Reading Archaeological Evidence: Ceramic and Terracotta Production at Indor Khera, Uttar Pradesh (200 BCE–500 CE)

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Abstract

While substantial work has been done on Harappan crafts from the point of view of technological processes, spatial contexts and organisation, there is hardly anything that is known about aspects of technology and production in the early historic period. For the latter, the focus has largely been on stray artefacts rather than documenting other kinds of evidence such as debitage or waste, although more contextual information on craft production in the early historic period is beginning to emerge from sites excavated more recently. This, however, is still fragmentary in nature, in contrast to the archaeological evidence on ceramic and terracotta production that we have been able to retrieve from the site of Indor Khera in the upper Ganga plains between the period 200 BCE and 500 CE. This is in the form of tools, such as anvils, socket stones, pottery stamps, bone engravers, stone polishers; firing facilities; lumps, rolls and pellets of clay and terracotta that represent raw material used for various processes and objects; deposits of sand used perhaps for tempering; unbaked artefacts; wasters or over-vitrified material; rejects or misshapen objects; as well as the variety of ceramic and terracotta artefacts that were being produced. More important, this range of evidence has been recovered concentrated within four adjacent houses at the north-western edge of the ancient town of Indor Khera.

Keywords

Indor Khera, ceramic and terracotta production, 200 BCE–500 CE, craft indicators, potters' houses, organisation of craft.

It is a little surprising that though pottery and terracotta artefacts comprise the largest component of excavated assemblages, yet there is scant evidence for their production from archaeological sites in South Asia, save for Nausharo, a Harappan site in the Kachi plain in Baluchistan.[1] Early archaeologists working on the Harappan civilisation, such as Marshall and Mackay, had shown considerable interest in production by their recording of possible craft tools, facilities and unfinished objects. This was the initiation of research on craft activities that really took off from the 1980s in the Indian subcontinent when Vidale and Kenoyer used the methods of ethnoarchaeology and experimental archaeology to study processes as well as organisation of crafts. In the ethnoarchaeological work on crafts, the focus is on present-day communities that are still practicing craftworking, in that all aspects relating to crafts such as material procurement and processing and formation of objects are to be recorded. However, the value of such documentation arises only when questions of archaeological relevance are addressed; otherwise such observations would remain purely ethnographic. In contrast, actual experiments are conducted in experimental archaeology to ascertain whether a certain technique may have resulted in the archaeological object under study. Thus, ethnoarchaeology uses observation, while experimental archaeology uses simulation.

While ethnographic studies of numerous crafts have been undertaken from the nineteenth century onwards, it was Kenoyer who first undertook an ethnoarchaeological study of shell working in the Harappan context.[2] This was followed by the work at Khambhat, located at the head of the Gulf of Khambat. The study of Khambhat bead making undertaken by Kenoyer, Vidale and Bhan[3] employed both ethnoarchaeology as well as experiments aimed at reconstructing bead making techniques. Khambhat became important from the ethnoarchaeological point of view because the craft is still being practiced in homes and workshops in the city giving clues to understanding ancient bead making techniques. These archaeologists undertook detailed recording of bead making at an organised workshop as well as in an 'entrepreneurial' set-up. In the former workshop, they found demarcated spaces for storage, offices and craft processes. In the latter type of working area, there were few strictly demarcated areas with most of the production activities including chipping, storage, drying of nodules and dumping taking place in the same area. Various processes within bead making were recorded and earlier processes that crafters remembered were also documented. This was necessary in order to gain analogues for ancient crafts, particularly when several modern processes utilised facilities like electricity which would have been unavailable in the past. In such instances, experiments were conducted utilising older techniques to gauge how long individual processes would have taken to complete.

A surface survey of the site of Mohenjodaro in Sind was conducted by a German-Italian team as part of a non-invasive strategy of further studying the ancient site.[4] The

[1] Mèry, 'Excavation of an Indus Potter's Workshop'.
[2] Kenoyer, 'Shell Working Industries of the Indus Civilization'.
[3] Kenoyer, Vidale and Bhan, 'Contemporary Stone Beadmaking'; Kenoyer, Vidale and Bhan, 'Carnelian Bead Production'.
[4] Jansen and Urban, *Interim Reports Vol. 1*.

Mohenjodaro surface survey was significant as it revealed distinct areas where crafts and craft processes were undertaken. Information from the surface survey thus can be used to supplement the data recovered in excavation. The survey brought to light the evidence of manufacture of an unusual Harappan artefact—the stoneware bangle. Called as stoneware by early excavators on account of the hardness of the ceramic material, these bangles are composed of specially prepared clay. Halim and Vidale[5] reconstructed the techniques of firing of these bangles through finds of material eroding on the surface of the mound. Experimental studies using the skills of a modern skilled potter, Mohammed Nawaz, at Harappa by Kenoyer[6] suggested that the production of these bangles would have required extensive clay preparation, tempering additions, wheelworking and polishing of the finished bangles.

After these disparate efforts, Vidale's monograph was an attempt to place all the work that had been done on Harappan craft techniques in one volume. In addition, he has also dealt with issues related to the spatial and temporal organisation of crafts. Many of the Harappan crafted objects played 'important roles in the strategies of social comparison, inter-societal communication and the legitimation of the dominating ideology and social orders'.[7] Both Kenoyer and Vidale have also tried to understand the social role of using not just specific rare materials but also of creating new materials.

While most of the studies mentioned earlier deal largely with issues of techniques within specific archaeological contexts, a more recent study seeks to address much larger questions related to technology, technological change and the social contexts of technology. Within a temporal frame encompassing the Neolithic to the Iron Age cultures of South Asia, Ratnagar[8] tries to locate 'the connections between techniques and tools and between technology and social factors' and also explores 'the possible social and economic consequences of technological innovations'. For her, the key variable in the development of technology, the persistence or the disappearance of technology, is 'the labour process and the organization of labour'.[9]

Miller[10] while giving a useful overview of different archaeological approaches to technology emphasises on interactions across crafts. Such an interest emanated from her initial work on a comparative study of Indus pyrotechnologies, where different crafts such as metal melting and smelting, pottery firing, vitreous material production may have shared,

> […] a common need to create tools and techniques for dealing with the production and control of high temperature fires. Quite often, these crafts are firing objects at a temperature above the vitrification point of the clays used to make the firing structures and associated tools

[5] Halim and Vidale, 'Kilns, Bangles and Coated Vessels'.
[6] Kenoyer, 'Experimental Studies'.
[7] Vidale, *The Archaeology of Indus Crafts*, p. 128.
[8] Ratnagar, *Makers and Shapers*, p. 1.
[9] *Ibid*., pp. 229–30.
[10] Miller, *Archaeological Approaches to Technology*.

> (crucibles, setters, containers). A clue to the degree of interaction between craftspeople is thus whether or not they used the same methods to solve this problem, all else being equal in the production process.[11]

Coming closer to the period with which this article is concerned, craft indicators have been identified at several sites as early as Marshall's work at Bhita near Allahabad. These include moulds for printing on cloth or pottery, crucibles and 'jeweller's melting pots' and 'dabbers'.[12] Although some of these objects are mentioned in relation to a house, we do not have more specific information as to their exact location vis-à-vis rooms or open spaces. Moreover, the concentration remained focused on stray artefacts rather than documenting other kinds of evidence such as debitage or waste. The same kind of information has been cited from the site of Taxila near Rawalpindi.[13] However, some recent excavations have presented a different picture. At Sonkh near Mathura, for example, craft indicators such as 'dabbers' have been retrieved and recorded contextually.[14] Numerous other craft indicators such as pottery moulds, pottery stamps and coin moulds have also been documented.

