Introduction

We are proud to present the second issue of the journal 'Design Thoughts'.

This issue has a collection of thoughts again like the first issue from many disciplines that are connected to design. This includes — research into the history of Tamil typography from the southern part of India ('Traditional writing system in Southern India — Palm leaf manuscripts'), building up a collaborative environment on the net that is inclusive of new audiences ('Across the Web: The Colors of India as a cross-cultural collaborative initiative for learning'), how simple dots can mean a lot ('Bindu: The Dot Personified'), investigation and analysis regarding the use of a multi-faceted storytelling device ('The Kaavad storytelling tradition of Rajasthan'), building up of a structural model for creating stories ('Fractal like Model for Designing Educational Stories') and a study of the different properties of the grid ('Functions of Grid, a key for flexibility in framework'),

The next issues is planned to focus on a specific area of design and is planned to include thoughts concerning issues related to 'sustainability and design' and is expected to be out in the next six months. If you would like to contribute to this area, do write to designissues@idc.iitb.ac.in

We do hope that you enjoy reading this issue — we look forward to your feedback and suggestions.

Good thoughts,

Ravi Poovaiah,
Editor,
Design Thoughts

Traditional writing system in Southern India — Palm leaf manuscripts.

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Introduction

Palm leaf manuscript is one of the oldest medium of writing in India especially in Southern India. It is also the major source for writing and painting in South and Southeast Asian countries including Nepal, Sri Lanka, Burma, Thailand, Indonesia and Cambodia (Agrawal 1984:24). Though palm leaf writing was practiced since the ancient times its precise origin is still unclear. Agrawal ascertains,

"It is difficult to say exactly when the palm-leaf first began to be used for writing. There is no extant of palm-leaf manuscripts in India before the 10th century. However, the palm-leaf was definitely in use much earlier than this since it is mentioned as a writing material in several literary works and its visual representation can be seen in several sculptures and monuments. It is almost certain that the earlier manuscripts have been completely destroyed owing to the tropical climate of the region" (Ibid 24-25)

Further Richard Salomon ascertains the existence of palm leaf manuscripts and other materials in the following passage.

"Before Asoka, writing was probably used principally, if not exclusively, for economic and administrative, as opposed to literary and monumental, purposes; perishable materials such as palm leaves, tree bark and (according to Nearchos) cloth, which have little chance of surviving the rigors of the Indian climate, were used. Thus, according to this view, we need not be surprised that no early specimens of Indian writing have survived and their absence does not prove that they never existed" (Salomon 1998:14-15).

The magnitude of this medium is such that its composition and method of writing has remained unchanged right from its known existence. People still prepare and use palm leaf manuscripts the way our ancestors used centuries ago.

Types of palm leaves

There are many varieties of palm-trees. However, the leaves of only a few have been used for writing. The most widely used were (Agrawal 1984:25-27):

1. Borassus flabellifer Linn (the palmyra palm)
   These palm trees grow in a dry climate. The leaves of the palmyra palm are thick, fibrous, initially strong and flexible, over time its flexibility decreases. They are also prone to insect attacks.
2. Corypha umbraculifera Linn (talipot, fan palm)
   The talipot palm needs wet climate and abundantly grows in moist coastal areas. The leaves are soft, light coloured when dry and flexible. The earliest manuscripts are on this type of leaves. They remain flexible for a long period. The leaves are also mainly used for making fans, mats, umbrellas, baskets, thatching, roofing and so on.
3. Corypha taliera Roxb.
   The Corypha taliera are strong palm trees. Its leaves are slightly brown in color with black spines. They are also thick, non flexible and prone to insect attack.

Of the three varieties of palm leaves, those of the talipot are the most smooth, delicate and supple. Its fibers do not damage easily and are more resistant to decay. In India all the varieties are used for writing.

Preparation and preservation of palm leaf manuscript

Palm leaf manuscripts are found in linear horizontal format this is basically due to the natural size of the leaves. Normally,

length of the leaves vary from 15cm-60cm and width between 3cm—12cm. Their dimension depends on the available size of leaves. Before writing, the palm leaves has to be processed and prepared to make it suitable for scribing.

Preparation

There are several ways of processing palm leaves, these methods differ from region to region. In South India, different method is adopted whereas in Orissa and other Southeast Asian countries different technique is adopted. The basic method of palm leaf preparation for writing is as follows (Patnaik 1989:16-17):

Palm leaves are first cut from the trees before they could dry up and become brittle. Only a half opened young shoot of palm leaves are suitable for making manuscripts. These are cut into required sizes and then boiled in water to the required temperature in order to render them soft. The softened leaves are then dried in the shade or mild sunshine. The unwanted middle ridge is removed from the main leaf. The desired portion is pressed, polished and trimmed to size. Then holes are made on either side of the leaves with a red hot wire. A cord is passed through the holes to hold the leaves together. Two wooden planks of leaf dimension are then placed above and below the manuscript as covers to protect the leaves and stored in dry place (Fig 1.1). After sometime the leaves are taken out which by now would have become flat and smooth for writing. The total number of leaves in a manuscript depends on its content.

To the above descriptions Agrawal further adds on its binding system,

"Palm leaves could not be bound like a book. Therefore, they were stored between two wooden panels that were slightly larger in size than the leaves. These wooden boards were sometimes painted or decorated with ivory and mother of pearl inlay work. To keep the leaves together, holes were punched in the leaves: in the centre, if the leaf was small; otherwise at either end of it. A cord was passed through the holes and bound around the manuscripts to keep the leaves in position. The wooden holders were polished with insecticide oils prepared from lacquer and minerals. Illustrations are also seen on the cover boards, the drawings were based on the contents of the book. Finally, the bundle is wrapped in cloth to keep it free from dust" (Agrawal 1984:34).

Fig 1.1: Wooden planks slightly bigger than the leaves dimension are placed above and below the manuscripts as a protective cover. A cord is passed through the holes made to binds the leaves.

Preservation

Palm leaf manuscripts are organic in nature and are susceptible to different types of deterioration. If not preserved properly they are subject to physical damage and decay. Some of the most common deteriorating agents are climatic factors (e.g. variations in relative humidity and temperature), light, insects, constant handling and adverse storage (Ibid 36). To prevent from such defects, palm leaves are treated with special preservatives. T. Ganesan states , "At present, to preserve palm leaves lemon grass oil is applied to each leaf, then dried and kept under air condition at low temperature. Each state and region has its own indigenous method of preparing, writing and preserving the palm leaves." Few methods to conserve manuscripts are (Agrawal 1984: 43-48):

1. The use of natural herbs like sweet flag (ghorabach) or margosa leaves with the manuscripts to keep insects away.

2. Application of citronella oil, camphor oil, or lemon grass oil on the surface of the leaves to keep it flexible. This prevents physical damage due to brittleness.
3. Fumigation with thymol vapors helps to prevent fungus
4. Fading of ink is restored by applying carbon black mixed with oil to the leaf.

Writing system

Traditionally, palm leaf writing has been passed on from generations to generations through scholars and scribers. It was a customary practice that whenever a palm leaf decays, its contents are transferred on to fresh new leaves. And that was how our written ancient literature was passed on to the newer society. John Samuel says, "Lifespan of a palm leaf manuscript is about 300-350 years. The present manuscripts are mere copies of the earlier manuscripts which are also replications. Manuscripts have been copied from generations to generations by a set of people. Each time a manuscript gets old or decays it is transferred on to a new leaves, these new ones are then preserved. The old manuscript is either burnt in ghee or thrown into the river".

Writing on palm leaf is a skilled activity which requires patience, practice and training. A common man cannot easily take to writing on palm leaves. In olden days, writing on palm leaf manuscripts was practiced as a profession by some, they were called lipikaras – copyist. There are even references of families who belong to the generation of palm leaf manuscript writing. T. Ganesan refers ,

"In olden days only a section of people specialized in writing on palm leaves. Knowledge in written form was passed on by copying the text from old manuscripts to new manuscripts. At present, very few people know the technique of writing on palm leaves; the tradition has come to an end. The practice doesn't exist as people no more understand what's written on the palm leaves. Some even throw the manuscripts in the river without making a copy of it. Thus some of the most valuable resources and knowledge are lost forever".

In general, there are two main techniques of writing on palm leaf manuscripts (Agarwal 1984:31). They are:

1. Writing with a pen or brush as done on paper (Fig 1.2), normally seen in North India.
2. Writing by incision with a pointed metal stylus (Fig 1.3). This method is predominant in South India. Tamil palm leaf manuscripts are normally written using this method. The current research is based on this type of Tamil manuscripts.

Fig 1.2: Illuminated palm leaf manuscript of 18th century from Eastern India. The text is written using brush and ink.

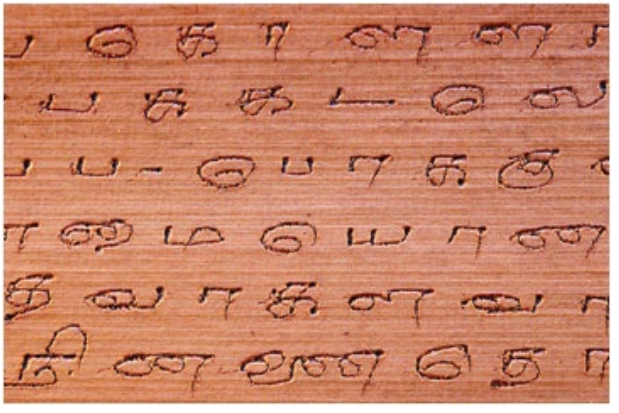
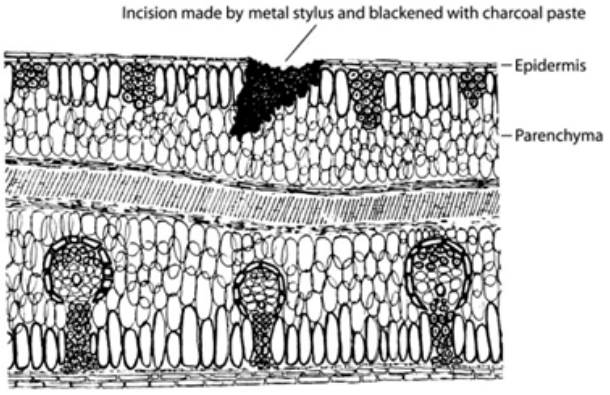


Fig 1.3: Tamil palm leaf manuscript written using incision with pointed metal stylus. On the right is a cross section of the written palm leaf showing incision and deposition of black powder.



In the method of writing with ink, a brush or a reed pen was used. The writing was done in the usual manner as with pen on paper. Since palm leaf is less absorbent than paper, the ink remains on the surface. This method was mostly prevalent in North India.

