11. Conceptual knowledge as technologically materialised: a case study of pottery production, consumption and community practice

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How do we come to be knowledgeable social beings? Western ontological traditions situate knowledge as based in individual cognisance and arising from a prioritised, discrete body (see critiques in Knappett 2005, Thomas 2004). Through the body, we internalize and make the world meaningful and in this process, nature and society are co-constructed. However, to make things meaningful, we require engagement with our physical surroundings and the materiality of this physical environment. In order to construct the ontological or conceptual knowledge of the world based on these engagements, it is imperative to acknowledge that engagement is situated in social milieus such as interactions with family, cohorts, colleagues and a broad spectrum of learning communities. It is in these social milieus where, when we first experience the world, someone is there to help make it meaningful and to structure our conceptual knowledge of the world. Without contextual social engagement to structure knowledge acquisition, our individual and embodied habitual movements, inculcated practices and ways of doing things in the world are de-contextualized and exist outside a framework of knowledge. If there is no knowledge framework, the reason or ability to conceptualise embodied technical knowledge of 'doing' or 'making' is impossible; both an embodied knowledge and knowledge framework are necessary to 'dwell in the world' (*per* Ingold 2000a: 185)

This paper explores the inter-linkage between conceptual social knowledge systems and technological practices. The construction of conceptual knowledge systems, or ontologies, is immediately and inextricably linked to practical engagements. Meaning, knowledge and ontological perspective is shaped by contextualized embodied experiences and the creation of habitual practices and a *habitus* for moving within our social and physical world (Bourdieu 1977, similarly but using a different level of scale see Ingold 1993 for the concept of taskscape). The interconnectivity between conceptual and practical knowledge weaves together individuals and material objects within a framework of communal, structural meanings. The result of practical engagement is the establishment of knowledge technologies – or ways of structuring our knowledge – that are reinforced and habituated within community of practice frameworks. Through material engagement and a community of practice, conceptual knowledge is linked to technological knowledge, as both embodied and materialised practice. In this paper, I will build a case study around Copper Age pottery production in western Iberia. Specifically, I will consider how communities of practice shape technological knowledge and how this reverberates back into the conceptual knowledge framework held by the society to become materialised in future production acts and their material culture results.

Technology and Embodiment Theories

Before exploring potting technologies in Copper Age Iberia, it is fruitful to highlight the theoretical underpinnings for this argument. The last twenty years have provided an excellent framework for thinking through the social aspects of technological implementation, decisions and practices by way of a series of anthropological, archaeological and sociological discussions on the topic (see Dobres 2000: Latour 1991, 1993, 2000, Lechtman 1977, Lemmonier 1993, Pfaffenberger 1992). These approaches have explored the dialectic between individual production events and broader social knowledge systems within societies and the structural principles by which

these events are operationalized in meaningful social ways. Increasingly, focus has been placed on the material culture and materiality of the objects as subjects in their own right within the human-material culture relationship; both are inseparable from each other and the relationship can be construed as seamlessly extending between humans and material culture (Latour 1993: 136, 2000: 12). If this is a fundamental aspect of technological engagement and practice, then it has an inescapable effect on our perception of the world (see Ingold 2000b). Technology is a knowledge framework that we use to construct our world, but at the same time, technology shapes us, constructs our world and becomes a principle avenue for communicating social meanings.

Knowledge systems at the societal level are necessarily viewed as broad, abstract and encompassing, however, when focussed on a specific production (or materialisation) act, understanding practical knowledge starts by incorporating the social situated-ness of the individual. The social community does not in reality mark out the role of 'producer' as singular and all encompassing. In fact, the description of 'producer' only scratches the surface of identity and knowledge systems held by a single individual performing a single production act. We must realize that the knowledge a producer brings into production events materialises a whole suite of social as well as technical knowledge informed by the different roles, status positions and genders experienced by the individual. That said, at a community-based scale, these knowledge systems are also shared, manipulated, restricted and reproduced within society, albeit by different people with their own embodied and experienced pasts, and they occur in different and changeable social contexts (see Barth 2002). Turning specifically to the knowledge required when enacting a technical event, embodied and bodily practices affect how this knowledge is individually reproduced. Embodied practices, drawing on Mauss's (1979) concept of *techniques du corps*, emerge as inculcated and habituated bodily movement from learning how to act and move within the social environment. Bodily and conceptual knowledge are inseparable, as both are made meaningful within the social milieu.

Thus, how we view the world and make sense of it is channelled through our body not only from a material engagement aspect as implicated in the approaches above, but also through our 'communities of practice' (*per* Wenger 1998). Groups, to which we belong and are incorporated into, create boundaries for experiential understanding by providing a framework for learning specific techniques and structuring their meanings. These techniques, reinforced through a continued interaction with a community of practice, routinise techniques of doing and in the process also routinise a specific way of understanding the world. Communities of practice enclose us in the comfort of a learned, shared world-view and, as such, a shared way of making and doing things in this community-constructed world. Communities of practice fluctuate, which adds a dynamic and flexible element to how knowledge changes and techniques are practically enacted. We choose to align ourselves with different communities and groups depending on situation and context, each aspect varies and alters perspective in those different situations and contexts. In essence, our practical engagements within a community, or communities, of practice, structure the conceptual knowledge systems – including social and technological knowledge – that inform our material engagements.