At Arikamedu near Pondicherry, Wheeler[15] had identified a brick structure in the Northern Sector as a warehouse and several enclosures in the Southern Sector as tanks, possibly for the dyeing of cloth. Based on this, he felt that the Northern Sector was the port area while the Southern Sector was 'industrial' in nature. Begley,[16] however, has more recently argued that drains were added at a later stage to several of these enclosures. Further, these enclosures showed

> ...no traces of paved floors or drainage outlets, nor any discolouration of the sand/soil remaining to indicate organic discharge. From the evidence they could not have been intended for dyeing of textiles…. Their function was probably not related to 'industrial' production, at least none can be recognized, but more likely to storage of 'industrial' or agricultural products. In any event the purpose of these enclosures would appear to be related to commerce rather than identifiable domestic or residential use.

Casal[17] in his excavations in the Southern Sector had found a cluster of small 'workshops' with evidence of working in glass, semi-precious stones, ivory and shell, but the information was not published in detail. The Pondicherry Museum does have a large quantity of debitage as well as chunks of raw glass and mica sheets which indicate a measure of ancient production. While neither Wheeler nor Casal found any evidence for craftworking in the Northern Sector, Begley in her excavations recovered a furnace-like feature along with wasters of semi-precious stones and shell as well as a dump

[11] *Ibid*., p. 240.
[12] Marshall, 'Excavations at Bhita', pp. 81, 83–84.
[13] Marshall, *Taxila*.
[14] Härtel, *Excavations at Sonkh.*
[15] Wheeler, Ghosh and Deva, 'Arikamedu'.
[16] Begley, 'Changing Perceptions of Arikamedu', pp. 17–18.
[17] Cited from *ibid*., p. 18.

of amphora sherds, all suggesting craft waste. Francis[18] points out that craft working was not limited only to the Southern Sector of Arikamedu. In fact, glass making and tube drawing was concentrated in the Southern Sector while the cutting of tubes into segments was done more in the Northern Sector, indicating sub-specialisation within the craft. As far as stone bead making is concerned, both sectors showed evidence for the craft. Yet, while undoubtedly there are craft indicators at Arikamedu, the specificities of their occurrence within workshops and/or houses are not so clear.

Kodumanal located on the north bank of the Noyyal River in Tamil Nadu is another site from where craft indicators for lapidary, iron working and weaving have been reported for the period 300 BCE and 100 CE.[19] The evidence for bead working lies in the number of undrilled and unpolished specimens found along with finished stone beads. The range of stones being worked includes quartz, carnelian, sapphire, agate, jasper, beryl, garnet, lapis lazuli and steatite. Of these, quartz, beryl and sapphire are available within 15 km of the site while the others must have been brought in from further away. The indicators for iron working include lumps of iron slag near the southern part of the habitation as well as the base of a furnace and terracotta tuyères. From the northern part of the settlement were recovered a large oval shaped furnace surrounded by a number of smaller furnaces along with vitrified crucibles. Spindle whorls along with a piece of preserved cotton are cited as evidence for weaving. The site is supposed to have functioned as an 'industrial' centre, although a more appropriate term would have been craft centre. While there clearly is evidence for stone bead making and iron working, it would have been useful if the excavator had provided quantifiable details for the debitage. Was the evidence for craftworking found within houses, in rooms or in courtyards? Or did production take place in non-domestic contexts such as 'workshops'?

Evidence for glass production has been noted at Kopia in eastern Uttar Pradesh. Recent excavations at the site have revealed indicators for glass working in the form of a furnace, tuyères, pot crucibles with molten glass and thousands of chunks and wasters of raw glass.[20] These were found in the north-western part of the mound outside the fortified area. Two radiocarbon dates of charcoal samples from the furnace of the second century CE suggest that production took place in the Sunga-Kushana period. Though there is an oblique reference that the working and living areas were separate in the northern part of the site, there is no structural evidence for actual workshops within which glass was produced.

Coningham[21] was able to study the evidence for craft production at the site of Anuradhapura in Sri Lanka. From Period I dated to 350–275 BCE and from Period G dated 275 BCE–200 CE were found craft indicators in association with a structure in each period. In Period I, a structure with 87 posts covering 40 m², comprising two

[18] Francis, 'Beads and Selected Small Finds', pp. 491–96.
[19] Rajan, 'New Light on the Megalithic Culture'; Rajan, 'Further Excavations at Kodumanal'.
[20] Kanungo, 'Antiquity of Glass in India'; Kanungo, et.al., 'The Radiocarbon Chronology of Kopia'.
[21] Coningham, 'The Spatial Distribution of Craft Activities'.

rooms connected by a corridor or verandah was excavated. Semi-precious stone micro-debitage was found within the structure (one fragment in the verandah/corridor, two fragments in the northern room and one fragment and one undrilled bead blank of carnelian in the southern room). Two worked shell cores were found in the northern room and one worked shell core was found in the southern room. One crucible fragment in the northern room and one fragment of slag in the southern room was the evidence for metal working. From outside the structure were found two slag fragments, worked shell cores, semi-precious stone and micro-debitage and part of a worked deer antler.[22] From Period G was found a wattle-and-daub structure of six rooms measuring 10 m long and 4 m wide. Within this structure were found three fragments of micro-debitage and four fragments of slag. To the north of the structure was a paved area which showed evidence for working of glass, shell, metal, semi-precious stones and ivory.[23]

Coningham has surmised from the foregoing evidence as well as the information regarding craft indicators from Bhita and Taxila that the early historic cities showed a strong preference for multiple crafts co-occurring together within the same space. However, the evidence cited for such a generalisation is too scanty and much more work needs to be done. But he has validly pointed out that the normative pattern of space delineated for separate crafts as written in the *Arthaśāstra* does not show up archaeologically.

On the whole, while substantial work has been done on Harappan crafts from the point of view of technological processes, spatial contexts and organisation, there is hardly anything that is known about these aspects of technology and production in the early historic period. An early excavator like Marshall left out any evidence of debitage and incidentally listed artefacts at Bhita and Taxila that were related to craft production. Later excavations as at Mathura too have artefacts like pottery stamps reported[24] but with no discussion on their context. More recent excavations such as at Arikamedu, Kodumanal and Kopia have registered most categories of craft indicators but have perhaps not found these contextually within structures. It is this lacuna for crafts in the early historic period that we wished to address when we began excavating Indor Khera, a small urban site in the upper Ganga plain.

The excavations undertaken at Indor Khera in three seasons will be discussed in the following section. These began in 2006–07, followed by a gap year, and were continued in 2008–09 and 2009–10. Summary information on the site, its location, the evidence in the form of structures and the chronology will be presented here.[25] The discovery of craft quarters at the north-western edge of this settlement, in particular

[22] *Ibid*., pp. 358–59.
[23] *Ibid*., pp. 360–61.
[24] *Indian Archaeology: A Review*, p. 32.
[25] While a more detailed discussion of the first season can be seen in Varma, S. and J. Menon, 'Craft Quarters at the Edge of a Settlement: Indor Khera 200 BCE–300 CE', *Journal of Interdisciplinary Studies in History and Archaeology*, 2009, Vol. 6, forthcoming, the documentation of our work in the other two seasons is ongoing.

potter's houses, and different phases of domestic architecture comprise important evidence for the period dated between 200 BCE and 500 CE.

The Site of Indor Khera

Indor Khera (28°14'57"N, 78°12'48"E) is located in Tehsil Debai, Bulandshahr District, Uttar Pradesh on the Chhoiya Nadi, also called Nim Nadi. The site lies between the rivers Kali Nadi and Ganges, and is about 10 km away from the Ganges River. The mound measures 285 m (North–South) × 428 m (East–West) with a maximum height of 17 m, with the present-day village of Indor extending over the entire eastern, north-western and south-eastern portions of the mound and the adjacent area.