In south India, incision with metal stylus (Fig 1.4) was the most common method of writing. Even within the incision method there are two ways of scribing.

a. In one method, the stylus is held in the right hand, at a fixed place on the leaf. The leaf is held in the left hand and is moved backwards and forward to make the incision (Fig 1.5). In this method, both hands are actively involved in the writing process and their coordination is important to scribe letters. In right hand, the stylus is held upright between the ring finger and last finger. The left hand, apart from holding the leaves, also controls and directs the stylus using the thumb nail. Scribers who write on palm leaf usually grow their left thumb nail through which a hole is bored to hold the stylus. Alternately, some people make a groove in the nail to hold the stylus. To write, the stylus is placed over the grove of left thumb nail and incisions are made letter by letter. As the writing progresses the leaf is moved leftwards using the left hand. At times, the holes made on either side to bind the leaves get bigger with frequent use. Therefore, a sufficiently large margin had to be provided around the holes (Fig 1.6).

Fig 1.4: Various types of metal stylus were used for writing on palm leaf manuscripts.

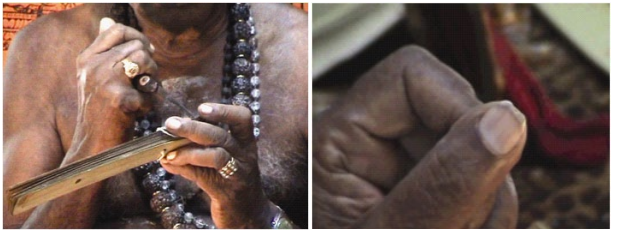


Fig 1.5: Method of writing on a palm leaf manuscript. Right side image shows the groove made in the left thumb nail to control the stylus while writing.

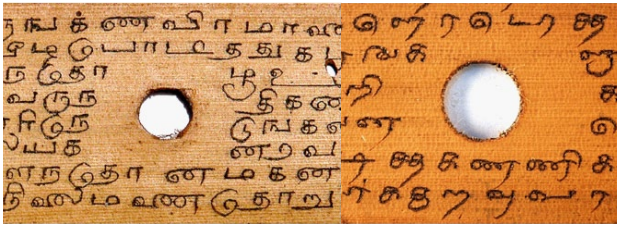


Fig 1.6: Holes punched for binding the leaves are the only elements which breaks the text flow. A sufficient margin is given around it as they expand due to usage.

During the process, the left thumb plays a crucial role in supporting and directing the stylus. It controls the stylus to properly align and position the start of next letter. Perhaps, this determines the letter spacing and some cases even line spacing. The extent at which the left thumb nail moves is one of the factors which determine the size of letters. To draw

an analogy, its movement could be compared with the type caster of Monotype type machine where the matrix moves in x, y direction to cast individual letters.

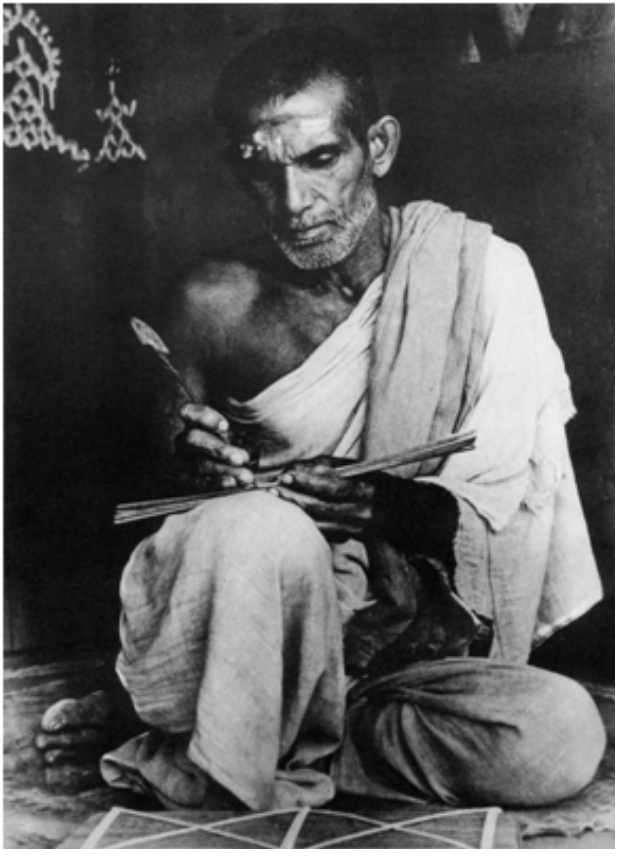


Fig 1.7: Another method of writing on a palm leaves where the leaves are held on the thighs and scribed using stylus. In this method, the stylus is held like a normal pen.

b. In the other method, writing is done by moving the stylus. Similar to the previous method, the stylus is held in right hand and the leaf in left hand. In this method, the writer generally sits on the ground and places the leaf on the right knee, using it as desk. He then scribes with the stylus, moving it from left to right (Fig 1.7). Sometimes, the leaves are placed on the desk and inscribed like writing with the pen and ink in normal books.

After incision, the letters may not be visible to read (Fig 1.8). Therefore, lamp-black or coal powder mixed with oil is applied on the leaves so that the letters become noticeable and read more easily. The excess mixture is then wiped off with a cloth. Sometimes, fresh green leaves of a particular tree are rubbed on the palm-leaf so that the green juice of the leaves gets deposited in the engravings rendering it visible. Since correction or overwriting was difficult, great attention was required to make each leaf error free. The palm leaf manuscripts also had illustrations, either incised or painted with a brush. The illustrations are incised with the stylus in the same manner as writing.

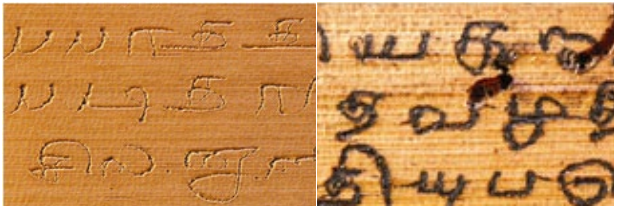


Fig 1.8: Left image shows a manuscript after incision. Initially, the letters may not be noticeable to read. Therefore, to make it visible a paste of charcoal powder mixed oil is smeared on the manuscript and wiped off. The black mixture gets deposited on the grooves making the letters stand out like the right side image.

Image Courtesy: Government Oriental Manuscript Library, Chennai, French Institute, Pondicherry, Kuppuswami Research Institute, Chennai and Pulavar Chockalingam, Tanjore

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Across the Web: The Colors of India as a cross-cultural collaborative initiative for learning

Ajanta Sen, Ravi Poovaiah, Robert Pulley

Introducing the context — the people and the times:
In a touching feature on travel, a visiting design scholar from the Rhode island School of Design (Taguiri, 1999) had remarked: "some journeys cover great physical distances, while others are journeys in altered states." Project Solar Eclipse, suggesting the occasion for the conception of the Project as well as representing the empirical arm of Colors of India (COI, 1998), is one such journey in altered state and carries the tale of real people in a fascinating time …

Most of these 'real people' were painters, sculptors, tribal artists, textile artists, storytellers, printmakers, housewives, community workers, schoolteachers and educators at the forefront of people's movements (movement for workers, movement for the demystification and popularization of science). Then there were the children, not just as real people, but as the 'fascinating people' of a fascinating time, since they had lent magic to the Project. Among the member-participants were children from schools that were both mainstream as well as economically deprived. Street children who went to no schools at all. And, indeed, children with learning disabilities such as dyslexia and in that sense making them disenfranchised. All these people, in turn, had the collective effect of imparting to the rest of the participants, viz., students, practitioners and the faculty of design and technology a 'realness' usually not attributed to this category of people.

The essence of the Project: "connecting up"

Now comes the tale itself from a fascinating time …
It all started in 1997, when the Internet was still at the beginning of a communications revolution. The technology, not yet chronicled, was threatening to explode on one's face in directions completely inconceivable, even five years down the line today. A major cosmic phenomenon in the form of a complete solar eclipse, awaited by people with breathless anticipation, presented itself as an impetus for an experiment with new media technology.

This occasion of a complete solar eclipse, slated for the 11th of August 1999, was still two years away. The eclipse was estimated to commence at dawn, off the coast of New Foundland, Canada to quickly move on into Cornwall on UK's southwestern most tip off the Atlantic. In the late hours of the same evening, the eclipse was going to conclude over a location more than half way round the world, off the Bay of Bengal, along India's eastern coastline. Since UK and India were at the onset and the concluding points, respectively, of the solar eclipse's line of trajectory, the Project naturally came to be conceived and partnered as an Indo-UK initiative.

The reason that made the phenomenon of the eclipse so unique was that this was the first time in recorded human history that the trajectory of a complete solar eclipse was going to travel through a large swathe of landmass so as to cover entire portions of the UK, Europe and Asia. The sun was expected to get eclipsed over a veritable string of countries, with France, Germany, the erstwhile Yugoslavia, Hungary, Czechoslovakia, Turkey, Iran, Iraq, Afghanistan, Pakistan and India being just some of them[1].

Next on mind was the question: could we turn this historical occasion into an opportunity to build a "daisy chain" of communities with the intention of "connecting up" the different cultures that were intrinsic to the countries located on the straight line of the eclipse's trajectory? Differentiated and yet resplendent across the spectrum, in their varied hues and colors as in a rainbow, could we celebrate the fact that these different cultures were suddenly strung together and bonded by a common universal thread of the narrative — the sun? Unified, as they were, by the fact that all of these countries were expecting to experience a unique, cosmic, once-in-a-lifetime solar phenomenon of an unimagined magnitude over their respective skies.

And then, almost as if by serendipity, this unique cosmic phenomenon seemed poised at the threshold of a new technology, the Internet. The obvious question to ask was: could we expect to leverage this new technology, aided by the already existing networking technologies, to create web-based exchanges that would enable communities located far away from each other in different parts of the world, to interact, share ideas and work together?

Towards this end, could we create a space that would exist in continuity across all these countries? Almost co-terminus, as it were, with the geographical spread of the eclipse's own sphere of influence?

And, could we eventually attempt to build into this contiguous space on the Internet, a set of "collaborative work spaces," in order to get the member-communities (drawn from universities, art galleries, craft centers, schools for children or even the industry), to collaborate creatively with each other on themes of mutual interest or on themes thrown up by the different cultures? [2]

The questions that kick-started the experimentation might well have been a tribute to the inventor of the WWW, Tim Berners -Lee, and an opportunity for us to construct a critique of Berners-Lee's original intention of constructing the WWW — as a universally connecting device for people across the world[3].

The series of questions that inevitably follow could also well have been inspired by the original genius of computing A.M.Turing's thoughts from his writing "Computing Machinery and Intelligence" (Hofstadter and Dennett, 1981). In it Turing asks: "what is the answer to this new form of the question?" To which he counter-questions: "Is this new question a worthy one to investigate?"