Materialising Technological knowledge as social knowledge

Materialisation theories have also renewed our focus on material culture and the ways social agents/subjects engage with it. Beyond active agents and agency, objects and individuals continually reproduce and transform their social world through technological processes (i.e. Ingold 2000). While this type of materiality and material engagement theory is amorphous enough to incorporate all types of object-subject relationships (see Miller 2005: 4), I want to use the concept of materialisation rather than just materiality or material engagement as it specifically necessitates the enactment of social knowledge within a technical event to produce material culture. Materialisation theory has focused on the social construction of political institutions and social ideologies through the deployment of material culture, often in a way reinforcing social inequalities within a society (DeMarrais 2004, DeMarrais, Castillo and Earle 1996, Renfrew 2001). I think this focus on social inequalities has been liberating (see DeMarrais 2004) and the idea of materialisation within the technical production process is a useful development. Variation in techniques and styles of production can be seen as the agency of individuals, communities, and objects materialising the history and continuation of social relationships and shared knowledge being reproduced within the milieu of technical processes.

As such, visuality can be a key means of materialising appropriate social meanings, attitudes and relationships within society. Visual differences provide a means for multiple ideologies, institutional facts, and shared conceptions of the world to be materialised within a single engagement event. The application of technical knowledge in *chaîne opératoire* choices draws on a system of socio-technical knowledge that holds the rules structuring convention and variability while at the same time being a reservoir for heterogeneity. This heterogeneity can be used to materialise individual expression and specific contextual meaning, while still materialising broader social meaning through adherence to other visual characteristics (see Gosselain's 2000 discussion of salient production techniques and technical malleability).

Visual attributes, then, are key ways of exploring the materialisation of technological and social knowledge systems within material culture. The variation present in specific visual

attributes reflects the inculcated knowledge and practices of individual producers learning within a bounded community of practice. The social choices structuring the standardisation or variability of each specific visual attribute result from both the physical characteristics of the media and the social ways of making and using the finished material objects. Those techniques and features that allow a greater degree of latitude for expression still conform to social knowledge about what makes an appropriate tool or object, but they are also socially acceptable avenues for exploration of technique and practice by producers within that community. At the same time, attributes and techniques held to a greater standardisation reflect deeply seated ideas of appropriateness and aesthetics within the community – change in these areas affect social and technological knowledge. So, as societies innovate, accept and internalise new technologies or big changes in socio-technological knowledge, new arenas for variability in technical practice emerge permitting changes in the finished form of objects as the dialectical influence of social and technological change recreate producer and material culture.

Let us take an example from a more recent technological knowledge system, and consider its innovation and change due to social knowledge and the practical uses for which it is employed by both individuals and society as a whole. Computers often epitomize the concept of science and the 'technological world' within modern society. In actuality, however, computers are enmeshed in the social networks and relationships of our everyday lives; they facilitate and mediate how we communicate, obtain social information and make our world meaningful in a variety of ways. How you engage with computer technologies also often depends on your access to technical knowledge, skill, needs and social history (see Woolgar's 1991 example comparing specialists' and non-specialist trial users' ease of engagement). In essence, computer competency and technical skill are materialised through engagement and practice; computers, just like all material culture, are produced through the intersection of technological and social knowledge systems rather than falling into one single field of discourse.

What conceptual knowledge and meanings are being materialised through the computer and its associated social technology? Do computers materialise a Western prioritising of technology within an ideological framework categorised as 'science'? Do they materialise an ideology necessitating constant communication and information transfer through the quest for increasing speed and accessibility? Do they reflect a belief in social interconnectivity through the diversity of email, blogging and social networking resources available through them? Computers materialise all these conceptual beliefs, often simultaneously, but the material reality and presence of the computer further affect our more immediate and practical daily interactions. As a social technology and as a representative of innovative 'technology' the computer shapes our behaviour, scheduling and ways of engagement; the reality of computer technologies demand we conform to an entirely new set of social conventions revolving around computer etiquette. So, writing emails does not require the formality of a letter (or if it does, the letter is often included as an 'attachment') and email access ensures constant contact with colleagues, friends and family even as it dictates a presumption for an immediate response to those emails. How far can you resist the computers and associated technologies? Resistance as a form of engagement may be a choice, but as others in society integrate computer technologies such as emailing into everyday practice, one is forced to compromise. As social etiquette regarding how we respond to emails or produce letters and documents in electronic form changes, the technological reality of how we communicate also changes. Compliance regarding new technologies and practices – such as in computers and communication – are not just choices but necessities as they create social networks and tie us into knowledge systems.

Thus, the computer and its facilitating technologies are not only tools for disseminating social knowledge (writing research grants, preparing visual presentations, emailing and blogging) but they actually enable us to be social. In the end, the computer can be argued to have significant agency in social relationships – mediating them, facilitating them and even creating them. This active role for material culture is unproblematic if we draw on Latour's assertion regarding subject-object relationships as blurred and continuous (1991, 2000). From this perspective, the computer can be construed as an extension of the self (bodily and cognitively) just as with any other material culture-based technical, practical or performative engagement. But, would these engagements and knowledge systems have emerged if the computer had remained the enormous, complicated and overly specialized machines they were forty years ago? Forty years ago, people were forced to engaged with them very differently due to their physical presence as they filled entire rooms, required punch cards and spools located on their exterior (Fig.11.1). This was a very different type of physical engagement; the materiality of the computer affected access to the computer and its technical knowledge. The size, complexity and mechanical aspects of the computer mean that very few people actually engaged and interacted with the machine, as it required specialist knowledge and specialist settings not accessible to wider society. This type of practical engagement involved mechanical, or sets of specialist technical knowledge, as well as the organization of knowledge practice which we often use computers for today. However, as the technology expanded beyond the specialist engagements – meaning, as it became an increasingly open social technology – those overt technical attributes became masked and closed off thereby affecting our practical and technical engagement with the computer. The open mechanics of the computer (i.e. spools, punch cards) were replaced with closed mechanics (i.e. microchips) hidden away in 'aesthetically' pleasing boxes, which should not be opened under serious penalty (your warranty will be