As the area under the present village was not going to be excavated, only the unoccupied parts of the site were gridded on a 10 × 10 m grid. The layout of squares followed this grid. The northernmost point on the North–South reference line was G 0. This also marked the southern limit of the present-day village in this part of the mound. South of G 0, each consecutive East–West row of 10 × 10 m squares was labelled as A, B, C and so forth. In turn, the squares to the west of the North–South reference line were labelled as A1, A2, A3, A4 and so forth. The squares to the east of the reference line were labelled as ZA1, ZA2 and so forth. Each 10 × 10 m square was sub-divided into four sub-squares of 5 × 5 m and these sub-divisions were in turn labelled. For example, the 10 × 10 m square, B1 had four 5 × 5 m sub-squares, labelled as B1a, B1b, B1c and B1d with B1a as the north-west sub-square and the others following in a clockwise direction.

Trial soundings taken earlier in the south-western part of Indor Khera in 2005–06 had given us a stratigraphic profile of the site.[26] Our intention was to undertake horizontal excavations of the early historic period in order to map houses and activity areas within and outside houses. A survey of the mound had revealed, in the north-western area of Indor Khera, a flat exposed ridge halfway down the slope of the mound. This ridge has been created by the cutting away of the mound and construction of houses in this area by local villagers. A systematic intensive survey along with a close examination of the exposed sections in present-day houses in the adjacent area indicated the potential of excavating here.

In all, the following squares and sub-squares were excavated in this area in the three seasons: A1c, A1d, A2c, B1a, B1b, B1c, B1d, B2b, B2c, C1a, C1b, C1c, C1d, C2b, C2c, D1a, D1b, D1d, D2b, D2c, ZB1a and ZB1d. The reason why in some places only parts of sub-squares could be opened was due to the encircling ridge or the edge of the mound.

The domestic architecture comprised walls which in all cases were oriented in the cardinal directions. These were constructed both of mud-bricks as well as burnt bricks.

[26] Menon et al., 'Indor Khera Revisited'; Menon, J. and S. Varma, 'Everyday Objects, Pottery Production and Non-elite Houses in the Medieval Period at Indor Khera', *Journal of Interdisciplinary Studies in History and Archaeology*, 2009, Vol. 6, forthcoming.

There were also traces of mud plaster on the bricks. It is possible to recognise that these walls were constructed in different phases. Houses and features were traced in A1c, A1d, B1a, B1b, B1c, B1d, B2b, B2c, C1a, C1b, C1c, C1d, C2b, C2c, D1a, D1b, D1d, D2b, D2c, ZB1a and ZB1d. We identified three structural periods in the deposits that we excavated. In Period I there were no brick structures. We first encountered baked brick structures in Period II and what is striking is that in this period, whole bricks were used in construction. However, in the upper parts of Period II, structures of brickbats begin to be found, which continue into Period III.

In Period I, we exposed several mud floors, as well as two furnaces in trench B1c. We were able to reach natural soil in trench B1c in this part of the mound. Natural soil was reached at 14 m. The earliest occupations here (painted grey ware and black slipped ware) correspond with what was exposed in the trial cutting A3 in the south-western part of the mound.

In Period II a mud-brick platform in trenches B1a and B1d was exposed. There was also evidence of two rooms with a brick-paved area in B1b. With these were associated the firing facilities comprising reddish deposits and rammed brickbats found in trenches B1a and B1d. These firing facilities continued to be used in the next sub-phase in which was found a mud-brick house in trenches B1a and B1b. Belonging to a slightly later phase was a large house (House 2), with five rooms and two possible courtyard spaces, that covered trenches B1c, B1d, C1a, C1b, C1c and C1d. Walls 1, 2 and 3 in trenches B1c and C1a from the 2006–07 excavation were now found to be part of this house. We identified several sub-phases for this house. Further north in B1b and ZB1a were exposed walls of another house (House 1) which was contemporary to the above-mentioned house. It is in association with these houses that the circular platforms of white ashy deposits were found (in trenches C1b, Zb1a and ZB1d), suggesting that these were the houses of potters. Belonging to the same phase were found two other houses (Houses 3 and 4) in D1a, D1b, D1d, D2b and D2c. The western part of House 3 has been recovered with the eastern portions under the overhanging ridge. The whole of House 4 has been excavated. Several walls, made of brickbats, and facilities were found though no plan could be identified in the upper parts of Period II. These included two East–West walls in ZB1d, a North–South wall in ZB1a, a brick paved area in B1c, a hearth in C1b, as well as random alignments in C1b and ZB1a. The evidence for Period III has been recovered from Zb1b, Zb1c and the eastern half of C1c.

On the basis of structures, artefacts and pottery, we have tentatively dated the different periods as the following:

Period I: 1200 BCE–200 BCE
Period II: 200 BCE–500 CE?
Period III: 500 CE?–1200/1300 CE?

At this stage, we still do not have very clear evidence regarding the dates for the end of Period II as well as when the occupation in this part of the mound came to an end. From the surface has been found a six-*jital* (*shashgani*) coin which has been dated to the thirteenth and fourteenth centuries CE, suggesting that occupation continued here

at least till this period. In this article, however, we will be primarily concerned with Period II.

From the excavated deposits of Period II we have found stamped potsherds, sprinkler forms, tiny sherds of wares with a black slip or polish and a red core and sherds of fine grey ware. The bulk of the pottery comprised red wares. Also excavated were terracotta stamps used for decorating pottery.

Out of a total of 46 copper coins recovered from the north-western part of Indor Khera till date, only seven have been conserved and cleaned.[27] Out of these, three are datable to the Kushana period, three are entirely unreadable while the last is a square punch-marked coin. A coin from the reign of Huvishka was excavated from sub-square B1b. From the same sub-square and depth was found a coin with part of the dotted flan still visible but the rest was unclear. Three coins, stuck together, came from sub-square C2a, out of which only one was well preserved. This is a coin of Vima Kadphises, showing the king on the obverse, standing with his head turned to his right, offering with his right hand to an altar and on the reverse is a figure of a bull. This is similar to the gold coin illustrated by Gupta.[28] Another Kushana coin with the king on the obverse with part of a Greek legend still visible, and a completely mineralised reverse side, was recovered from the same sub-square and depth. The copper punch-marked coin was found in square B1c. While the Kushana copper coins were found from the upper deposits, the few sherds with black slip or polish and the copper punch-marked coin were found from the lower levels. According to Gupta,[29] copper punch-marked coins are found from the post-Mauryan period from the Magadh-Anga, Mathura and Mewar regions.

Ceramic and Terracotta Production at Indor Khera

> As far as the archaeological evidence regarding the place of production and distribution of these objects [terracottas] is concerned, there is little that can be said. Jayaswal shows that production centres for ritual figurines in the present areas of Uttar Pradesh and Bihar invariably continued to be located within the *Kumhāra-tolīs*, the residential areas of the potter communities. These *tolīs* are usually situated at the outskirts of large settlements. *Any archaeological precedent for this ethnographic situation is absent. No single centre or workshop area of pottery production converging on the residential areas of potters has thus been recognized so far from any habitation in the Ganga Valley. The reasons may be that archaeological ruins of such concentration would be represented by equipment of a very general and perishable material. Clay lumps, ash pits, and potsherds from kiln remains may not form a distinctive or recognizable pattern to archaeologists*. (our emphasis)[30]

[27] Seven coins were found in the first season and we were able to identify them after they were cleaned and conserved. However, the coins found in the subsequent two seasons are yet to be cleaned by the Department of Conservation, National Museum Institute, New Delhi.
[28] Gupta, *Coins*, Plate VII, 64 and Plate VI, 62.
[29] *Ibid*., p. 22.
[30] Agarwal, 'Terracottas from Mathura', pp. 246–47.