The questions give us a glimpse of the allegory surrounding the eclipse. By attempting a "daisy chain" it was possible to look at the larger context of space and time. The themes on the anvil for intended collaborative exchanges could well end up providing the subtext of what these cultures were predominantly about. To future generations and to people from far away cultures, the work carried out on the collaborative spaces via the networking technologies could become a crucible of the cultures' iconography, folklore, use of colors, and a myriad of such tales usually unavailable first hand unless one visited a country.

This idea of using technology (albeit in its non web-based form) to collaborate over a shared idea had just started to gain ground through the works of Scrivener (1992). Based at

a UK university, Scrivener was suggesting mechanisms such as CSCW or CSCL (Computer Supported Collaborative Work/Learning) which were the technical terms for collaborative practice aided by computing. And was highly supportive of this idea of a "daisy chain" and shared tasks mediated by computing[4].

However, the existing technical definitions of CSCL and certainly the one posed two years later by Ryokai and Cassell at MIT Media Lab's Gesture and Narrative Language Group as being "a collaboration between a teacher and a learner mediated by a computer," was obviously too restrictive for us. This, given our own intention of applying it to the larger context of cross-cultural exchange on a web-driven platform. Instead, what found convergence with this study (Ryokai and Cassell, 1999) was that it coincidentally supports an original assumption of ours (related to another aspect of CSCW/L). Namely, that such collaboration drew strength from the ability of participants to "co-construct fantasy worlds and tell stories about them." Which automatically meant that since children fantasized as well as shared their fantasies with great ease, children could end up being wonderful collaborators on the Net.

Also, an ongoing study about locating technology within a cultural paradigm (Sen and Poovaiah, 1998) helped provide us with a theoretical imperative for our emphasis on culture as a powerful mediator for communication practices. Additionally, our own hunch based on the notion that the essence of a culture was much better communicated through a paradigm of folklore, social mores and imaginative narratives rather than through dry ethnographies, gave the Project the confidence needed to undertake cross-cultural collaboration via the networking technologies.

At a more specific level, therefore, the Project became committed towards providing a design-technology axis of opportunities for cultures/cultural set-up(s) to not only access and learn through cultural studies, art and design practices of other cultures by specifically interacting across the networking technologies. As a step further, with every cross-cultural exchange, it would be our intention to enable participants to build on top of ea ch others' stories and ideas that have been shared/communicated across the technologies, and give the outcome of such construction a character of its own. This kind of construction would obviously depend on the willingness of the partners to wish to share spontaneously and without cultural biases. However, the actual exercises on the ground eventually bore out our initial hunch that people were much more willing to co-construct stories and imageries about their respective cultural milieus than is usually made out to be, and that the Net could be a facilitator in this regard.

Vision statement and objectives/mandates of the Project

Project Solar Eclipse was conceived at a time when the 'The Economist' (1997), known for its wry humour, had declared as a title for its book review section: "Hardware, software and fancyware: a new crop of books on digital revolution looks back more clearly than forward." However, even this 'looking back' had thrown up no example of any similar initiative, and hence, set the pace for enumerating a lucid set of Project objectives.

Virtual 'Holi' — Festival of Colors and a riot of activities

Based on a vision statement that aimed at creating "new art, new audiences and new experiences," in turn, based on connecting up distantly located communities with one another through design-technology initiatives in order to create a body of work that would be a direct outcome of these cross-cultural interactions, the Project was able to formulate the following as a set of mandates/objectives:
(i) to explore a larger and a possibly far-flung world through the networking technologies, thereby making the intention of "connecting up" an imperative rather than a mere rhetorical question. Inherent in this being an attempt to make the Net cross-culturally viable by developing interfaces that could cut across any dominant or any local language dependency. And in that sense, be able to effectively extend the use of the Net, in one grand sweep, to large swathes of users from across the world. This potentially effortless access to another's culture is what we would term as "new experiences";
(ii) to involve "new audiences" into the folds of the emerging technologies by making the Internet work in a friendly, inviting and intuitive manner, and in that sense, aim at bringing the digital world, in all its positive essence, at the doorstep of those as yet unfamiliar with its use. To this end, the terminology "new audiences" was coined for the occasion to typically represent those who have been excluded from the technology's use either for want of resources or because they have approached the technology with a sense of intimidation and fear. Examples of such user groups: children, street children, artists, craftsmen, artisans, dyslexics, housewives and such;
(iii) to view the virtual-physical domains as a continuum (rather than as being fragmented and compartmentalized worlds) in order to make the resulting learning environment more comprehensive[5].

The objective would be to extend the domain of the 'virtual' into the 'physical' through a set of activities that were able to express themselves through both of these domains, rather than allow the computer-mediated interactions to remain restricted to the 'virtual' domain alone, as is usually the case. This marriage between the domains would then create a form of "new art" and open up the option of a parallel use of the mediums of expression (such as the arts, the crafts, music, films etc.,) as well as that of a parallel use of materials (such as paints, clay, fabric, geometrical structures, videos, photography, etc.,). The physical artefact(s), created as an outcome of interaction across the virtual, would have the added and distinct advantage of being representative of an inspirational structure as a tangible reminder to potential future users about the promise of being able to relate to another's culture via the networking technologies. Something that cannot be expected of the 'virtual' which, in comparison to the physical, can be rather ephemeral and distinctly non-tactile.

It has to be said here that not being armed with the benefit of hindsight experience of other initiatives may be a bit unnerving but not necessarily debilitating. It could, instead, have the effect of achieving something altogether fresh. It is tempting to reference a rather remote but related context provided by Australian designer Kevin Murray's efforts in 1997 to develop a curatorial thesis 'Turn the Soil,' which pondered over whether things would have been different if Australia were colonized by another country. In the context of the exhibition concept that explored the experience of second generation Australian crafts people from a non-English speaking background and the influence of their parents' homeland culture, Murray quotes from Alex Miller's novel of Chinese diaspora 'The Ancestor Game.' A local painter intending to leave Shanghai for Australia is advised: "There must be plenty of work for artists to do in such an uncertain place as Australia." (Murray, 1997-98). With the operative emphasis on 'uncertainty,' our Project had attempted to leverage a new technology's wilderness and treats it as an open stage for creative experience, rather like a futurists' stock in trade.

The experimentation on the ground:
The envisaged cross-cultural online-offline collaborative exchanges were designed to take place within the framework

The Project's nerve-centre: people, material and resources in action in 'project-room'

of a series of 'modules/'events' that would go on to form the empirical backbone of the Project.

I) A few parameters for Project 'events': Intended as activities within these 'events' were a series of interactions both via (i) the conventional networking technologies (fax, tele-conferencing and email), as well as (ii) the emerging ones, the Internet[6]. These interactions were to then find translation on to the 'physical' domain through use of parallel mediums of expression (arts, crafts, photography, video streaming etc.,) and parallel materials (paints, clay, geometric structures, fabric, etc.,) of use.

After a pilot project held in early 1998, it became apparent that each module/'event' ought to start with a two and a half month period of asynchronous/offline research and exchange of ideas between participating cultures/countries over a pre-designated theme(s), followed by short outburst(s) of synchronous/online exchange ranging across a time period between three days to a week's duration. During which period, the cultural partners would work simultaneously on the ground at their respective countries and constantly exchange and share ideas and inputs towards the stated tasks/goals, culminating with the completion of proposed artefact(s) as well as joint presentation through conferencing. The prohibitive costs of online networking then had altogether foreclosed the option of longer bouts of synchronous/online exchanges.

(II) Dominant models of interactivity: What emerged through experimentation across these 'events' were two models of interaction and connectivity.
Model I concerned a set of 'events' that involved two distinct cultural partners working on a one-to-one collaborative basis over a pre-designated task across a pre-designated time-period and theme. An 'event' would begin with the act of constructing a dedicated webspace for the given theme and occasion, followed by the establishment of 'project rooms' at the partcipating locations/countries. The idea of a 'project room' was also to establish parity in composition and size as well as inventory of people and material required between the partners. Typically, the main collaborators [Indian Institute of Technology (IIT) Bombay in India and Falmouth College of Arts (FCA), Falmouth, UK; IIT Bombay with City Gallery and De Montford University, Leicester, UK, and on occasion others], would set up shop by drawing in their respective stake-holders on board. Stakeholders such as children and teachers from primary and occasionally secondary schools, artists, printmakers, story tellers, documentation team, and such. As well as design students, members of faculty of design, faculty of technology and engineering, model makers and whoever else needed to set the ball rolling towards the designated theme and project goals.

Model II, on the other hand, usually commenced with India and a dedicated webspace on a given theme as the take-off point, with the doors of the Web thrown open in invitation to any country/culture to join in for collaboration on a pre-designated task across a pre-designated time-period. This set

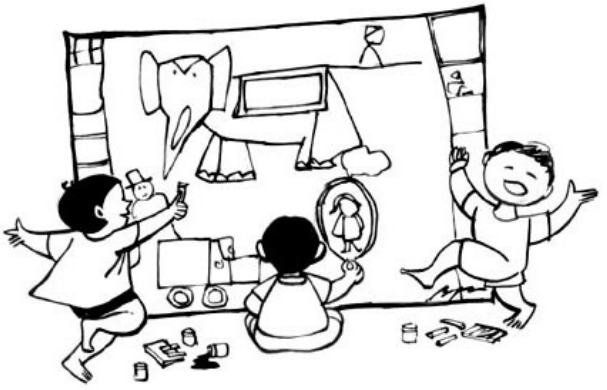
of 'events' did not require synchronicity in project room size and composition and were, in effect, quite open-ended.

These two modes of interaction are by no means exhaustive. It is possible that other models will emerge in future from other Projects of a similar nature. Both the models had their respective charm and advantages. While the model based on one-on-one interaction seemed more rigorous and concomitantly less open-ended (not in ideation, but only in the structuring of time), it also ensured more constructive results on the ground. The open-ended interaction on the other hand could, by its very free-wheeling nature, generate hyper-excitement like a kaleidoscope gone out of control. Model II could also require intense hands-on editorialising of content, given Internet's tendency to use its chat mode to digress into inanities.

(III) Theme for pilot event: Our pilot 'event' viz., the Bombay-Cornwall collaborative mural was based on Model I, which followed the one-on-one interactive pattern. The 'event' involved the simultaneous build-up of two murals—both eight ft by eight ft in size, one constructed at Cornwall, UK with Bombay as its theme, the other constructed in Bombay with Cornwall as its theme. Information, stories and lore about Bombay were asynchronously transmitted to Cornwall via a dedicated website built for the occasion by participants at IIT Bombay. Additional information about Bombay was transmitted via fax and email. On Cornwall's part, information came in as faxed images and email information as well as online digital images posted on the Bombay website (there was no dedicated website of Cornwall). All this formed part of the preparation, leading up to the pilot 'event' on Feb 6th 1998.