void). In effect, although conceptual knowledge revolving around the use of computers is embedded in social practices, the technical aspects of computing still rest in the hands of specialists holding specific technological knowledge even if its material and practical reality exists across a broad spectrum of social knowledge systems (see Woolgar 1991). The social use of the computer demonstrates how material culture, and our engagement with it, shapes broader social relations and conceptual knowledge systems: social and technical knowledge systems are enmeshed through continual and changing practical material engagements.

Fig. 11.1: TITAN computer of the 1960s–1970s (reproduced with permission of the Computer Laboratory, University of Cambridge).

Pottery technologies, variability and practical knowledge within a Copper Age community

Let us look now at a case study from prehistory, that of pottery production and the role of variability and conformity in materialising appropriate social meaning. Just as computers have become ubiquitous and everyday within our own society, pottery has been described in the same manner, being seen as a technology integral to a diverse set of everyday practices (i.e. Braun 1983). These practices are informed by the production event, but reside also in historically- and community-based styles, aesthetics and uses beyond just the technological choices involved in a vessel's production. In essence, pottery technologies represent exceptionally well how technologies of production are influenced by and materialise social and conceptual knowledge within society.

Here, I wish to highlight the importance of visual differences and technical choices within pottery assemblages. Visual attributes, unlike compositional or fabric characteristics, can be experienced directly by all producers and consumers of a vessel. As such, visual characteristics can be relatively easy to link to social knowledge regarding identity (who can use what vessels, who has made what vessels) and the meaningful use of particular vessels in appropriate contexts. As outlined above, multiple ideologies, institutional facts and shared conceptions of the world are all materialised within a single pottery-based engagement and a single finished vessel. The technological sequence, or the practical application of technological knowledge, provides a baseline for the implementation of pottery knowledge. It cements the rules that structure the life biography of the vessel, starting with the sequence of production, but also affecting consumption and depositional practices. It also continues to influence future production choices. These sequences do not just happen and the technology does not just mechanically reproduce the same pottery vessel over again. The potter is enmeshed in existing technological and social knowledge systems which reinforce and help shape the choices available – this is a learning and socialising environment which can be framed as a community of practice (per Wenger 1998). From an embodied individual to the community of practice in which they are inculcated, we can consider a potter (or any producer or user of material culture) as situated within this network and retaining various levels of potting skill and knowledge within a broader societal-based conceptual technological structure.

Our case study focuses on the 3rd to 2nd millennia BC Middle Guadiana Basin, which partially delineates the modern national borders between Spain and Portugal. The site and assemblage described here come from an enclosed Copper Age settlement on the Spanish side of the river named San Blas (Fig. 11.2). The University of Seville excavated the site over four seasons as part of the Alqueva Dam Project (see Hurtado 2004a, 2004b). San Blas had two phases of Copper Age settlement and it is the second, or later, phase pottery assemblage and associated technologies that will be discussed here. This later occupational phase of the site includes multiple dry-stone wall constructed houses – all approximately the same size and sharing very similar spatial organization – an internally demarcated, ditched central zone and a large enclosing wall with bastioned entrance facing a sheltered location on the Guadiana River (Hurtado 2004a). Material culture is abundant at the site, indicative of the permanence and occupational focus within the community. Pottery is the dominant material recovered, but evidence for metallurgical, lithic and bone-working practices is also widespread. The ceramic assemblage indicates a diverse repertoire of attributes and styles present within the community, although the vessels can also be consolidated into general formal types such as bowls, deep storage vessels, fine wares and *campaniforme*, or Bell Beakers (Kohring 2007). These categories – and, more importantly, their variability – are the bases for exploring the interrelationship between object/human/knowledge as materialised in technological production practices. This materialisation of technological knowledge is held against a backdrop of context, social relationships, social realities and embodied technical practices.