The argument clearly shows a lack of understanding of the methods of excavation, retrieval and recording of archaeological data. What is even more surprising is the inability to recognise that terracotta production is actually going to leave tangible evidence. Not only will tools, clay lumps, deposits of tempering material and ash pits survive, but so will unbaked objects. The relevant point is not the absence of archaeological evidence for production at early historic sites. As pointed out earlier, it was an over-emphasis on the retrieval and recording of 'antiquities' rather than a complete documentation of the material record that has created this impression.

In fact, excavations in the north-western part of Indor Khera have provided us with considerable evidence for ceramic and terracotta production in association with houses. In this section we will be detailing the data on production that we recovered in one particular season, which is 2008–09. A very careful excavation and recovery method has enabled us to retrieve quantitative data on almost all aspects of ceramic and terracotta production, something that has not been reported from any of the excavations of the early historic period in the past.

Before we start discussing the archaeological evidence from Indor Khera, we need to briefly refer to the stages of ceramic and terracotta production. Much of this discussion has been excerpted from Rice.[31] The first stage in ceramic production is procurement of clay after which the clay is processed. The processing of clay requires either or both of two procedures: the removal and/or the adding of material to the clay. What are removed are inclusions such as vegetal matter, small stones and so forth. The clay is also beaten/crushed/ground/sieved. What are then added are known as 'modifiers' or 'temper' which could be sand, ash, crushed rock or shell or potsherds (known as 'grog'). Dung may also be a tempering agent as well as finer clay itself. These inclusions or aplastics are added to give strength to the clay for the formation of vessels. Once these are used in the required proportions, water is added to the clay mixture to make it plastic and the whole is kneaded like bread dough and wedged to further clean the clay and to remove air pockets. Kneading can be done with the hands and/or foot and wedging with a sharp-edged tool or a wire (or even with the hands as seen among modern potters at Indor Khera). Lumps of clay are prepared to be formed into vessels. Vessel forming itself can be done without the wheel which then involves techniques such as pinching, coiling or slab building. The first is the simplest clay-working procedure and is usually used for making small vessels. The clay lump held in the palm is rotated between the fingers of the other hand. This technique is probably the earliest known and one by which children begin to experiment and play with clay.[32] In the second, coils or long rolls of clay are made by rolling between the palms or between the palms and a flat surface and coiling the rolls to make the vessel wall. The joints between the coils are smoothened by later finishing treatments. Slab building involves making vessels out of slabs of clay which are rolled or patted flat and then

[31] Rice, *Pottery Analysis.*

[32] See Menon, J. and S. Varma, 'Children Playing and Learning: Crafting Ceramics in Ancient Indor Khera', *Asian Perspectives*, Vol. 49 (1), 2010, forthcoming.

joined into the required shape, which may often be rectangular forms. The technique is also used for making large vessels, such as storage jars. Another technique, moulding, necessitates the use of prepared moulds into which the clay is pressed. Decorated pots can be made by using decorated moulds.

Vessels may also be thrown on the wheel or on its precursor such as a turntable. The difference between the fast and the slow wheels can be seen in the more even and closer spacing of the striations ('rilling') on the vessel wall in the case of the former. The clay lump is placed on the wheelhead and then centred to prevent asymmetry of the vessel and uneven walls. The throwing process involves a number of movements of raising, pushing down, raising again and outwards. Vessels may use the entire lump of clay or several vessels could be made from one lump, the latter called as 'throwing from the hump'. Finished vessels were removed from the wheel while it was still in motion with a string or even a hair, resulting in the characteristic shell-shaped swirl that can be seen on base exteriors.

Vessels could also be formed by a combination of processes, involving throwing and coiling, moulding and throwing, or throwing and beating. Beating is an important technique of vessel formation in which the essential tools are the paddle and the anvil. However, beating is rarely a primary constructional process; more usually, a vessel is partly formed on the wheel with thick walls, taken off for drying till the leather-hard stage and then beaten. The clay walls of the vessel are beaten between the anvil held inside the vessel and the paddle held on the outside of the vessel. The thick walls are thinned to the required thickness and more usually the vessel becomes larger. The technique thus involves forming large vessels with proportionately thin walls.[33] Thus, beating can be called as a finishing process as are also turning, scraping, trimming and smoothing. Turning, scraping and trimming can be done with sharp tools held against the leather-hard clay walls on a rotational device. Smoothing is done to create a finer, regular surface and can be done with a soft tool such as cloth, leather, a bunch of grass or a hard tool such as a stick. A greater surface luster can be given by burnishing the vessel surface using a pebble, bone or horn. The vessel surface may also be decorated by stamping and incising. These techniques need to be done while there is still some moisture in the clay, that is, the leather-hard stage. It is at the same stage that appendages such as spouts and handles can be attached to the vessel.

The last stage is firing, but before we come to that, we may briefly mention certain techniques specific to terracotta production. Terracotta objects may be formed by several techniques, ranging from pinching and moulding. With larger objects such as figurines, certain parts such as limbs and trunks may be wheel-made and the rest by hand and the various parts luted together. Terracotta figurines often have additional decoration in the form of thin rolls or coils and pellets appliquéd onto the bodies.

Vessels need to be dried before firing. Too rapid or incomplete drying can ruin the vessel and thus often pots need to be dried in the shade. There are several ways

[33] Ratnagar, *Makers and Shapers*, p. 53.

of firing vessels depending on whether permanent facilities are constructed or not. Non-kiln firing is called open firing or the bonfire method. Such firings are generally short and achieve low temperatures, but there is an extremely rapid rise in temperature. Temperatures may range from 600° to 850°C. A bed of slow-burning fuel is prepared over which pots are arranged and more fuel is placed on top and around the vessels. The major disadvantage of this type of firing is the direct contact between fuel and pots; the pottery thus fired often shows fireclouding. The major advantages are that the method does not require a heavy capital investment of construction and repair and the fact that there is less likelihood of thermal shock due to the low temperatures.

Kiln firings achieve higher temperatures and more complete firing. This type of firing requires the construction of a permanent facility, the most common being a double-chambered structure, the lower part for the fuel and the upper for the pots; the two chambers being separated by a perforated grate. Such kilns may differ in being updraft (where the heat moves upward and the heat is vented outward) and downdraft (where the firing chamber is in front of the pots but the heat is deflected from the pots by a bag-wall and forced to travel upwards and then down through the pots on the other side of the wall). The latter type is an obviously more complex construction. While permanent kilns will probably leave some archaeological evidence in the form of kiln linings, kiln furniture, firing chambers, perforated grates, large numbers of misfired or overfired vessels or 'wasters' and deposits of ash,[34] we have not been able to find any reference, archaeological or ethnographic, to the evidence that may be left by open firing. But if we assume that the place of firing was relatively permanent, then archaeologically we may be able to recover a pit line or dumps of ash.

Tosi[35] has categorised the archaeological indicators for craft production into six groups, which are facilities (permanent installations like kilns and furnaces), tools for manufacture (potters' wheels, anvils), residues (wasters and debitage), semi-finished products ('masses of raw material prepared in convenient form for further processing'),[36] stocks of finished but unused artefacts and materials for recycling. We can also include lumps or masses of raw material kept for processing or working. While all these indicators are individually important, for him it is the spatial co-occurrence of these different groups that are more reliable to indicate production areas than the recovery of artefacts from one group alone. However, it is also possible that separate processes within a craft may take place in different spatial areas (such as firing from the actual crafting of objects) in which case one may find the occurrence of indicators from different groups spatially segregated.