The participants chosen for the occasion were children, eight years of age (about 12–15 in number from each side), along with students of design and students and faculty members of technology. In addition to other support base made up of teams for documentation and those who helped with the physical construction of the mural[7].

(IV) Outcome of pilot event: (a) An interesting outcome of the murals were their respective identities. Cornwall did not remain exactly Cornwall after the children in Bombay had interpreted the received images in their own light. The black



Collaborative Bombay-Cornwall Mural in progress

and white faxed images (of the tiled English houses or ships docked at the Falmouth yard) were painted by children in India in their own notion of what Cornwall could be like. In the reverse, the image of an elephant sent across to Cornwall found its own shades of colors there. Bombay at Cornwall did not remain exactly Bombay, nor Cornwall in Bombay exactly Cornwall. It seemed like a celebration of points of view about cultures and how differently one's culture could be perceived by another when mediated by technology, without raising unnecessary hackles or dust about why one's culture was being perceived differently in the first place.

(b) It was also interesting to observe the way the technologies worked. What seemed the most uncertain was the glamorous, emerging technology of the Internet. What worked well, on the other hand, were the tried and the tested technologies of the fascimile, the telephone and the email. Outside of these, what additionally worked well was the 'pasteboard', a proprietary tool developed for the occasion by a bright technology student at IIT Bombay and meant to place on record, the happenings at both ends of the collaboration, by splitting the computer screen as part-Bombay and as part-Cornwall. At the time of the experimentation, the ability of the 'pasteboard' to store and then unfold itself chronologically to retrospectively reveal the entire chain of happenings, was not what was possible as part of the just discovered paradigm of the digital dairy. The 'pasteboard' as an innovation made us confident that tools built with a focus on context (of use) and user group were likely to make an impact as well as be sustainable.

(c) It was a matter of happy irony that while technology aids such as the CUCme cameras installed at the UK end and whiteboarding installed at both ends worked rather tediously since they are both bandwidth-hungry technologies. What worked extremely well on the ground and for all to see were normal activities that required human, mental and emotional energies. These were activities such as drawing and painting that helped express one's culture to another, with these activities being supplemented by technology only for purposes of their transmission (via faxed images and digital images). Or, the act of chirping through telephone-conferencing that came out unfettered, spontaneous and natural as the most basic of communications are expected to be, and additionally lending to the interactions, a sense of tactility. As was the privilege of being able to interact with children from another culture (through the computer, of course) and directly get to learn about their milieus. The point here is that, technology did not obfuscate or overwhelm the real human activities on the ground, it merely uplifted their quality.

(d) The elements of surprise unleashed about each other's cultures through direct and imaginative communication, with the most significant revelations relating to the area of time. Apart from difficult lessons of 'time void' made easily comprehensible, the 'event' brought home to roost differing notions about one of life's most baffling concepts. It seemed ironical that a technology born in the cradle of the West was actually structured around Eastern concepts of time. Rather than being depicted as absolute and uniform (after Schopenhauer and Newton), the Net seemed to work in an infinite series, more like "a web of time, the strands of which approach one another, bifurcate, intersect, or ignore each other" (after Ts'ui Pen's concept of time, Borges 1962).

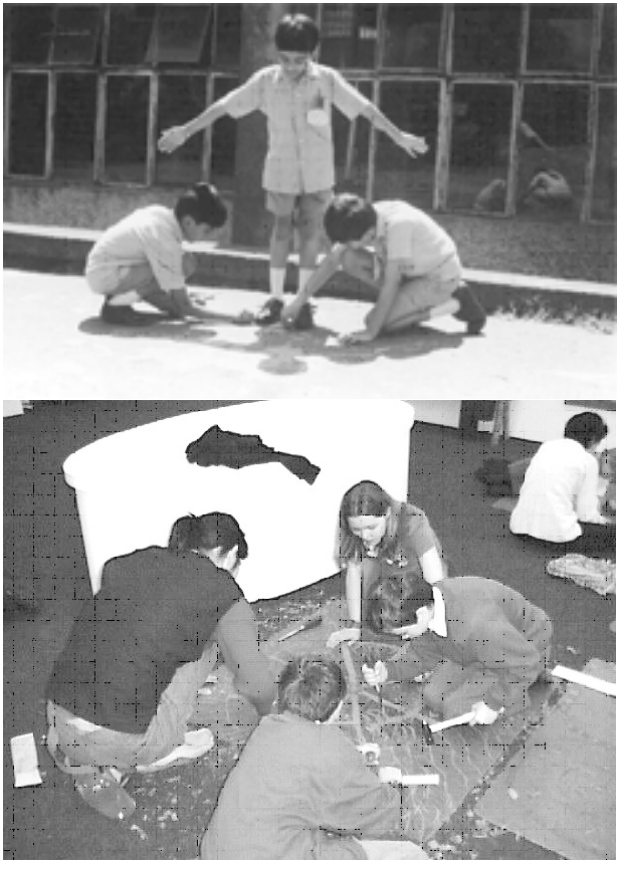
(e) And most of all, the excitement of seeing a large empty canvas transforming before one's eyes into a beautiful mural across a four hour period that carried the time zones of two different continents and managed to finding a remarkably uncomplicated expression through timelines (on the mural in India) - with the GMT (Greenwich Mean Time) marking the left border as if depicting the West and the IST (Indian Standard Time) right border, as if the East..

(f) But the greatest celebration of the day came from a fantastic sense of a 'carnival' that had been triggered off by

"Walking through" an Indian Elephant: Cornish Sailboat in India: designed and built in Cornwall from images exchanged constructed after exchange of information between India and UK and images between Cornwall and Bombay

the joyous and spontaneous participation of children and adult alike - notwithstanding key technologies failing at the most critical of moments. This, in turn, was underwritten by the unassailable fact that it was not technology that had steered the course of the day, it was people and their activities. Technology was there to help when it did. It was also apparent on the face of it all that something about learning had changed irrevocably, and that Stephen Pappert's 'Mindstorm' (1980) about the computer's ability to make learning breathtaking and constructive had suddenly appeared to be almost prophetic and oracle-like (Pappert, 1999; Time, 1999) All other 'events' conducted under project Solar Eclipse'99 have carried the same quality of the 'carnival', driven as they were, by collective inspiration, by the very sensorious nature of their experience, and not least of all because of the exciting user-groups involved. The infusion of creativity through children and artists - urban and tribal alike. Street children with their keen native intelligence, wonderment and a hunger to learn writ large in their eyes. Storytellers with their ability to regale an audience even while communicating matters of grave import. Model makers and printmakers surpassing everybody else in their energy and staying power long after the last rays of the day had vanished. And school teachers with their immense reserve of patience and never ever appearing to be patronising with their wards.

(V) Other 'events': The following 'events' followed the pattern of interaction as in Model I:
(i) collaborative installations of the Indian Elephant and the Cornish Sailboat: a life-sized walk-through installation of the Indian Elephant at Cornwall and a life-sized walk-through installation of the Cornish Sailboat at Bombay, India. Once again, the respective outcomes were a distinct function of the interpretation of the information exchanged across the wires. The Indian Elephant website, built for the occasion by IIT bombay provided a comprehensive information and feel of the elephant, while the sailboat carried nuances of Cornwall's tragic story about King Mark's unrequited love for a commoner Isore, resulting in her death. Sails in black and white uplifted by motifs of the sun provided a warm metaphor for the way two cultures could work creatively around each other's idioms and folklore.



Children in India acting as live sundials under a Partners in UK reciprocating with bright sun: preparing to collaboratively build their own preparations for sundials with UK partners collaborative sundial building

(ii) collaborative sundials, with sundials made collaboratively at the two locations - India and UK through information and ideas exchanged about their designs and functions. For inspiration acting as starting point for the designs, there was India's ancient legacy of a huge sundial called the Jantar Mantar, located in its desert-state of Rajasthan, The sundials that emerged at the end of the 'event' either bore the distinct imprint of the respective parent cultures or came out as sundials that were neither English nor Indian in their identities. But assumed a persona of their own as a function of contemporary materials and processes available to design combined with cultural exchanges.

(iii) collaborative love stories and love letters, based on exchanges between children and adolescents from schools in Bombay and Leicestershire in UK's Midlands. Activities included one of the partner countries writing part of a story and the other partner completing it. Or one partner outlining various possibilities of a story end and the other partner fleshing out the story itself. All this, with help of eminent story tellers at both locations. India's story teller, Badrinarayan, the country's foremost designer of children's story books and artist par excellence (in the genre of Matisse) died soon after, taking with him his first-time memorable experience of interacting with children across two continents via the networking technologies. The participants also exchanged love letters that were like puzzles, incomplete at one end and completed at the other by the recipients.

The following 'events' followed the pattern of interaction as in Model II:
(iv) "Here comes the Sun", held on the occasion of the complete solar eclipse that took place on the 11th of Aug'99, was an 'event that was driven towards creating a web-community from around the world and enabling them to experience a virtual solar eclipse on the Web. The idea was also to interact and share eclipse-related ideas and products with the logged-in web-community before and on the day of the event. What the communities got to share were off-shoots of the theme such as eclipse-related myths from different cultures, with the metaphor of the eclipse being transposed onto non-eclipse activities and games such as kite-flying (with one kite eclipsing the other). Or revealing the face of the sun as seen in nature such as on the sunflower or on fried egg with its sunny side up or the face of the lion with its golden mane, and so

Dedicated site for 'event' entitled 'Love Stories.

Artist and Story teller Sri Badrinarayan narrating progressively built during Stories to children the course of the 'event'.

on. Some of the products designed on the occasion were solar masks and solar filters with help of ideas-exchanged across the Web.

NASA (USA)'s Exploratorium and UK's Art Catalyst joined in as collaborators after they came to know through the Web of the Project's existence

(v) "Castles in the Air", which was a three-day event about using the Web to interface with the arts and the crafts in order to explore patterns, shapes and structures across two-dimensional surface and in three-dimensional space, drew its inspiration from referencing, via the Web, patterns from other cultures. As part of an experimentation to understand the Web and the networking technologies' ability to mediate with the 'physical' and the tactile mediums of the arts and the crafts, the 'event' invited renowned artists, sculptors, tribal artists, textiles artists and installation artists. The end-game was to construct a large installation on the theme of shapes, structures and patterns with the help of parallel mediums of expressions (painting, sculpture, textiles designing, etc.,) and the parallel use of materials (such as clay, textile swatches, paints, hand-made paper, pvc structures, and such). All of these were thematically driven by ideas exchanged across the Web. Collaborating with the artists and sculptors were students from a fashion design institute as well as a private trust for promotion of the crafts.