The realm of pottery production decisions and engagements

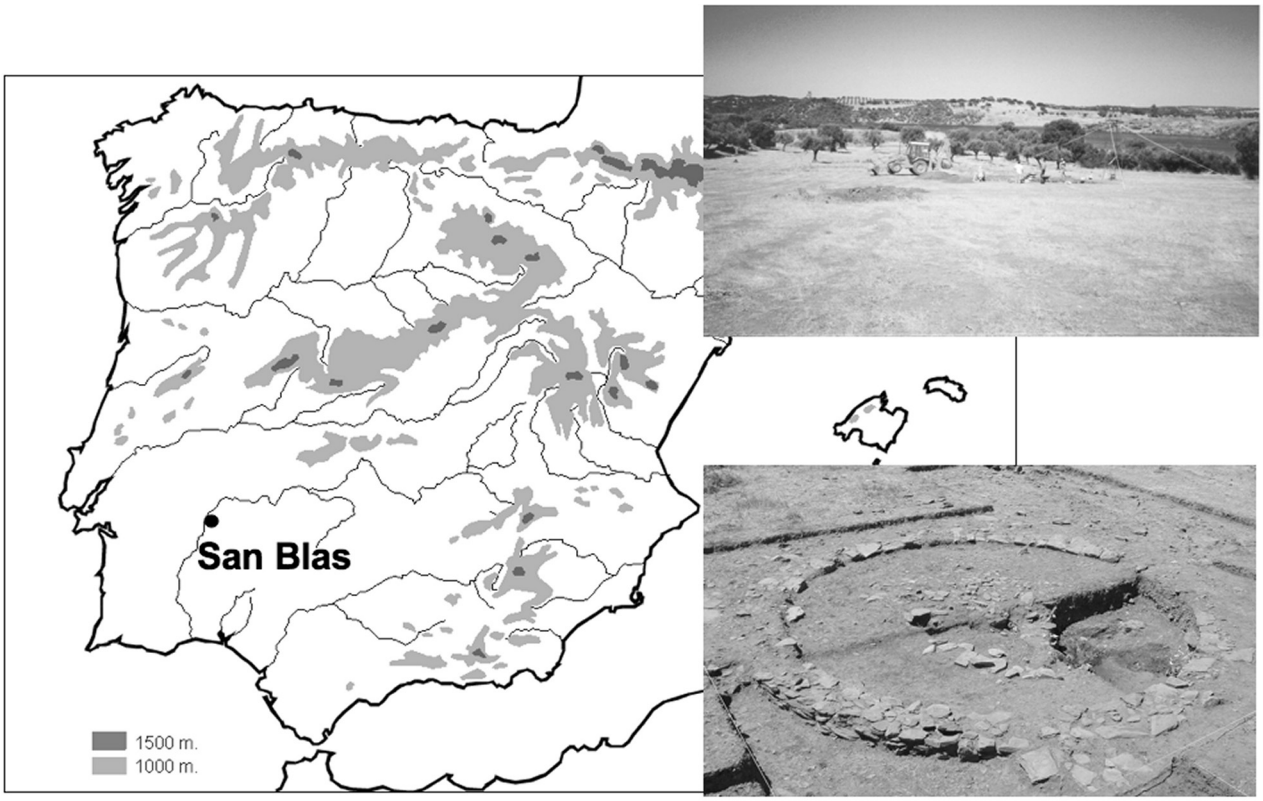
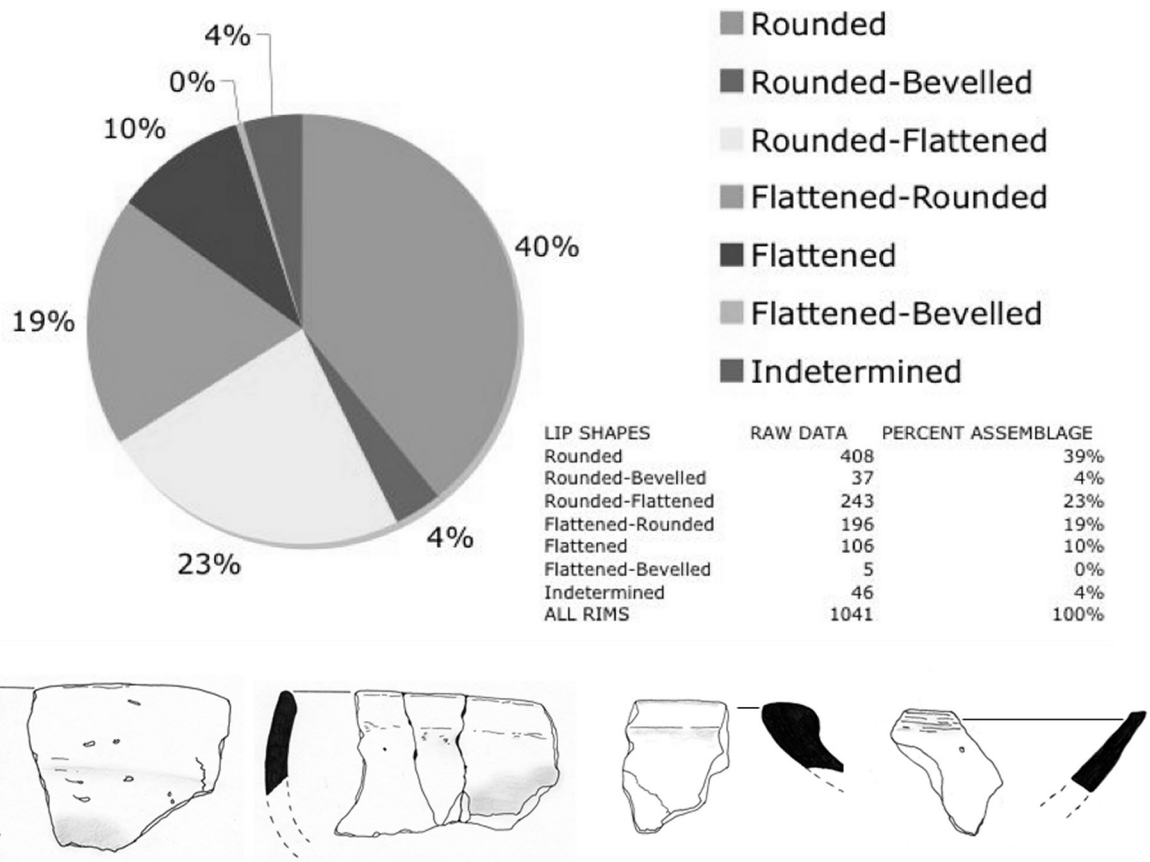


