30.3 | 28:30.3 |
| Carving inside of bowl one |  | 28:30.3 | 35:30.3 |
| Carving inside of bowl two |  | 35:30.3 | 42:00.3 |
| Checking |  | 42:00.3 | 44:30.3 |

**Figure 3**

*The Stages of Bowl Making: (a) The Exterior Shaped (b) Hollowed and Separated and (c) Finished and Ready for Sale.*

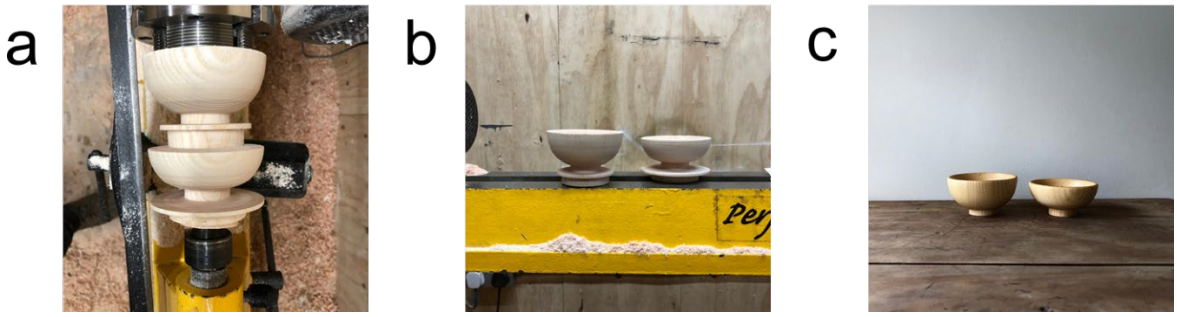


**Figure 4**

*A Bowl which Has Warped During the Drying Process*

**Figure 5**

*Sight Is Used to Judge the Progress of Shaping. The Top Line Starts Blurred (Panel A) and Becomes Smoother as the Blank Is Shaped (Panel B)*

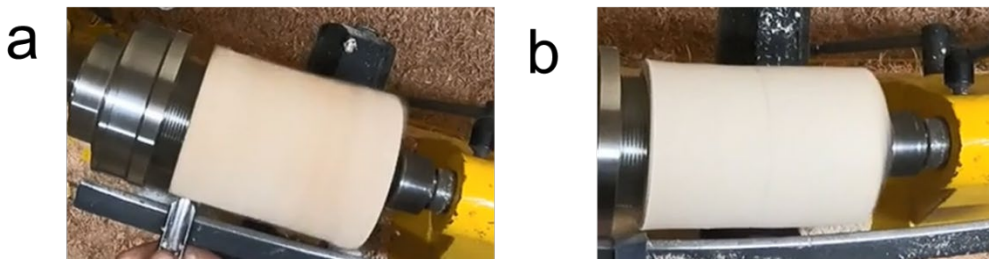


**Figure 6**

*The Use of Embodied Gesture to (a & b) Explain the Planned Design and (c) Predict How the Design Would Fit onto the Blank. Stills Taken from the First Thirty Seconds of the Video*