Project findings:

Our cross-cultural collaborative exercises based on 'events' starting in the late 1997 and ended around the end of 1999, threw up the following pointers:

(i) the web-community appeared far more committed towards creating physical artifacts when the model of interaction consisted of a one-to-one interaction-mode between two focussed user-group, rather than when the model of interaction involved a wider and a more diffused user-group. The product-ideas exchanged were usually in inverse proportion to the number of the audience/web-community involved or the products generated. It is rather telling that in spite of our web site being 'hit' with a figure of 400,000-plus across a period of two days during the solar eclipse, with many of

these hits coming from designers, the number of suggestions for products continued to remain insignificant. It is our understanding that for more serious product-generation activities, one would need to restrict the number of interaction-groups to a select few and devise an inbuilt-monitoring structure in order to get the communities to seriously respond to pre-designated task(s) at hand.
(ii) A carnival-like atmosphere prevailed without exception under both models of interaction.
(iii) Children appeared to be the more intuitive in their approach to community-building across the Net than adults, with almost no pre-conceived notions or fear about the computer-mediated technologies.
(iv) The parallel employment of the networking technologies, with both the conventional and the emerging technologies bailing each another out at critical points of failure appeared to represent the use of emergent planning at its best.
(v) The usual infrastructure-related problems such as bandwidth-availability or the lack of it, more than occasionally slowed down or brought to a grinding halt entire chunks and segments of the events in progress.
(vi) Over and above all these findings, empirical testing clearly established that: while it was the state of the art of the networking technologies that had enabled the information-exchange, the fact that the information exchanged had got actually transformed and assimilated 'locally' by members involved in this transfer, created a significant take-off for design's intervention into the networking technologies. It is our understanding here that technology alone would not have achieved these outcomes. It had to be the result of a combination of technology-design initiatives such as the use of imaginatively designed web-based tools, alongside the use of intuitive interfaces rooted in everyday metaphors, as well as easy uncluttered navigation that could make the Web feel like a dream, a journey worth taking, rather than give one the feel of a new technology device in use.
The important thing to remember here was the mix of planned and emergent strategy that was employed entirely based upon researchers sensing that there was a strong contextual and cultural field to be explored.

Looking ahead - shape of the Project's future as 'Project New Century':
Project Solar Eclipse'99 was Phase I of Colors of India and was undertaken to comprehend the cross-cultural collaborative potentials of new media technology. While for most part of the time between its commencement in fall '97 to Dec '99, the Project's energies were directed at conducting 'events' as an empirical exercise to support our original assumptions about the technology. The period between spring '99 to the present (fall '2002) was devoted towards understanding the findings of the experimentation and then articulating these as international papers to mirror different aspects of the new media technology.In the process of researching into the subtext of the Internet as a technology that continues to scratch the mere surface of its total potential, the following aspects have found articulation:
(i) The early inklings of its appeal in the market even without its containing a business model (which was never the intention in the first place since the Project was learning-driven and involved children). The interest was evident at a presentation for "Business Models for the Internet," where major IT companies in attendance found the Project's content rather business-worthy (Sen, IIT Bombay, India, April 1999).
(ii) The Net posited as a 'School of the Future' (Sen and Pulley, ICSID-ICOGRADA-IFI Millenium Congress, Sydney, Sept 1999; Sen, University of New South Wales/ACUADS, Sydney, October 1999).
(iii) The static and dynamic qualities that uphold the Net's progressive ability to 'inform', 'dialogue' and 'collaborate' towards creative ends (Sen, CADE 2000 Postgraduate Forum, Falmouth College of Arts, UK, July 2000).
(iv) The reach of the Net and its potential to work as a functional medium for the non-technologist (Sen, City Gallery-De Montford University, Leicester, UK, July 2000).

"Castles in the Air": installations as outcome of collaboration between painters, sculptors, tribal and textiles artists and fashion design students working with different mediums of expression

(v) The powerful combine of a technology-non technology alliance as a function of learning, especially for children (Sen and Poovaiah, University of West of England, Bristol and Rajabhat Institute Suan Sunandha, Bangkok, 2001).
(vi) The Net's ability to work as a medium for sustainable practices (Sen, Poovaiah and Pulley, Design History Society, Aberystwyth, Wales, September 2002); and

(vii) Identification of certain strains of pedagogy (Sen, Poovaiah and Pulley, Design History Society, Aberystwyth, Wales, September 2002).

Phase II of Colors of India, tentatively named 'Project New Century', is about building actual deliverables into the Net. At the time of submitting this paper, work on constructing stand-alone tools to leverage the potentials of the Net's collaborative environment has already started with stated focus on children as user group. Other tools for other user groups will follow.

In conclusion — the metaphors of the Solar Eclipse as a basis for optimism:

It might be presumptive to announce with the certainty of faith, the concluding words about a medium that remains as yet so nascent in its development cycle. While completely subscribing to the more well-known facets of the new media technologies, viz., their open-source and shareware idioms, what really represent the cornerstones of an experimentation undertaken amidst immense uncertainty are a few metaphors drawn from our own experience of viewing the eclipse on August 11 1999, as well as from an on-the-spot recounting by Observer's Nicci Gerrard of what had occurred across the actual moments of the eclipse in Cornwall (Lewis, ed. 2000):

(i) While Milton called it the disastrous twilight, for us the Eclipse was far from being a signifier of disaster. For us, it had everything to do with an opportunity to "connect up" and open doors to those shut out from the networking technologies:

(ii) If the daylight sun was predicted to get reduced to a gleaming crescent just, before being completely devoured by the moon, for us this was going to be a moment of deep reflection over the downside of a technology considered the "mother of all technologies." It was definitely time to de-glamourise technology and see its underbelly in full objective view.

(iii) If the eclipse was going to send the birds home to roost in the middle of the day and make bats flicker around on silent wings. If the air was going to become still and cold, and if for a few seconds, day were to turn into night and night itself giving the feel of the end of the world. For us it simply meant that we would have to do without the warm comfort and support of institutions and markets that did not see the merit of trying to de-mystify the novelty of a new technology. And worst still, reluctant to make it freely available to those who did not have the means to afford it.

(iv) And finally, the belief that the sun would return and a new dawn would flood in from all sides, the bats would disappear and the birds would fly back and begin to sing, and the ghastly chill replaced with golden light and warm sensibilities. For us it meant that we were going to work with some of the nicest user groups in the world - children and artists, sculptors and the disabled. To see a smile on their face because they could make a technology work to their advantage? That sight, as a potential and a real outcome of our experimentation, was definitely worth the leap, quite comparable to the leap of faith taken five years ago to conduct this experiment in the first place.

The implications for design and technology surrounding Project Solar Eclipse'99 stem from our attempts to bridge cultures, resources and time, evidently through addressing certain impending and looming realities about the new technologies, viz., (a) the decision-making scale that is likely to arise out of having to operate outside of finite data systems and finite geographic boundaries, and (b) that "as we design technological systems, we are in fact designing sets of social relationships" (Cooley, 1980).

At the end, it could have been like walking into a dark tunnel that Jorge Luis Borges (1962) so eloquently described in his 'Labyrinths' as: "roads that fork and corridors that lead nowhere, except to other corridors, and so on as far as the eye can see." The desire to remain in such a labyrinth for the sheer love of the excitement and promise of the joyous discovery of collaborating with potentially unknown frontiers of knowledge-systems vested in faraway cultures. The excitement of connecting up with these unknown people without fear or favour of offending. And awaiting the flavour of a

finished product borne out of time-bound, shared, reciprocal exchanges.

In that sense and more, the Project does not claim to offer solutions except to ask questions such as 'technology for whom' and 'technology for what'? If only to understand whether it is a mark or a scar that technology has left behind in its march across people's domains. Perhaps, one day, the answers will emerge from verily asking the right questions!

Footnotes:

Footnote 1: Complete or partial solar eclipses are not such rare cosmic phenomena. However, for most practical purposes, they are lost to humanity since they usually occur over the oceans, given that the earth is made up of only one-third land and two-thirds water. Under the circumstances, since the trajectory of the Solar Eclipse of '99 was due to cover a large part of the inhabited world, this presented itself as a rare opportunity for millions of people to be able to get a glimpse of one of nature's most fascinating occurrences, without having to undertake travel to far away destinations.

Footnote 2: The intention of putting on the ground the mechanism to connect up all of the countries on the occasion of the Solar Eclipse'99, just two years away, was highly notional and idealistic. The important point to remember here is that this idea of a large-scale possibility of "connecting up" cultures for the purpose of learning and camaraderie seemed to have a life of its own and quite capable of extending well beyond the temporality of the occasion (of the actual eclipse). The solar eclipse had provided us with a powerful idiom for connecting up and learning through shared ideas.

Footnote 3: Although the Internet has its origins in early US defence applications - the ARPANET—way back into the sixties, the first time it assumed a form that would make it accessible as a universal device of connectivity was in 1993. This was when Tim Berners-Lee, a scientist from the CERN Laboratories, Switzerland, invented the World Wide Web (WWW) that enabled computers from disparate systems from around the world to get connected to each other. Berners-Lee, who had since moved on to MIT, USA, had explicitly maintained on the BBC in late 1997 that his preference for letting users have the device for free over selling the WWW to the market, was to enable its use on a world wide scale. Project Solar Eclipse owes a large part of its ideology to this stated position of Berners-Lee's.

Footnote 4: A paper presented by co-author Robert Pulley at ICSID '97, Toronto had raised the possibility of a "daisy chain" along the eclipse's trajectory. And had Scrivener commenting positively about the potentials of CSCW underlying the "daisy chain" idea.

Footnote 5: Subsequent experimentation on the merging of physical and virtual interfaces at MIT's Media Lab (Glos, J.W and Castell, J., "Rosebud: Technological Toys for Storytelling," 1997) would suggest that there were obvious advantages of marrying the digital with he physical. The digital domainis known to be attributed with properties of "networking and ease of abstraction," while the physical is laden with properties of "legibility of interface and multi-sensory interaction".

Footnote 6: The reason for combining emerging technologies (usually novel, glamorous and exciting but hardly tested out) with conventional ones (tried and tested and ubiquitous by nature and hence non-glamorous), was to assure us of returns in the event of the failure of an emerging technology to deliver.

Footnote 7: What occurred on the day of the pilot project/'event' was beyond anybody's imagination. On the downside, despite our best efforts at placing the infrastructure on the ground and running a technology test with Cornwall the day before, the insufficient bandwidth often held communication to ransom, forcing us to revert, from time to time,

to fax, email and telephone communications. The telephone stood out as the oldest and yet the most heroic, stoic and unfailing technology of the day. The emerging technology (Internet) worked erratically and had to be seriously bailed out by the conventional ones (email, fax and telephone). However, everything else seemed on the upswing. When the children 'met' each other, it was warm, sunny and just past school hours in India, and cold, freezing and early on in the morning before school hours in the UK. The children in India greeted their counterparts in UK in at least eleven different ways of saying 'hello' in Indian languages. Before the children in England could recover from the idea of such multi-linguality, the children on both sides were already on to the computers that had CUCMe cameras fixed at the UK end, enabling the children in the UK to view those in India. Soon enough, there was whiteboarding as a tool allowing both sides to mediate each other's drawings and to come up with drawings done together. And most of all, they had questions for each other: UK:"what are you wearing?" India: "lemon-coloured shorts." UK: "how lucky! it's freezing out here." India: it feels almost hot here." UK: "does your mom scold you over homework" India: "you bet!" UK: "my favourite pet is my hamster" India: "mine is a parrot." UK: "wow, it's already past three in the afternoon there?" India: "And it's just nine thirty in the morning there?"