Fig. 11.2: The Site of San Blas, Cheles, Extremadura, Spain.

is an active arena in which social reproduction is continually being practically reworked and experienced in the context of this prehistoric Iberian community. Daily activities and social engagements are experienced through a suite of visual and material avenues in which producers and consumers make themselves simultaneous technical and social agents extending knowledge through the material forms. Those material forms spread into multiple knowledge systems and create new contexts for engagements, experiences and socialities. Knowledge in these engagements does not just apply to the symbolic and contextual aspects of the material culture (Hodder 1987, 1990) nor do the techniques of materialisation simply reference isochrestic variations in style (Sackett 1990). Instead there is an extension of subject and object through the materialisation-of-knowledge process instigated and reproduced through the technological experience. As Latour (1991) states in his title, it reflects the reality that 'technology is society made durable'.

To set the context for our case study, I wish to briefly expand on the community wide ceramic assemblage during the Later Copper Age at San Blas. At the most general level, one word can describe the predominant of vessel form used and produced in the community – bowls. The San Blas assemblage is marked by particularly overarching conventions regarding pottery forms and technical representations, especially regarding the predominance of bowls in every context examined in the study (Kohring 2007). Those contexts include several different structural or domestic settings, and several open, or public, areas. Yet, there is an intermingling of social/technical conventions and technological knowledge systems evident in the production and *chaîne opératoire* utilized by the community potters in the production of these bowls. While vessels are generally round-lipped and highly polished, the lips and surface finish can be seen as areas for individual expression and technical manipulation.

These two areas for the expression of social/technical knowledge can be discussed in terms of the techniques of production regarding surface finishing quality and those regarding lip and rim final modifications. Both technical aspects, as represented in the San Blas assemblage, are not difficult to manipulate nor do they require high degrees of specialised training to create visually distinct differences in these attributes. Surface polishing and burnishing are the most common finish for bowls in the assemblage and the finest burnished sheen is more a product of labour investment and controlled repetitive technique than requiring highly specialised training. Lip and rim manipulation can be highly variable, although within this community the lips are often rounded or slightly thickened. Despite this prevalence in rim production technique, more than sixty-five different variations



LIP SHAPES	RAW DATA	PERCENT ASSEMBLAGE
Rounded	408	39%
Rounded-Bevelled	37	4%
Rounded-Flattened	243	23%
Flattened-Rounded	196	19%
Flattened	106	10%
Flattened-Bevelled	5	0%
Indetermined	46	4%
ALL RIMS	1041	100%

Fig. 11.3: Lip Shape Variability in the San Blas Assemblage. Percentage and raw data provided. Bottom demonstrates some of the continuum between rounded and flattened lip shapes suggesting individual, embodied practice and learning.

of rim and lip formation were recognized in the San Blas repertoire (Kohring 2007). Again, greater manipulation or elaboration in this area does not require significant specialised knowledge, but rather a knowledgeable competency in the media and techniques of production. If both surface finish and rim/lip production steps are easily learned, manipulated and open to great variation, how do we explain or make sense of the patterning of visual characteristic combinations recognized in the San Blas assemblage?

The key to understanding choices in production techniques must be sought first in the socially learned knowledge of what makes an appropriate pottery vessel in the San Blas community and then, how this is translated into the equally socially learned bodily practices involved in making vessels. Both the techniques for producing surface finish and lip and rim form may be used as examples of how conceptual knowledge systems interlink with the technologies of pottery production through the social reproduction of these vessels, as both surface and lip attributes can have a significant visual impact. As discussed previously, visual characteristics create and inform socially understood conceptions of material culture appropriateness and as such can be firmly situated in the social realm. However, through social engagement processes, these visual characteristics are reproduced again in the technical realm of practical pottery making. In essence, social categories and meanings are reproduced in the act of producing.

The degree of conformity or variability in these visual characteristics becomes an important point of analysis as it reflects the boundaries surrounding social categories (which are created within the community and are applicable to all material culture). The categorization process situates variability by placing it against a conceptual template, or aesthetic standard of acceptable material culture genres. At San Blas, the fact that the majority of sherds have a highly polished dark surface and rounded or thickened lip and rim is important as it indicates a certain level of conformity for a specific visual aesthetic for vessels and hence, a pertinent conceptual pottery category. But by also considering the variability in techniques, surface finish and lip and rim form, technical choices – often the product of embodied practices inculcated in the community of practice – can be imbued with more meaningful interpretations of social conceptual knowledge and categorical systems within society.