One good example of finding indicators related to craft or more specifically pottery production is the case of Nausharo. Within the area identified as a pottery workshop were found tools such as flint blades used for turning vessels, bone spatulas, unfired

[34] Sinopoli, *Approaches to Archaeological Ceramics*, p. 103.
[35] Tosi, 'The Notion of Craft Specialization', p. 25.
[36] Semi-finished products could also include artefacts which were unintentionally left unfinished.

vessels and several scraps of clay resulting from the turning or scraping of vessels. Also found were layers of compacted ash and firing wasters in the form of blistered or warped sherds.[37]

In our excavations, we have been able to find most of the indicators for ceramic and terracotta production as well as their spatial co-occurrence. These include permanent facilities like firing areas; tools such as anvils/dabbers (see Table 1), socket stones (Table 2), pottery stamps (Table 3), bone points and pebbles as polishers (Table 4); residues in the form of lumps, rolls or coils (Table 5) and bits of terracotta; semi-finished products in the form of terracotta lumps, unbaked objects and pottery; and materials kept for recycling which may include the very large number of pottery bases found in the vicinity of Houses 2, 3 and 4 that may have been kept for modifying into tools for spinning and weaving. The raw materials for ceramic and terracotta production include clay lumps and sand possibly used for tempering.

It is thus evident that we have found most of the indicators for the production of ceramics and terracotta artefacts. Clay as the essential ingredient of pottery and terracotta production has been found in the form of lumps, many of which are the fine, compact yellowish-grey silty clay considered ideal for ceramic production by the villagers and available in the vicinity. Several lumps of terracotta have been also found suggesting the accidental firing of clay lumps kept for working. As an example, we are giving the data on clay and terracotta lumps from a single house, that is, House 2. A larger number of clay and terracotta lumps were found outside the house to the north but this data relates to the number found within the house. A total number of 28 clay lumps weighing between 1.0 and 133 g, and 73 terracotta lumps weighing between 1.0 and 95.0 g were found within House 2. Rolls and coils of clay and terracotta as well as terracotta pellets have been found which were used perhaps to make appliquéd additions to artefacts such as figurines. Many of these show pinched ends indicating the manner in which they were to be used. Several small lumps show shallow depressions in the centre with finger impressions suggesting they were to be pinched into miniature containers or vessels. However, some of the lumps could also represent discarded bits of clay. Piles of sand for tempering the clay have been found in both excavated rooms of House 3.

As far as the tools of production are concerned, some are straightforward and obvious while others are hypothesised to be potters' tools. The most obvious are the terracotta stamps used for decorating the surfaces of vessels, resulting in what are generally termed as 'stamped pottery'. The details of stamps found are listed in Table 3. While early scholars such as Carlleyle[38] and Marshall[39] had conjectured that these objects may also have been used for stamping designs on cloth, it is clear they were used on ceramics as the same designs on the stamps are also found on pottery at Indor Khera. From House 2, in fact, not only was a stamp found but also sherds of pottery with exactly the same design.

[37] Mèry, 'Excavation of an Indus Potter's Workshop'.
[38] Carlleyle, *Reports of Tours*.
[39] Marshall, *Taxila*, p. 210.

Table 1. Terracotta Anvils/Dabbers Found at Indor Khera

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
1	B1a	8	98.1	95.9	76.2	600.0	Oxidized. Somewhat flat handle (71.9 × 71.0 mm). Working surface broken at one end up to neck. Interior fully oxidized. Working surface convex.
2	B1a	11	74.1	42.8 (extant)	31.8 (extant)	86.0	Oxidized. No handle. Broken in half. Core blackish interior incompletely oxidized.
3	B1a	11	62.5	61.5	35.9	136.0	Oxidized. Only the handle and a little portion of the neck is extant. The rest is broken. Handle length 18.5 mm.
4	B1a	11	83.3	82.0	33.0-62.2	313.0	Oxidized. Only working portion is extant. Interior partially ill-fired.
5	B1a	11	124.2	123.1	120.0	1,356.0	Oxidized. Handle measurements 96.8 × 87.6 × 35.4 mm. Broken in two pieces longitudinally. Interior partially ill-fired.
6	B1a	11	108.1	107.3	86.5	883.0	Portion of handle anciently damaged. Handle measures 82.6 × 77.9 × 26.2 mm. Working portion convex, slightly chipped at one end, exposing the inner core showing incomplete oxidation.
7	B1a	11	96.9	96.2	89.9	602.0	Oxidized. Handle (67.7 × 66.7 × 23.8 mm) chipped anciently at one corner. The outer surface on one portion of the base is broken off, exposing incomplete oxidation. Working surface convex, marred by one small ancient depression. Clay, coarse with chaff admixture.
8	B1a	11	75.8	74.3	63.3	293.0	Oxidized. Handle (59.6 × 58.8 × 13.8 mm) slightly depressed in the centre. Convex working surface broken in centre. Holes in clay. Well slipped.
9	B1a	11	82.7	81.2	78.7	552.0	Oxidized. Smooth, slipped, convex working surface. Handle (69.9 × 67.4 × 19.3 mm) anciently chipped near neck at one portion. Convex handle top.

10	B1a	11	110.2	108.3	49.1	704.0	Oxidized. Waisted in centre. Handle (108.2 × 107.3 × 19.6 mm) and working portion almost equal in height. Working surface convex, broken at one section, exposing incomplete oxidation of interior. Handle anciently damaged at portions along the edge. Handle convex on top.
11	B1b	19	151.3	148.3	149.6	2,755.0	Oxidized. Intact. Slipped. Convex handle (dimensions 108.9 × 108.8 × 46.1 mm) top and working surface. Working surface slightly damaged recently.
12	B1b	19	130.2	130.0	118.8	1,705.0	Oxidized and slipped. Outer surface slightly worn off on one side. Working surface convex, intact; slight chip on one side. Handle (98.8 × 96.1 × 39.4 mm) top largely flat with a rounded edge but one side of the edge is rough.
13	B1b	25	87.1	87.0	79.5	542.0	Oxidized. Convex working surface intact. Handle (67.3 × 57.2 × 19.7 mm) convex, broken at one end. Slipped.
14	B1b	36	80.7	80.0	74.5	395.0	Oxidized. Intact. Working surface convex, full of tiny holes and chaff. Handle (57.2 × 56.9 × 20.8 mm) flat on top.
15	B1b	39	68.1	67.2	68.8	234.0	Oxidized. Broken convex handle (50.0 × ? × 22.5 mm) top. Interior incompletely oxidized. Broken on one end of convex working surface. Inscribed marks on body all along height. One set of three marks together separated by 33.5 mm from an incised *swastika* mark.
16	B1b	39	88.2	86.6	79.9	583.0	Oxidized and intact. Convex handle (67.9 × 67.6 × 24.0 mm) top and working surface. Slightly chipped at two places on working edge. Made of coarse clay—full of chaff. Black marks on one side of anvil as if burnt.
17	B1b	42	73.0	71.6	70.1	285.0	Oxidized. Largely intact, with a slight chip on one end of the working surface and a cut in the handle. Otherwise, smooth surface, made of well-levigated clay. Handle (53.7 × 52.9 × 23.9 mm) top knob-like, convex, slightly misshapen. Well-formed convex working surface.