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Bindu: The Dot Personified

Haku Shah

In Gujarat, the Chaudhari tribals on the day of the dead remember their ancestors. They feed them by placing food on their roof. They also clean their house and apply cow dung and clay on their walls and floor. They prepare a liquid out of jawar-flour and buttermilk with which they print their hands on agricultural implements, on cattle and also on their walls of their huts. They also draw primitive figures on the walls and sprinkle this liquid (figure 1) everywhere in the corners as well as on the walls. This sprinkling which they call "Chantana", are dots of white on brown coloured walls. Visually one may say that these are just 'bindus' or dots. But for the tribals its the act of feeding the walls. To us artists and designers these are merely a part of the painting but to these tribals, these dots mean a great deal. This ceremony of sprinkling this liquid is performed on the new day called "Navo Dahado".

Figure 1

In the same way the dots are sprinkled, in a methodical manner, on the walls of the houses of the tribals of Orissa. Three splashes put together form a triangle which represents the heap of grain. Here also it is this sprinkling of the white liquid by which the patterns is created. The tribals of Chhota Udaipur region in Gujarat, the 'Rathwas', offer the terracotta to their Gods. But they won't buy a terracotta horse, elephant, or tiger without the sprinklings of white on it, which they call painting. If the terracotta is not sprinkled with these dots they say they cannot buy it, because it is not painted.

In tattooing, the dot means a great deal. In fact each dot is called a "dano" which is the grain. If it is one, then they say 'ek deno' (figure 2). Four dots are called "Char dana" which is four grains (figure 3). When it increases, there are fabulous meanings given to the motifs created if it is just a triangle, that is one dot placed on two, and the three together placed on another three its called a heap. (figure 4). But if it is one more grain on top of this heap, it is called a "DEAADI" 'temple' (figure 5). Two triangles joined together make the 'cobra' or a 'yoke' which is the bull's harness made out of ropes (figure 6).

Figure 2

Figure 3

Figure 4

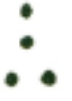

Figure 5

Figure 6

But if the same form is repeated four times around a centre to form a square from, the it becomes a step-well (figure 7). If there are six dots placed around the dot it becomes a flower (figure 8), but if there are eight dots around a central dot, it becomes a 'kaudi' a unit of currency of Kutch Gujarat (figure 9). Eight Dots placed in a diamond shape with one in the centre, represents a leaf (figure 10). A vertical line flanked by two dots on either side denotes a fly (figure 11). A semi circular line in the middle of two dots, one on the top and the other on the bottom makes it the moon (figure 12). Four semi circular lines with four dots and one dot in the centre make the 'mango tree' (figure 13). And if it is just a plus or a cross mark with a dot in each section it becomes a symbol for the 'Der tree'. (figure 14). The cradle is represented by three dots placed horizontally and 2 semicircles on either side with a dot within (figure 15). Similarly, a semicircular line with a dot within and the triangular 4 dots at its apex make a woman with water pots (figure 16). Similarly, a mole on a cheek is called 'Saseme' seed i.e. 'Til' which is always seen as an auspicious sign and also as an adornment of the body.

The dot is seen as a grain or a 'Sesame seed'. Also while stitching a quilt, the stitch itself is called 'makudio'— an ant. In the same way sometimes, the dot becomes the star or flower or is just placed on the very first page of an account book with red kum-kum marks forming the Ganesh (figure 17). The account-book does not start without the placing and worshiping of the dotted" Ganesha.

In the account books, every page is started by these five dots. The credit word 'Jama' is represented by a dot and a floating line (figure 18) which shows the importance and use of the simple dot in our daily life.

There is a caste known as "Vagharis" where the women wear a cloth 'thapedu' which is red in colour with a pattern of white dot, created as a part of design on the fabric. These people know exactly the amount of dots they need to put.

Figure 7

Figure 8

Figure 9

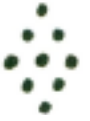

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

They do not accept lesser amounts of dots than those. In the same way a large number of forms are created in the tie and dye known as 'bandhani'. It is again here, that the dot converts an ordinary cloth into a priceless fabric. Small little dots scattered over the fabric give it the name of moonlit night called 'chand Rokhani'. It has a black base with red dots on it. The technique of making a dot and creating a fabulous environment in colour through dots makes another fabric called "Chundadi", which is worn by the women of Gujarat in the marriages. In fact, a square piece of cloth with tie-dye dots, is offered to the Mother Goddess in which she adorns herself. The bright dots have always been used to adorn the garments of both men and gods. Like the 'Sitara' or Mukesh' — the star which is either silver or gold in colour and is used all over the surface of the cloth. These dots themselves makes such an environment that it really takes you into another world that which is above human. In the terracotta of Gujarat women make small primitive figures of man and women, so beautifully that the dots themselves become the ultimate expression. At times, they become the eyes, at times the ears, the breasts, the nostrils and at others the navel or the sex organ itself.

One of the untutored painters from Gujarat, has created a variety of different meanings from dots. For example, in one of his paintings (figure 19) he uses the dot at one point to describe the texture of the trunk of a tree, in another the pattern of the body of an animal. In the squirrel the dot denotes the inside of the body may be the blood cell, in the Sun the diffusing rays, on the mountains it becomes grass and through the dots he creates a whole world of creatures. In one of the paintings of tribals the grain merchant is shown with heaps or grains through dark and light thick and thin dots. (figure 20–21)

Most of the folk and tribal forms have the hidden dot or the play which creates a larger imagery of visuals. For example, in the rangoli, the dots guide all the patterns whether they are lamps and flames, beetle boxes, turtles, snakes and so on. In the same way in the South, in Kolam the dots again guides all patterns and design.

Beautiful play of material for the visuals to create a meaningful result is seen all the time whether it is a brocade sari in Gold or a clay used as resist on red ground. The skill is so beautifully shown that sometimes even our eyes become oblivious to the elemental dot, for example the jamdani' from Dhaka. How beautifully the fabric itself shows the fragrance

Figure 20

of the body and soul of a woman. The visuals and their meanings have achieved a height of expression. The example is one of the blouse pieces of Jat which has a dot in the centre of the breasts. These are embroidered with cardamom seeds and cloves, with mica mirrors and bright colours. These dots of cardamom seeds and cloves not only adorn the blouse piece but also leave a fragrance which is turn, enriches and enhances the meaning of the visual.

Figure 21

So we have taken just one element the dot' or 'bindu' and seen how much is woven around it, what a variety of meanings is lent to it through various ways of representation and use. Not only that, the material is enormous from clay to gold, precisely used for very definite purpose and meaning. It has become very much a part of life. One cannot afford to separate this visual in any way—it is no decoration Separate from life: it is life itself.

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Reprint

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The Kaavad storytelling tradition of Rajasthan.

Nina Sabnani

Introduction

Stories could be memories or mediations between reality and aspirations that reflect what a society wishes to express about itself. Story is perhaps the oldest form of communication known to humankind. It has a way of mesmerizing the listeners into silence and the tellers into expressing the deepest desires and anxieties of their society, directly or through subversive means. Storytelling brings people together, whether it is a street corner or a darkened cinema hall. While the essence of story remains the same, the way of telling stories has been influenced by the kind of tools and technology of the times. From telling stories with the help of voice and gesture alone to using painted scrolls and boxes, text, dance, music, performance or a combination of all, storytelling in India is a rich heritage. It defines our culture and our identity.

'Kaavad Banchana', an oral tradition of storytelling is still alive in Rajasthan where stories from the epics Mahabharata and Ramayana are told along with stories from the Puranas, caste genealogies and stories from the folk tradition. The experience is audio-visual as the telling is accompanied by taking the listener on a visual journey made possible by the 'Kaavad' shrine. Against the backdrop of storytelling it invokes the notion of a sacred space and provides an identity to all concerned with its making, telling and listening.

The Kaavad is a portable wooden temple/shrine that has visual narratives on its multiple panels that are hinged together. These panels open and close like doors simulating the several thresholds of a temple. The visuals are those of Gods, goddesses, saints, local heroes and the patrons. It is made by the Suthar (carpenter) community in Mewar for the itinerant Kaavadiya Bhat (storyteller) from Marwar who brings it to his patron's houses in Rajasthan.

This portable temple/shrine comes to the devotee rather than the devotee going to the temple (Bhanawat, 1975). The Kaavadiya Bhat periodically brings the shrine to his patron's house to recite his genealogy and to sing praises of his ancestors. He also recites the stories especially those that relate to the patron saint of the community concerned. The Kaavadiyas (storytellers) and their jajmans (hereditary patrons) consider the Kaavad as a sacred shrine which demands certain rituals to be followed, listening to genealogies, epic stories and making donations. It is believed that listening to stories purifies the soul and reserves a place of entry for the devotee in heaven.

A synergy exists between the maker, the storyteller and his patron which has kept the tradition alive. The survival of the Kaavad tradition hinges not only on a set of economic relations and transactions but on the fact that the maker, teller and patron are dependent on each other for their individual identity which cannot exist if either of them is absent. The Suthar community prides itself for being the preservers of the Kaavad making craft for generations since no one else outside Bassi makes it. The storyteller's identity is tied to the very term Kaavad as they are known as the Kaavadiya Bhats, (distinguishing themselves from other Bhats or Kaavadiyas), and their patrons derive their identity from the Kaavad recitation where their genealogies are recited by the storyteller as he points out at their painted images on the shrine. Thus, the Kaavad imparts each with an identity that reaches back into time and space, in a way enabling 'the

groups to preserve a remembered past, conserve community integrity and identity and behold a vision of the future" (Mayaram, 1997). One of the ways by which the identities are reinforced is the way the origin myth of each community connects to reality and binds them together. The synergy that exists within the communities is thus mirrored in these myths, making life and myth seamless. Finally, images, myths and genealogies together connote memories as well as aspirations of the communities involved.