Taking the analysis down to micro-scalar variability, the range of minute differences in mouth orientation, rim shape, lip style and lip shape as separate variables make the lip and

Primary Permutations			
Lip Shape	**Rim Shape**	**Lip Style**	**Designation**
Rounded	Simple	Neutral	IA1
Rounded	Simple	Thinned	IA3
Rounded-Flattened	Simple	Neutral	IIIA1
Rounded-Flattened	Simple	Thinned	IIIA3
Flattened-Rounded	Simple	Neutral	IVA1
Flattened	Simple	Neutal	VA1

Permutation Cluster	Number in Cluster	Number of Examples	Percent Assemblage
Primary	6	598	57%
Secondary	5	113	11%
Tertiary	9	130	12%
Quaternary	21	118	11%
Unique Examples	24	36	3%
Unknown	1	46	4%
Total	66	1041	1

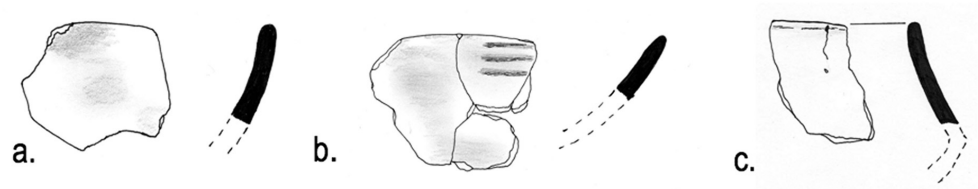


Fig. 11.4: Rim and Lip production permutations. Examples below include a. IA1, b. IA3 and c. IIIA1. Evidence of individual practice and community-based learning.

rim an interesting arena for exploring inculcated practice, individual expression and the individual materialisation of a broader social aesthetic. A combination of practical knowledge – such as how much pressure is exerted on the clay or how much smoothing is employed around the lip edges – and the lack of strongly instituted rules over lip shape within the technological repertoire results in a gradient of acceptable lip shapes between roundness and flatness (Fig. 11.3). The diversity of these permutations in the assemblage suggests that any of the ranges within this continuum were considered appropriate lip shapes. Importantly, the actual differentiation between variations may have been noticeable and meaningful within the community, but as they remained in keeping with the acceptable aesthetic for lip and rim form they were not categorically differentiated. These features were then combined in very flexible permutations with other 'finishing touches' around the rim and are applicable to the majority of vessel forms. Thus, in terms of lip shape we see the inculcation of practical and individually embodied knowledge affecting the materialisation of the technological knowledge systems. However, these same techniques and choices also have knock-on effects on the materialisation of other practical techniques of rim form production, some of which may be more rigorously structured, and which also contribute to the creation of conceptual knowledge categories.

If we then consider the practical employment of embodied techniques in relation to other rim and lip variables (such as orientation, which is also affected by shape categories), we see a set of linked choices, or permutations, consistently being used by the potters at San Blas. Immediately, and unsurprisingly, it is obvious that not all possible permutations were materialised by the community's potters and many potential permutations do not seem to have even been produced experimentally or as one-offs. Patterning suggests social rules regarding the practice of technological knowledge structured and channelled the potters' physical and embodied technique, style and aesthetic into appropriate forms and ways of making. Appropriate pottery was not homogenous in its visual characteristics, and variability and expression had their place. Variability and expression, however, existed within boundaries. An analysis of rim and lip attribute distribution frequencies demonstrated five different levels, or clusters, of acceptable permutation within what might be considered appropriate San Blas pottery. These permutations were then ranked based on their prevalence and repeated patterning in the technological repertoire.

Primary permutations were the most prevalent set of linked lip and rim visual characteristics (see Fig. 11.4). They were dominated by simple (where the rim follows the natural line of the vessel body) and thinned (where the lip is more than 2mm thinner at the lip than at the juncture with the neck of

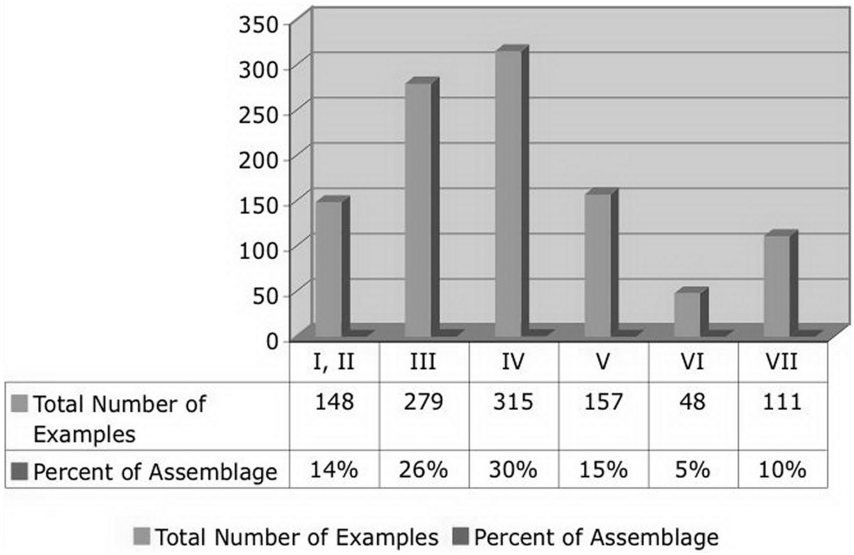


Fig. 11.5: Surface Finish Quality. Evidence of technical choices for creating a community-based visually appropriate vessel.

the vessel) rim and lip forms. The repeated presence of some permutations suggests technical traditions, styles of making and learned *habitus* within the community (see Dietler and Herbich 1989, 1998, Gosselain 1998). Non-existent permutations must also be considered in terms of materialised knowledge as their absence suggests the physical and technical restrictions within the technological knowledge repertoire of the potter due to their socially dictated practicality or logic; those permutations are simply not possible either as potential embodied practices or conceptual knowledge. Thus, both prevalence and presence of particular permutations is significant when considering the technological-social knowledge of pottery production and its materialisation.