(*Table 1 continued*)

(*Table 1 continued*)

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
18	B1b	43	120.9	119.7	56.3	1,009.0	Oxidized. Waisted. Bun shaped—seen by handle measurements (121.9 × 118.7 × 22.1 mm) almost equalling the rest. Convex top and bottom. Recent damage on one surface.
19	B1b	44	65.9 (handle)	65.5 (handle)	60.0 (handle – 28.1)	187.0	Oxidized. Only handle and small portion of one side of neck extant. Working surface gone. Handle top convex, smooth, slipped. Interior incompletely oxidized.
20	B1b	55	?	?	c.87.3	516.0	Oxidized. Working surface largely broken. Convex handle (70.3 × 68.4 × 29.0 mm) top. Well slipped. Incompletely oxidized internally. Inscribed on one side but largely damaged.
21	B1b	55	75.8	75.3	77.0	303.0	Oxidized. Broken on two sides of handle (56.7 × at least 45.1 × 27.0 mm) edge. Smooth surface. Flat handle top. Convex working surface. Inscribed set of marks on one side of body along height. Damaged on the bottom centre of marks.
22	B1b	55	70.1	70.0	62.9	261.0	Oxidized. Largely intact except for a small portion of the handle edge (near neck) damaged anciently. Handle (53.8 × 52.3 × 21.2 mm) top convex as also working surface. Smooth, well slipped.
23	B1b	55	87.0	?	83.5	277.0	Oxidized. Half an anvil—broken longitudinally. Slipped. Convex handle (at least 57.0 × ? × 23.3 mm) top and working surface. Body smooth but extant working surface is somewhat rough. Incompletely oxidized internally.
24	B1b	55	74.9	74.4	72.4	368.0	Oxidized. Intact except for ancient gash on working surface and outer surface removed on one portion of handle edge. Smooth body but working surface shows marks of use. Surface of handle (58.5 × 58.1 × 20.8 mm) not convex and not perfectly flat. Convex working surface.
25	B1b	55	89.1	87.6	86.0	568.0	Oxidized. Intact. Well-slipped red surface. Convex handle (68.3 × 67.7 × 27.6 mm) top and working surface. Encrustations around neck.

26	B1b	57	80.8	79.9	80.9	401.0	Oxidized. Intact. Slipped. Convex handle (63.3 × 62.9 × 24.3 mm) top and working surface. Top and body slightly rough. Incised *Nandipada* symbol just below neck on one side of body.
27	B1b	57	81.3	77.9	76.9	445.0	Oxidized. Intact handle and body. Working surface damaged at one end—outer surface removed, exposing incomplete oxidation. Convex handle (66.8 × 64.1 × 31.3 mm) top and working surface.
28	B1b	57	79.0	77.9	77.4	428.0	Oxidized. Handle convex to flat at top. Handle measurements 60.1 × 57.3 × 23.4 mm. Handle on one side is misshapen; it does not curve inwards to neck. Convex working surface. Slipped and smooth.
29	B1b	57	87.0	86.6	92.7	559.0	Oxidized. Largely intact except for outer surface damaged on bottom side of body above working surface. Incomplete interior oxidation exposed. Slipped. Long necked. Handle measurements, 67.5 × 65.7 × 27.2 mm.
30	B1b	57	93.6	93.2	90.5	701.0	Oxidized. Convex handle (73.8 × 73.3 × 27.9 mm) top and working surface. Slightly misshapen on handle top as well as working surface. Slipped. Smooth.
31	B1b–ZB1a	28	80.0	77.7	67.1	367.0	Oxidized. Slightly damaged at handle (62.9 × 60.3 × 26.8 mm) edge and working edge on one side. Slip has come off at several places leaving a rough feel. Hole in handle top but not precisely centred. Hole dimensions, 16.2 × 15.5 × 17.5 mm. Handle top somewhat flat. Convex working surface.
32	C1c	28	90.8	89.4	87.9	585.0	Oxidized. Intact. Well slipped. Convex handle (67.5 × 67.1 × 29.3 mm) top and working surface. Chaff admixtures visible in clay.
33	C1d	14	86.6	85.4	89.3	593.0	Oxidized. Handle (65.6 × 64.9 × 33.1 mm) damaged all along edge, exposing incomplete interior oxidation. Handle height more than most anvils—it is more than one-third the entire height. Working surface and handle top convex. Working surface pitted and rough—made of coarse clay. Holes in clay.

Table 2. Socket Stones Found at Indor Khera

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
1	B1b	55	141.9	68.8	61.2	1,040.0	Limestone or dolomite. Dark grey. A narrow sub-rectangular block with a narrower base. Depression on broader side not centred. Depression measures 28.7 × 28.2 × 13.5 mm. The depression is smooth but with a few pit marks. This and the lack of polish indicate little use.
2	B1b	56	113.1	94.0	29.2	625.0	Flat block of sandstone. One side is pinkish-yellow with a central depression measuring 26.1 × 26.0 × 10 mm. The depression is polished indicating use.
3	C1a	8	226.3	124.2	66.9	2,741.0	Sedimentary quartzite. A large natural cobble elongated in shape with rounded edges indicating water action. One side more even than the other but both sides show a depression. On both sides, the hole is off-centre. Depression on the more even side measures 32.1 × 31.3 × 16.5 mm within which there is a swirl of a darker colour perhaps indicating a metal streak. Was the pivot of metal? The depression is polished indicating use. Depression on the other side (27.7 × 27.5 × 12.5 mm) appears little used; it shows no polishing and the interior is flat unlike the other depression which is conical.

4	C1a	11	135.1 107.2	98.2	40.9	1,113.0	Pink sandstone. Quadrilateral in shape, flat on both sides but one side more polished. This has a single shallow depression (26.0 × 25.2 × 6.5 mm). The depression shows polish indicating use. The other side is rougher showing marks of the tool by which it was cut. This side shows a chip removed at one end. There are two depressions on this face. The larger one (17.2 × 17.0 × 5.5 mm) is polished but the smaller one (13.8 × 13.5 × 5.5 mm) is uneven and shows pit marks and is probably incomplete.
5	C1a	11	117.9	104.7	37.2–47.5	850.0	Rounded sandstone nodule. Depression on one side only which is sloping. The other side is relatively flatter but has a slight concavity in the centre but no depression. The top surface is pinkish-grey in colour but the depression is yellow and polished indicating use. Depression measures 25.0 × 24.5 × 9.5 mm. Though rounded, the pebble does not have the smoothness of a river pebble—its rough edges show it was cut in this shape.
6	C1d	37	119.2	105.6	32.8	1,062.0	Dolerite. A sub-rectangular block, flat on both sides. Bluish-grey in colour. Depression on one side measuring 23.6 × 23.1 × 6.5 mm. Highly polished indicating use. The depression is reasonably well centred.

Table 3. Terracotta Stamps Found at Indor Khera

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
1	B1b	12	23.3	23.0	29.1	9.0	Oxidized. Slightly damaged at one part of design. *Nandipada* design. Handle portion tapering—the stamp is conical in shape.
2	B1b	30	19.9	19.5	27.2	6.0	Oxidized. Intact. Floral motif. Handle portion tapering—the stamp is conical in shape. Clay shows no stress marks resulting from pinching.
3	B1b	43	30.6	20.5	18.1 (a)-20.8 (b)-23.1 (c)	16.0	Oxidized. Broken at thicker end 'c'. Malformed. Not clear if this is a stamp, but there is a possible design at the other intact end.
4	B1b	57	22.5	21.9	29.2	13.0	Unfinished as it is unfired. Intact. Handle portion tapering—the stamp is conical in shape. Floral motif.
5	B1b	57	21.1	19.8	24.3	9.0	Oxidized. Rectangular face with a *swastika* design. Handle tapering to a rounded point.
6	B1c	AW2 (section scraping)	58.3	17.1	19.7 (a)-20.6 (b)-27.3 (c)	25.0	Oxidized. Floral motif at 'a' and leaf design at 'c'. Smooth clay. Ancient damage at central side of body.
7	B1d	6	42.6	16.3	18.6 (a)-16.6 (b)-24.0 (c)	13.0	Oxidized. Intact. Decorated at both ends. On shorter side 'a' is a floral motif, on longer side 'c' is a design with two holes on the top and bottom with grooves in between.
8	C1b	44	32.7	32.0	35.3	28.0	Oxidized. Well made, smooth. Clay shows no stress. Floral motif. Handle tapering to a cone but shows no trace of pinching.
9	C1d	18	22.4	19.6	37.2	11.0	Oxidized. Chipped on bottom left of design. *Nandipada* design, but more complex than Number 1. Handle also rougher than Number 1. The crafter attempted to make a conical shape but the stamp is inaccurately pinched. Clay shows stress marks.