Overview of the Kaavad tradition

The Kaavad tradition is approximately a 400 year old tradition (Lyons, 2007) although like several oral traditions in India, its origin is located in mythology or attributed to a mysterious power. Historical evidence of portable shrine exists in some religious texts (Jain, 1998) but there are no clear references to the Kaavad. An indirect reference is probably made to the Kaavad in Tarikh-i-Firoz-Shahi of Afif, where it is referred

to as a 'Muhrik — a wooden tablet covered with paintings within and without' (Singh, 1995)

All the extant Kaavad shrines have images of the Bhakti saints as well as stories of Ram and Krishna, so it may be assumed that it probably came into prominence after the 'Bhakti movement', bhakti also being the term for Hindu devotional expression. The Bhakti movement in the North, centered on the devotion of Ram and Krishna, both considered as incarnations of Vishnu. Bhakti was also associated with a group of saints who rebelled against rituals and caste distinctions (Sharma, 2002) Saints like Kabir, Meera, and Narsinh Mehta amongst others can be found in the Kaavad. The fact that the other images on the Kaavad represent Hindu gods and goddesses also suggests its intent of being a sacred shrine which is portable.

The Kaavad Makers: Suthars/Basayatis

The kaavad makers known as Suthars or Basayatis reside in Nalla Bazaar in village Bassi, approximately twenty five kilometers from Chittor. Bassi lies on the Chittor-Kota road. It is situated amidst the hills of the Aravalli ranges in Rajasthan. Of the 25 families of Suthars only five to six families are involved in making Kaavads.

Bassi was found in 1560 AD by prince Jaimal from Devgarh. According to the genealogist of the royal family one of their ancestors Govindadas happened to come across a group of artisans in Malpura near Nagaur making painted wooden objects. He brought one of them, Parabhat to Bassi (Lyons, 2007) offering him ten bhigas of farming land and a house to settle in. This house called the Bheda ki Guwadi has seven to nine rooms and some families continue to live there, although several families have moved out of it over generations. Since they came and settled in the place it came to be called Bassi (as in Buss jaana: to settle) and the Suthars (carpenters) came to be known as Basayatis.

Origin myths of the Suthars

The Suthars of Bassi call themselves the children of Visvakarma. According to the Hindu tradition, Visvakarma is the chief architect of the Universe, the supreme patrons of the Arts (Raina, 1999). He had five sons that were born from his body, one of them being Maya the carpenter (Suthar), who fathered the carpenter community. The community in Bassi believes that Visvakarma was the younger brother of Brahma (others believe he was Brahma's son). Visvakarma was called upon several times to build for the Gods. At first he made the Universe, and then he recreated a Golden Lanka because it was burnt down. He also recreated Dwarkapuri for Lord Krishna because it had drowned. So pleased were the Gods with Dwarkapuri that they wanted to send him gifts. While he was still on his way home they sent the gifts of diamonds & emeralds and a cow to his house. His wife was sweeping the floor when the gift bearers arrived. She would not accept the gifts in his absence and sent them away. A merchant's (Baniya's) wife in the neighborhood invited the gift bearers to her place and accepted the gifts meant for Visvakarma. And 'so the suthars lost their wealth to the baniya merchants' (Mistry, 2009).

This myth establishes the professional identity of carpenter for the Suthars although not limited to the makers of Kaavad but it does give them a status of a higher caste whose ancestry is connected to the Gods themselves. The specific identity of Kaavad makers comes from the place Bassi, as it is the only place where Kaavads are made by a community that has one common ancestor.

The Kaavadiya Bhat or Storytellers

The Kaavadiya Bhats are the itinerant storytellers of the Kaavad tradition who live around the Jodhpur, Nagaur and Kishangarh districts of Rajasthan. The name is derived from the profession of the ones who carry/use the Kaavad to make a living. The term 'Bhat' is derived from the caste of the teller. This distinguishes them from the Kaavadiyas who carry

the water from the Ganges in Haridwar to their hometowns in 'Kaavads' (two baskets balanced on a pole in which the pots of water are placed and carried on the shoulder by the Kaavadiya). The Kaavadiya Bhats are related to the Barots of Gujarat as they too are record keepers and maintain a Bahi Khata of their patrons (Rav, 2008). The Kaavadiya Bhats live the life of a genealogist in their own village preferring to hide the teller identity at home because the storyteller status equates them to a 'maang khani jati' (those who beg and survive), the stigma of which is worse than being called a thief or murderer (Rav B. , 2004). Their life too revolves around the seasons. In the monsoons it is believed that the Gods sleep and therefore the patron cannot wake up the Gods and make a wish through the storyteller. This makes the storyteller free to pursue other economic activities such as agriculture. Some Kaavadiya Bhats have their own land but most often they work on the land of others. Others use their camels to transport goods for the community. For some months they even travel to distant places to work as masons or do labour work like carrying stones or making roads. Today too, the storyteller has to adopt multiple professions to make a living. However, he comes into his own when narrating stories or reciting the genealogies for his patrons.

Origin Myths of the Kaavadiya Bhats

There are several narratives built around the origins of the Kaavadiya Bhats. A Bhat has been described in some of the ancient texts (Brahmavaivarta Purana) as the one born of a Kshatriya father and 'prostitute' mother, or Kshtariya father and widowed Brahmini or Brahmin father and Shudra mother etc. Gunarthi (2000) describes the Bhat as the 'other' jati who are the record-keepers or genealogists of all castes, from the Brahmin to the Bhangi' They are divided into 9 'nyat' (the superior caste that drinks alcohol and smokes Bidis and visit the 'Chhoot or touchables') and 12 'Phagotara' (those who visit and eat with the 'untouchables'). Gunarthi also reports Sir Henry Elton's (reference to accounts of Bhats in the Ain-i-Akbari) origin story of the Bhats. This is the time before the universe was created (Sristi) Shiva wanted to spend time with his wife Parvati and did not want to go grazing the cows. So he created a Bhat from his sweat to look after the animals and chant (stuti) his name. But the Bhat began to sing praises of Parvati and wandered here and there. This angered Shiva considerably so he evicted him from heaven and cursed him to be a Bhanwar Bhat whose children will forever wander aimlessly (Gunarthi, 2000).

However, in their own words the Kaavadiya Bhats claim to be the descendants of Shravan Kumar of the Ramayan, but were born from the brow of Lord Shiva. In the Kaavad lore Shravan Kumar, was the nephew of Dashrath (Father of Lord

Ram) and was accidentally killed by him when Shravan was transporting his blind parents in a Kaavad. This narrative explains the given identity of being Kaavad bearers from the Treta Yug and also forges an alliance with Lord Ram. The other narrative which alludes to their birth from Shiva's brow explains their skills as storytellers. The way it is explained is that once a bit of ash fell from Shiva's brow and transformed itself into a bumble bee (bhanwara) and Shiva blessing the bee turned it into a human being. This 'being' then begged to be given an identity and to be assigned his task in life. Shiva pronounced him to be a Bhanwar Bhat who would go around singing the praises of the lord. Coming from the brow of Shiva the Bhanwar Bhats were thus gifted with superior memory and they became the record keepers of the barbers, tailors and carpenters (Rav, 2008). Lastly, they also claim to be blessed by goddess Sarasvati who resides in their throat when invoked, enabling them to speak fluidly and faultlessly.

There is no discomfort in claiming these multiple identities as each narrative tries to rationalize the storyteller's innate characteristics which are pre-given by birth. Besides claiming a space in immemorial time, claims are also made to caste status in historical time, that of having Rajput origins.

Origins of the word Kaavad

The dictionary (Apte, 1996) defines Kaavad as either a 'Kavaat' or 'Kapaat' or 'Kivaad' meaning half a door or panel of a door, or as 'Shruti' which is audition, hearing or relating to the ear. Bhanawat (1975) subscribes to the term 'Kivaad' meaning door and the shrine consists of several panels that open up like many doors. The Kaavadiya Bhats are more concerned with the conceptual aspects and for them the word Kaavad means 'that which is carried on the shoulder' and the origin of the tradition is therefore attributed to Shravan Kumar from the Ramayana who carried his blind parents in a Kaavad to various pilgrim spots but was accidentally killed by King Dashrath. Since Shravan was unable to complete the task of taking his parents to all the holy spots, the Kaavadiyas carry on the tradition of bringing the pilgrim spots to the people in the form of the Kaavad shrine (Rav K. , 2007).

To explain the origins of the shrine-like form they attribute it to a Brahmini Kundana Bai from Varanasi who made the first Kaavad and gifted them to the storytellers (Rav, 2008). Kundana Bai collected half the earnings of the Kaavadiyas towards feeding of cows. This is also inscribed on the front doors of the Kaavad shrine for the benefit of the patrons.

The Patrons

The patrons of the storytellers are spread far and wide in Rajasthan. They belong to 36 jatis and each storyteller may have 30 to 50 patrons whom he will visit once a year. The patron or Jajman is inherited by the storyteller from his father and will in turn distribute his patrons amongst his sons when he retires. The patron is bound to make donations to the teller once in a year. The patron gets the experience of a pilgrimage as the shrine-like Kaavad comes to their homes and sanctifies their space.

As the teller performs the ritual of reciting their genealogies and points out the images of their ancestors on the Kaavad shrine the patrons have the satisfaction of seeing their forefathers well looked after in the other world. It gives them immense pleasure to be told about their ancestry and helps them and their children remember all the generations. It encourages them to make donations and also aspire for a place for themselves on the Kaavad. As a part of the donation they may provide the storyteller with a goat or a calf, grain for the year, clothes, cash and even jewelry. The storyteller will also regale them with origin myths of their community which establishes their caste or professional identity.

Origin Myth of the Jat Community

The jats came from the jatas (coiled hair) of Shiva and as they came into being they asked Shiva what they must do in order to get salvation. He asked them to be charitable and generous.

When they asked who they should offer the charity to, Shiva rubbed his forehead and with the ash created the storyteller who could be the recipient of all charity. This myth ensures a synergy between the teller and his patron as each depends on the other for his survival and identity. For the patron it explains his identity and establishes his direct descent from Shiva.

Conclusion

The Kaavad offers an identity to all the communities that are connected to it. Each community has multiple identities but in this specific one concerning the Kaavad they are all related. The makers get their uniqueness as they are the only ones who make them and were created to make them. They depend on the tellers to some degree to continue making the Kaavads. The tellers get their professional identity from the very name and depend on their patrons to continue the tradition. The patrons 'recognize themselves' and their ancestors in the images that the Kaavad mirrors. The myth in a way explains the reality and reinforces the dependence and synergy.

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Fractal like Model for Designing Educational Stories

Sachin Dutt

Abstract
Stories have existed in the human culture since prehistoric times. They have been used for various purposes, knowledge dissemination being one of them. In the past century there have been various attempts at using stories for communicating knowledge suitable for the modern context. However there seems to be an absence of a systematic method of designing a story for particular educational communication. The existing process is mostly intuitive. In this article we present a model for designing story plots suitable for communicating educational information other than reading, writing, arithmetic and hands on skill development. This can provide tools for educators and learners to develop their own learning stories.

About stories
Although there are many definitions of a story, the most commonly held definition is that it is a sequence of events connected by a cause and effect relationship (Bal, 1997). If we use the term narrative, it includes "the way a story is told". Story is only about the content. We are currently dealing only with the question of content ie " What the story is about".