All the variables and techniques employed in the creation of the rims and lips of the San Blas pottery embed within the fabric of social knowledge. This means that all of the variables and techniques present in the assemblage recursively inform the choices – unconscious and conscious – for pottery production in any given context. Thus, as an arena of high variability within the potting *chaîne opératoire*, the formation of lips and rims is complicated, dynamic and informed strongly by both unconsciously and consciously inculcated bodily and social practices. Can the same be said for surface finish?

Surface finishing procedures reflect technological knowledge in terms of the type and technique of finish produced and social knowledge in terms of knowing which finish is appropriate to which vessel and later post-production use context. Of course, these two realms of knowledge overlap and in a practical reality they cannot be separated. However, the knowledge employed in creating a specific surface finish, perhaps more than during lip formation, is often an overt decision even if the techniques and bodily actions are inculcated. Decisions such as time, labour, post-production use and other non-technical considerations affect whether surface finish is simply a smoothing of the exterior, whether it is burnished, or even, whether it is decorated with incised or painted motifs. For the purposes of this discussion, I want to make clear that surface finishing does not include decoration. Based on the *chaîne opératoire* evidence it appears that primary surface finishing and surface decoration were distinct procedural steps. The rationale for this separation was twofold: first, the majority of sherds in the study are not decorated (in terms of incised or painted motifs) and, secondly, all decorated sherds went through a primary surface finishing stage where they were smoothed, polished or burnished prior to the decoration process (see Kohring 2007 for further discussion). Thus, primary surface finish refers only to the production step in which the vessel was smoothed, polished or burnished and excludes secondary stages where the vessel surface may have been further decorated.

At San Blas, the most common *chaîne opératoire* procedure for surface finishing was intensive smoothing of the pottery body with the hand, fabric or a hard object. The polishing/burnishing process does not necessarily require specialized knowledge, but does reflect an investment in production activity within this realm of technical choices and a certain amount of bodily repetition depending on the intensity of the act and desired surface finish outcome – especially with highly burnished vessels. The intensity of the surface finishing investment and activity was placed on a continuum and rated from I/II (Intense/special finish, including burnishing until the texture is hard and slick to the touch and with a shiny visual nature) to VI (Low intensity finishing, such as basic smoothing and wiping of the surface with soft material leaving a slightly rough feel and matte visual look) (Fig. 5). All sherd surfaces (unless otherwise eroded or encrusted due to post-depositional

erosion) indicated vessels were well smoothed, with 60% of the assemblage having been polished or burnished. While this process of polishing/burnishing had technical repercussions that might have been related to functional knowledge (i.e. making the surface impermeable) it also had social affects, creating a visually and texturally specific aesthetic, which might have had implications for potential use and display choices.

Thin-walled *paredes finas* and black bowls are the most commonly burnished forms and important, socially meaningful vessel categories at San Blas. They are found in public and domestic contexts, suggesting a display or consumption use-context in which their visual characteristics would have been important for establishing their appropriateness. Again, this is the interplay of social and technical knowledge co-informing each other. Socially constructed concepts such as style and aesthetic preferences intersect with use contexts and affect the *habitus* of the potter during the production of the surface finish. A surface aesthetic would have been achieved during the production process through visual cues (i.e. the increasing shine from the surface) and the feel and texture of the surface as it became increasingly slick or silky to the touch. A recursive relationship between social and technical would emerge with increasing skill and experience; as a potter's experience regarding differential surface treatments and their appropriate application grew in competency, they could assess the time and labour required to create the desired aesthetic and manipulate the entire *chaîne opératoire* accordingly. Unlike the variability of individual *habitus* or inculcated practices seen in the arena of lip and rim formation, surface finish represents a subtly different type of engagement with the technical and social knowledge. This type of technical engagement reinforces a social aesthetic as channelled by bodily knowledge of the visual and tactile experience; not only for the producer, but for all those engaging with these vessels in post-production settings and contexts.

When completed, the surface finish may be seen to materialise social knowledge within an understood framework of material culture, as conceptual categories of social use and meaning, while the lip and rim forms may materialise a slightly different set of social knowledge regarding community based relationships and preferences. Together, all these types of knowledge are materialised through practical engagements both in the technical process and social use. Looking at the production of pottery, we can see many conventions and heterogeneities. Lip and rim variability is highlighted, but other elements open for individual expression and preference include decoration and orifice size, while conventions are much more rigorously held for vessel form, surface finish and paste recipes (Kohring 2007). The creation of socially appropriate pottery affects both the production stages which show great consistency or even standardization, as well as those stages that permit more variability and expression within the acceptable range. These visual characteristics are the key to the engagement, relationships and knowledge networks being materialised.

The *habitus* and Community of Practice of the San Blas Potter

The social 'situatedness', experience and learned behaviour of the San Blas potters structured how they, as embodied and community-based individuals, linked up the different choices and potentials available in each pottery production event. Mechanical reproduction of techniques does not result in homogeneity and each vessel shows the subtle variability as event, technique and choice coalesce in slightly different ways with each production activity. Consistencies and patterns are, however, equally evident in the technical repertoire. Conventions of production, or the steps rigorously structured and held to great conformity, sway the technological knowledge system as much as the steps and attributes of production which are less constrained. The *chaîne opératoire* as such provides a conceptual framework about social appropriateness and a method for producing an appropriate vessel (see van der Leeuw 1993 on conceptualizations and executive functions). Yet, any *chaîne opératoire* must be inculcated through practice and this happens through learning within the community setting.