Table 4. Stone Polishers Found at Indor Khera

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
1	B1b – ZB1a	25	34.7	30.1	17.2	27.0	Sandy shale. Flat rounded pebble, grey in colour.
2	B1b – ZB1a	25	27.9	22.0	19.8	20.0	Quartzite. Rounded river pebble fractured in half. Whitish-grey in colour.
3	B1c	50	19.4	13.7	8.9	2.0	Sandy shale. Tiny elongated pebble. Grey.
4	B1d	14	53.6	24.0	31.0	67.0	Medium-grained sandstone. Rectangular with one flat surface tapering on both sides to a rounded top. Rounded by water action. Pinkish-grey in colour.
5	C1b	16	63.8	43.6	31.2	128.0	Sandstone. Pinkish-grey. Rounded river nodule.
6	C1c	11	32.3	23.5	13.5	14.0	Quartzite. White with yellow streaks. Oval with a notch towards the top. Rounded by water action.
7	C1c	19	49.8	35.2	27.6	70.0	Granite. White with black and grey flecks. Rounded river pebble.
8	C1d	23	35.8	25.9	23.0	32.0	Sandy shale. Pebble with one flat side and notch in upper surface. Rounded by water action.

Table 5. Rolls or Coils of Terracotta and Clay Found at Indor Khera

Number	Square	Locus	Length (mm)	Breadth (mm)	Width/Height (mm)	Weight (g)	Description
1	B1a	1	74.4	25.8	22.9	33.0	Roll of flattened terracotta squeezed in the palm leaving finger depressions on one side. Full of inclusions like chaff. At one end of length, it appears to have been cut off from a longer roll of clay originally. Oxidized.
2	B1a	13	67.6	17.7	15.8	19.0	Roll of terracotta. Slightly pointed at the two ends. Smoothened surface indicates it was rolled. Finger impressions clearly visible. A few inclusions visible. Oxidized.
3	B1c	AW2 (section scraping)	81.0	17.0	16.7	26.0	Slightly twisted roll of terracotta, pointed at both ends. Flattened on one face as if pressed against a flat surface. Clay full of holes, cracks, chaff and other inclusions. Oxidized.
4	C1a	16	37.4	7.8	5.5	3.0	Roll of terracotta broken at one end anciently, pointed at the other. Twisted and flattened. Clay shows inclusions. Reduced.
5	C1a	20	41.5	14.6	12.3	7.0	Terracotta roll broken at one end anciently and the other end rough. Squeezed into a roll. Clay shows numerous cracks, holes, depressions and faint finger prints. Oxidized.
6	C1d	13	36.8	17.2	13.3	7.0	Greyish-reddish in colour. Broken anciently at one end, pointed at other. Sub-triangular section. Flattened side shows tiny holes and cracks in clay.

Another obvious potter's tool is the terracotta anvil, of which numerous specimens have been found (see Table 1). Anvils indicate the clear knowledge of the paddle-and-anvil method, with the convex working edge held horizontally against the inner wall of the vessel and the paddle beaten on the exterior wall of the vessel. Several sherds from the excavations at Indor Khera reveal the rounded gentle depressions on the interior that are characteristic of the use of the anvil. It is also possible that these objects may have been used in a vertical motion with the working edge against the base of the vessel which would classify them as 'dabbers'. Ratnagar[40] has pointed out that the same shaped object may actually have been used in different ways, which seems to have been the case at Indor Khera. The interestingly great variation in the size of these objects at Indor Khera (see Table 1) can be used to suggest that possibly some large ones may actually be 'dabbers' (Numbers 4, 12 and 13 in Table 1). In our ethnoarchaeological survey of modern-day potters at Indor Khera too, we found them using the same terracotta and stone anvils in the paddling motion to thin walls as well as to hammer the bases of vessels. We have not found any paddles at Indor Khera, perhaps because they would have been of wood, but it is interesting that Marshall[41] at Taxila has identified certain cylindrical stone objects with handles as paddles.

Another tool that was possibly made of wood in the past which has not survived is the wheel. However, we have recovered several flattened (and sometimes worked) stones with small round depressions on one or both sides (see Table 2). These depressions show considerable polish resulting from friction. Such stones with similar depressions were called by Marshall[42] as 'pivot stones'. Some that Marshall excavated were natural cobbles, just as one from Indor Khera (see Number 3 in Table 2). He suggested these stones were used for two purposes, one as 'wheel-sockets' and the other as 'door-sockets'. Rather than terming these as 'pivot stones', perhaps it would be better to call them as 'socket stones', as the pivot would rest and move in the depression which is the socket. This suggests that the ancient wheel at Indor Khera was a pivoted wheel with the pivot resting in the socket stones. These stones would be embedded in the ground with just the upper surface protruding with the depression in it.

The socket stones and the anvils thus provide evidence of primary and secondary formation techniques for ceramics. A number of other formation techniques are indicated by the variety of terracotta artefacts recovered in the excavations. These have been tabulated in Table 6. For example, many of the terracotta figurines of animals found in this area were made by the technique of hand modelling. Some human figurines too were hand modelled whereas the finds of terracotta plaques suggests the knowledge of the technique of moulding.

Firing facilities were also found, of two types. In the lower levels was found a brickbat packed platform with over-vitrified brickbats and ash. In the upper levels were found the distinctive circular platforms composed of white compacted earth

[40] Ratnagar, *Makers and Shapers*, p. 49.
[41] Marshall, *Taxila*, p. 503.
[42] *Ibid*., p. 485.

Table 6. Terracotta and Clay Artefacts Found at Indor Khera

Number	Artefact	Clay	Terracotta
1	Anvil	Nil	33
2	Worked sherd	Nil	431
3	Sealing	Nil	12
4	Animal/bird figurine	7	51
5	Bead/whorl (arecanut shape)	1	101
6	Lump	119	87
7	Human figurine	Nil	25
8	Disc	13	94
9	Miniature vessel	11	63
10	Roll	Nil	6
11	Marble	5	71
12	Bead	2	30
13	Reel	Nil	12
14	Toy cart	Nil	5
15	Pendant	Nil	4
16	Wheel	4	17
17	Bangle	Nil	13
18	Human limbs	Nil	5
19	Top	2	2
20	Point	Nil	1
21	Ring	Nil	3
22	Pottery stamp	Nil	9
23	Ball	1	6
24	Cake	Nil	1
25	Toylid	Nil	2
26	Mould	Nil	1
27	Pellet	2	23
28	Seal	Nil	2
29	Skin rubber	Nil	2
30	Tile	Nil	1
31	Button	Nil	1
32	Unidentified	6	83

and ash ranging from 1 to 2 m in diameter. These were marked by 4–5 cm of white ashy deposits, perhaps representing the remains of firing activities. Similar features were found from Sonkh near Mathura.[43] Eleven such facilities were fully or partially recovered during excavations. Sometimes these recurred within the same house over time as was the case with House 2. The lack of remains of kiln linings and the fact that the majority of the pottery in the early centuries of the Common Era was incompletely oxidized suggests that these were the remains of open firing. That these ash deposits have survived for so many centuries indicates that such firing areas were probably permanent. In fact, it is possible that other processes of ceramic production, such as clay preparation, forming of vessels and finishing which utilised portable tools may have been moved from room to room or within open spaces depending on factors of

[43] Härtel, *Excavations at Sonkh*, p. 57.

shade, light and ventilation. We have found precisely the same pattern of working among present-day potters at Indor Khera.