The San Blas potter, like all his/her contemporaries within the community, materialised the social realities, rules and relationships which structured the community of practice to which they belonged. Thus, while the potter had a choice in the creation of a unique vessel (albeit structured by the *chaîne opératoire*), these options were highly contingent on the inculcated social and technical knowledge of learned practices. The learning of both technical skill and social aesthetic are channelled through the community of practice so that practices, even those that become inculcated or are non-discursive, are socially reproduced in meaningful cultural ways (see Wenger 1998). Let us consider embodied practice and community practice more dialectically. *Habitus* and structuration, which we may use to refer to the community of practice process, are crucial in appropriately executing technological knowledge because technological systems are intertwined with the materialisation of the social worlds in which producers/consumers are engaged. Shared technological systems, linked to contexts of social engagement, create communities of practice because they materialise the relationships between people and their world; the act of production is a materialisation of your social, and community, understanding of the world.

Furthermore, multiple meanings are always embedded in material culture during production and use, and the meanings and relationships being explicitly materialised often reflect the social context and personal relationships affecting any given event. Thus, different production and use patterns within a community may represent different access to technological and social knowledge, different social responsibilities and duties, and different social status among community members (see Gosselain 2006). The assemblage comparison among San Blas households supports differences in household groups. A look at the intensity of production (such as that of burnishing and

surface finishing), found that in one household (H22) three different levels of technical investment could be seen in the assemblage (Kohring 2007). These three levels of investment were equally represented in production activity and within the domestic contexts and it may be that they represent multiple producers at work, perhaps relating to skill and the learning process within a microcosm of the San Blas potting community of practice.

The San Blas pottery assemblage and its distribution represents the conceptualization of a pottery aesthetic and style as channelled through the community of practice and individual potters embodied technical practice. By looking at the patterned range of variability employed within the numerous production sequences and individual events, we can access the palimpsest of individually 'situated potters' within their community of practice, enacting a technological and conceptual knowledge of production and aesthetics with each potting event and decision. The exploration of lip and rim variability and primary surface finishing provide two ways of understanding the situated potter's *habitus* and how the community of practice shapes the materialisation of this technical knowledge. While the community of practice maintained a *chaîne opératoire* which structured pottery production in highly patterned ways, certain elements were more open to individual reflexes, choices and contingencies. The consistent pattern of polishing and even burnishing the vessel surface indicated an aesthetic ideal regarding the visuality of appropriate San Blas pottery. On the other hand, the great diversity of minute lip variations represent an attribute that in some ways is difficult to control, as it often integrates a great deal of bodily technique, which was learned within the community of practice.

Conclusions

This case study compares just two steps within the potting *chaîne opératoire* employed at San Blas. These two steps, however, demonstrate the inherent variability of production and show the materialisation of social and technical knowledge at work within a presumably close community of potters. Yet, by looking only at either the technical or the social aspects of pottery production, the societal wide conceptual knowledge of production and use is only partially accessible. Pottery, like all material culture, must be embedded into webs of socio-technical knowledge systems which crosscut both production and use and reflect a diversity of knowledge and meaning within society. Conceptual knowledge maintains an aesthetic regarding what makes an ideal San Blas vessel, but the practical reality within the assemblage suggests that this aesthetic permits variation within certain production choices and attributes. Based on the variation in rim and lip styles, it is argued these elements were open to potters for expressing their own unique styles and signatures on the vessels they produced. Choice, however, was still affected by individual potters' embodied knowledge, the community of practice in which they learned their *chaîne opératoire* and the wider community of practice in which they learned their own sense of aesthetic.

In comparison, other attributes may be more constrained by the aesthetic ideal. The individual choice of surface treatment, which could have been done in different ways, seems in practice to have been much more restricted. The community aesthetic seems to have required vessels with a well-polished finish. This has implications beyond the production event as the visuality and materiality of the polished and burnished vessels provided an overall sense of unity and appropriateness to the San Blas pottery assemblage. Through use in daily social contexts, this visual aesthetic would have been an important attribute for defining the Copper Age San Blas community and hence seems to have been rigorously adhered to within the *chaîne opératoire* for producing pottery.

Communities of practice, as learning contexts and dynamic social networks, do not reproduce material culture mechanically. Each individual is a member of many overlapping communities and communities of practice and, in terms of any technical act, they bring with them many different experiences and skills. The enacting of many embodied materialisations of technical and social knowledge results in variability. The aesthetic ideal of what constitutes an appropriate vessel must incorporate differences to allow for individual stylistic expression, skill and choice as much as it must restrict variability in other attributes. This mediation between individual choices and wider aesthetic ideals is maintained by the potting community of practice and the teaching and inculcation of social knowledge through practical actions of the *chaîne opératoire*. The materiality and visual cues of the vessel, however, further extend this knowledge beyond production and into other social contexts, informing appropriate contextual use and engagement throughout the entire community. The sharing of social and technological knowledge is crucial for the reproduction of social systems within communities. Technology, as the materialisation of society through the production of appropriate material culture, becomes an integral avenue for exploring the convergence of inculcated practice, embodied knowledge and social knowledge systems.

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