Numerous unfinished artefacts have been recovered, largely in the unfired form. Almost every class of terracotta artefact from Indor Khera has some specimens left unfired. As far as production areas are concerned, Sinopoli[44] points out that middens or trash deposits are usually located close to use and production areas. In the same context, one can note that because of the fragility of pottery at various stages of production, finds of semi-finished pottery are likely indicators of production areas. This is in contrast to metal, for example, where ingots can be transported far from their place of production.[45]

Certain craft tools such as a pottery stamp from Period II and an anvil from Period III have been found unfired, suggesting that potters made their own tools out of clay. Similarly, evidence for the production of bone points within these houses, some of which may have been used for incising lines or designs on pottery, possibly corroborates that several of the tools that they required were made by the potters themselves. We are also assuming that the smooth pebbles (see Table 4) found in the excavations may have been used as tools to polish or burnish the surfaces of certain vessels.

Spatial Context and Organisation of Production at Indor Khera

One of the important aspects about production is the context within which it took place. Several archaeologists have tried to formulate models of organisational complexity, taking variables such as context, size of activity areas, number of manufacturing stages performed in close spatial proximity and the intensity of production, that is, whether it is part-time or full-time.[46] For instance, Tosi has listed four types of activity areas purely in archaeological terms which include atelier, workshop, factory and craft quarter. He has used atelier in the context of small activity areas with few facilities, with a limited number of manufacturing stages of a single craft. A workshop, on the other hand, differs from the above in that it has a larger number of manufacturing stages performed in a single location. Factory refers to a large activity area with extensive facilities, but which is the locus of production for few stages of a single craft. The last, a craft quarter is a large activity area with a concentration of facilities and the production of several crafts.

Rice,[47] on the other hand, citing Sander van der Leeuw and David Peacock, has described four modes of production drawn largely from ethnographic data on pottery production: household production, household industry, individual workshop industry

[44] Sinopoli, *Approaches to Archaeological Ceramics*, p. 86.
[45] Miller, *Archaeological Approaches to Technology*, p. 242.
[46] Tosi, 'The Notion of Craft Specialization', p. 24; Rice, *Pottery Analysis*, pp. 183–91; Costin, 'Craft Specialization', p. 8.
[47] Rice, *Pottery Analysis*, p. 184.

and nucleated workshops. In household production, each household produces for its own requirements and is largely undertaken by women; household industry is a supplemental income for women undertaken on a part-time basis. Men become central to production in individual workshop industry with the major livelihood derived from production in isolated workshops; nucleated workshops are differentiated with a clustering of workshops. The marked difference lies between the first two and the last two modes, with the workshop patterns having a level of sub-specialisation not noted in the household patterns. The workshop patterns also show specialised areas for separate craft processes. The nucleated workshops are only urban in nature while the individual workshop pattern may also be rural. Rice has validly criticised the differentiation made between production patterns on the basis of gender. Moreover, the archaeological identification of part-time versus full-time production is usually difficult.

Costin[48] on the basis of ethnographic, historic and archaeological evidence has devised an eight-part typology for the organisation of specialist production. These are individual specialisation; dispersed workshops; community specialisation; nucleated workshops; dispersed corvée; individual retainers; nucleated corvée; and retainer workshops. Both individual specialisation and dispersed workshops produce for local consumption, but the former involves independent household production while the latter involve larger extra-household workshops. Community specialisation and nucleated workshops are marked respectively by several individual and workshop units aggregated together producing for regional consumption. In dispersed corvée, part-time labour produces for elites within the household or community setting. Both individual retainers and nucleated corvée work in administered settings but while the former is full-time, the latter works on a part-time basis. The last pattern of retainer workshops is marked by large-scale full-time work for elites within a segregated facility.

It is not easy to fit the evidence from Indor Khera into any of the categories delineated earlier. We feel that ceramic and terracotta production at Indor Khera was taking place within houses, of which four have been mapped within the excavated area. We have identified these to be houses based on the evidence of household-related objects such as stone grinders and pestles, tools of iron (such as axe heads) and copper (such as fish hooks), a terracotta box with 35 cowrie shells and ornaments of varied materials. The presence of children seen by finds of small-sized terracotta bangles suggests that these were houses. Several of the terracotta artefacts found in these houses fall into the category of toys, such as marbles, wheels and toy carts which may have been made and used here. Found within and outside these houses are other miniature objects, including vessels that we have suggested may have been made by children.[49] It is also important to point out that probably there was little strict demarcation of areas

[48] Costin, 'Craft Specialization', pp. 8–9.

[49] Varma, S. and J. Menon, 'Craft Quarters at the Edge of a Settlement: Indor Khera 200 BCE–300 CE', *Journal of Interdisciplinary Studies in History and Archaeology*, 2009, Vol. 6, forthcoming; Menon, J. and S. Varma, 'Children Playing and Learning: Crafting Ceramics in Ancient Indor Khera', *Asian Perspectives*, Vol. 49 (1), 2010, forthcoming.

into living and working spaces except for where the firing facilities were located. Our ethnoarchaeological survey too revealed considerable flexibility in the use of space.

Moreover, while production was taking place at the household level, yet it was not within a rural setting. We also feel that ceramic and terracotta production was on a fairly large scale as evident from our tabulation of craft indicators and the range of artefacts that were produced and used as seen from Table 6. The number of firing facilities (11) also may indicate the scale of production. There is also no way for us to identify whether production was being undertaken by men or women. We have pointed out elsewhere that production at the household level involves several members of the family undertaking separate processes within the craft of ceramic production. Our ethnoarchaeological study of present-day potters at Indor Khera has also corroborated that most tasks, other than wheel working, are not gender specific and can be undertaken by either men or women, and even by children.

Conclusion

The focus of this article has been to present the evidence for ceramic and terracotta manufacturing at the early historic site of Indor Khera. This is in the form of tools, such as anvils, socket stones, pottery stamps, bone engravers, stone polishers; firing facilities; lumps, rolls and pellets of clay and terracotta that represent raw material used for various processes and objects; deposits of sand used perhaps for tempering; unbaked artefacts; wasters or over-vitrified material; rejects or misshapen objects; as well as the range of ceramic and terracotta artefacts that were being produced. One or other of these indicators are often reported in excavation reports but usually without any context. While discussing the organisation of ceramic production at Vijayanagara, Sinopoli[50] writes:

> Like contemporary potters, it is my expectation that Vijayanagara-period ceramic workshops were organized at the level of the household workshop, with the unit of production, the nuclear or extended family. In the absence of archaeological evidence for such workshops, interpretations of the scale of workshop production must rely on the ceramics themselves, aided by ethnographic and historic documentation of pottery production in the region.

We have been fortunate in uncovering evidence for ceramic and terracotta production within what we have interpreted as houses. For the moment, it is our hypothesis that at Indor Khera we have evidence for 'household workshops' during the period 200 BCE–500 CE. This, however, needs to be explored further.

We hope to develop this hypothesis in a further study where we will explore questions as to whether production, storage or quotidian activities were limited to discrete and separate spaces within houses or whether multiple activities took place within the same spaces. We will be mapping the loci of various manufacturing indicators both within as well as outside houses. This will be done in the context of the four houses that we have

[50] Sinopoli, *The Political Economy*, p. 247.

excavated for this period at Indor Khera. For example, in House 2, we have found five rooms of varying sizes as well as two possibly open courtyard areas, one where three firing platforms were found suggesting the area was used for firing activities. In the other open courtyard area, there are several indicators for manufacturing, suggesting this space was used for production. This does not, however, preclude the use of this space for domestic activities such as cooking. Further, while focusing on the producers, we will be looking at pottery production within the household where different processes would have been undertaken by several members of the nuclear or extended family and which will also take us to the question of the level of specialisation involved in this craft. A discussion of production within the household would also involve the dissemination of crafting knowledge from one generation to the next. This would then allow us to refine our ideas regarding the contexts within which ceramic and terracotta production was embedded in the early historic past.

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