A story has three basic elements:
1. Character — The main protagonists in the plot on whom the story is based
2. Plot — How the characters interact with each other creating different situations
3. World — The location where story takes place

Story plots have been classified by many scholars. However there is no singular consensus on how many plots are there. Some common plots are Adventure, Quest, Transformation etc. (Tobias, 1993). However none of the existing plot structures, we have studied seems to be suitable to be used for modern educational content. We are presenting here a generic plot structure out of which a large number of plots can be generated from a single model. This model is open ended with no beginning, middle or end unlike other story plots. The story can be continued by more than one person if they have understood how the model works.

Basis for developing the fractal model of stories:
The story plot/premise designing model that we present is based on four sets of observation. One from the study of N.C.E.R.T. textbook for secondary school. Second, from the world view of structuralism. Third, from our personal observation of the phenomenon of challenge and fourth from Jean Piaget's philosophy of learning called constructivism.

1. We observed from N.C.E.R.T. textbook of class fifth to eighth, that every piece of information is based on something previously known. A very common statement in N.C.E.R.T. books at the beginning of every chapter is that "as you have studied in your previous classes …" Pointing to the previously known information. Whenever a new situation arises where a previously held knowledge or belief is unable to provide sufficient answers, then people are compelled to find a new way of resolving the new situation. In that process, new knowledge comes into being. This also happens to be the process followed in scientific research where a gap in existing literature is searched and new answers are found to fill that gap. Let us say for example, before the earth was discovered

to be a sphere, it was believed that earth was flat. Before the wave nature of light was discovered, it was believed that light is a particle. One can measure the area of a rectangle with a particular formula, but the same cannot be used when the shape in question is a sphere, a new formula needs to be created. Or before democracy came into being, empires across the world were ruled by aristocracy. One cannot understand democracy without contrasting it with aristocracy.

2. The second piece of observation on which our model is based is the binary opposition principle of structuralism. According to the structuralist view of the world, entities exist in paired relationship. One entity does not stand on its own, it is in relation to something that it is opposed to. Forming simple units to complex structures in a unified system (Hawkes, 1978). Levi-Strauss has shown in his structure of mythology, the idea of binary opposition as the central concept on which ancient myths are built.(Strauss, 1983)

3. The third piece of observation comes from our personal observation of the phenomenon of challenge. We found out that challenge as a phenomenon has an important role to play in developing compelling story plots. New ideas challenge old ones. One philosophy challenges the other. An organization confronts the other and in the process a better knowledge or better service or product is created. This observation has its root in Charles Darwin's survival of the fittest view of nature.

4. The fourth observation is the philosophical view of how intelligence develops in children by Jean Piaget. This view relates intelligence to the act of adaptation. The child forms a schema of the world. Which forms his current knowledge. A situation arises which does not fit into the existing schema. In this case, the child is compelled to reorganize the existing schema to accommodate the new situation. This happens essentially at the point of failure. When a particular situation violates an expected notion of a phenomenon; then readjustment takes place and the new situation is understood. This is also a way of adjusting or adapting an existing thought process to a new situation. This process of learning is termed as constructivism. (Piaget, 1953)

Combining these four set of observations, we have come up with a model for designing stories with specific educational purpose. These stories show the distinction between two sets of concepts. In order to explain one concept, a contrasting concept is shown in challenge against the old one. By this process a clear distinction is created leading to better comprehension of the subject matter. The fractal model for designing story plot is given in the following figure:

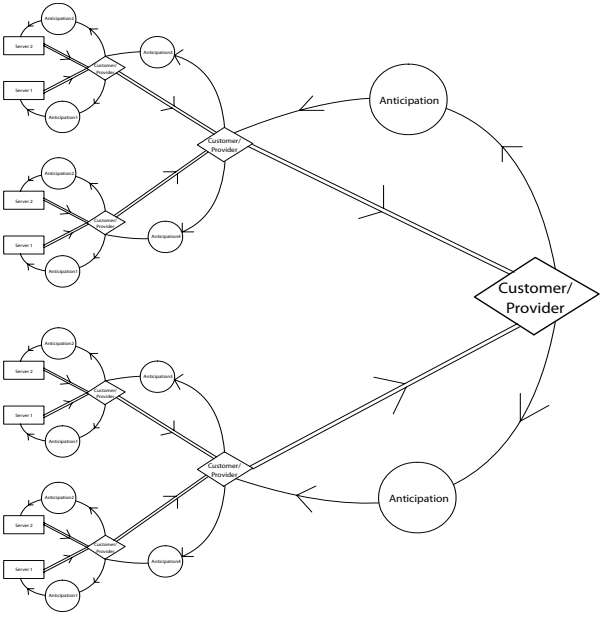


Figure 1:Story plot designing model

This is a branched structure with self similar units repeating at different levels. To understand this modal we look at the simplest unit.

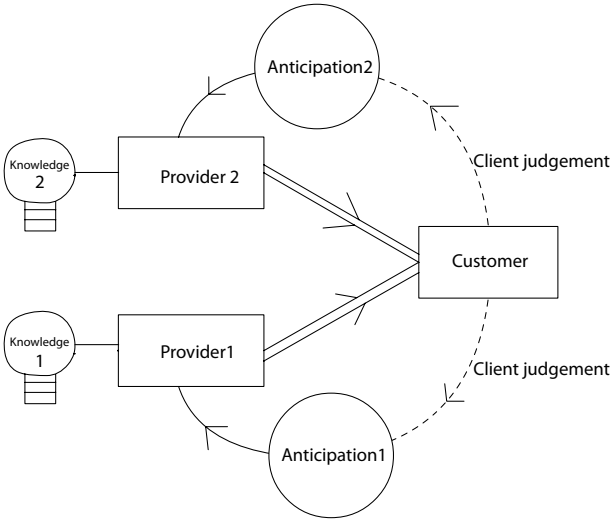


Figure 2: Basic unit of story plot model

It has five components:
1. Provider
2. Customer
3. Served entity
4. Server Anticipation
5. Client judgment

For the time being we will deal with this simple unit. The fractal nature of the model will be explained briefly later.

Provider: It can be a single person, group of people, a community or an organization who gives something to the client. For example a laborer giving his services to a civil engineer. A doctor giving services to his patient. A politician giving services to the citizens, A researcher proposes his ideas to the scientific community. In this case, the laborer, the doctor, the politicians and the researcher are servers..

Customer: Someone who receives a service. For example the civil engineer, a patient, a citizen, a scientific community in above cases. Customer can also be a provider for another person or itself.

Provider 1 and 2: Providers are the mutually challenging forces in the plot. Each provider, in order to make the customer happy, improves the quality of what he is providing or does whatever actions needed in order to win the attention of the customer. Providers may indulge in unhealthy challenge. This is also an important part of the plot development. The winning provider is the one who instead of indulging in unhealthy challenge and trying to lure the customer is honest to his trade and works only for the betterment of the entity he wants to provide the customer. His challenge is self improvement. The loosing provider sees challenge as a competition. His main focus is defeating the opponent than providing a better service to the customer.

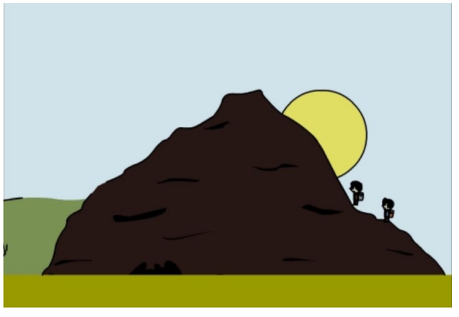
Anticipation: These are the arguments and internal thought processes that articulate the gap between what the customer needs and what the provider has at the moment. The anticipation is where the gap is reduced. Anticipation could be a wise person, or a manager of a company, anybody who provides a reflective element on a failed attempt. For example, a provider served something that the customer rejected or the customer chose from provider 2 other than provider 1. This will start the anticipation process where the customer will be compelled to think what went wrong in their effort. For example, arguments among politicians after loosing the election and planning the next strategy or for example the internal dialogue of a researcher after his theory is rejected by the scientific community. It is in the act of rejection that one is compelled to seek new answers. In case of renaissance and the dark ages, the new scientific spirit competed against the old religious belief system. In the process there is clarity achieved when one sees the right and the wrong concepts in contrast to each other. The better idea or the party with a better idea prevails.

Customer Judgment: This is the choice that the customer makes in the end about which provider it wants to choose as most appropriate in a given situation. This could be an outside person or an internal dialogue to clarify whether the concept at hand is workable or useful for a given situation. Served entity: This is the thing that provider is giving to the customerh. It can be a theory that a scientist wants to propose to the scientific community. It could be a policy that a minister wants to introduce for the public. It could be a product that a company wants to sell to the buyer. This story model does not have a concept of a protagonist or antagonist. The forces challenging each other are old knowledge against new preposition. This model helps in defining the basic plot of the story. How the story is constructed into a narrative depends entirely upon the personal creativity of the story maker.
Story Sample:

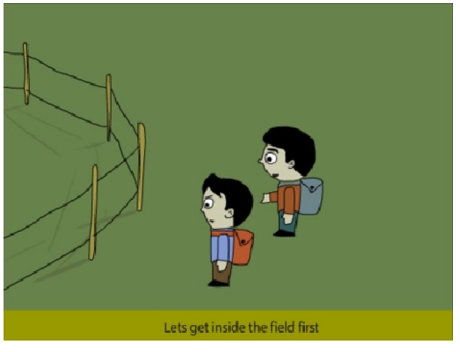
Here is an example of a story plot of an animation film based on the proposed story model to explain the difference between measuring the area of a rectangular shape and an irregular shape:

A father is worried because he has lost money in business and wants to sell his ancestral land to raise money for starting a new business

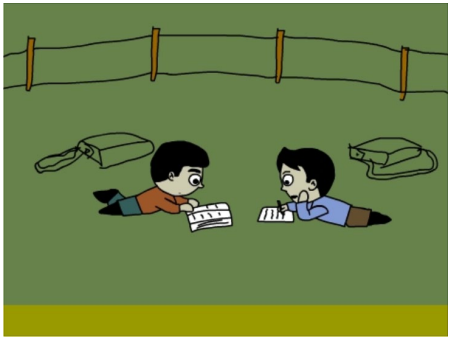
He calls his two son; Rahul and Raj to go and find out the measure of their land and promises to treat them with sweets upon their return before sunset



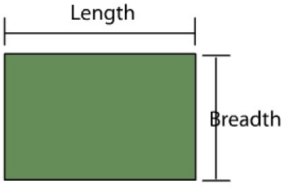
Rahul and Raj leave home to measure the area of their ancestral land



Upon reaching the field, they are puzzled about how to measure the area of the field

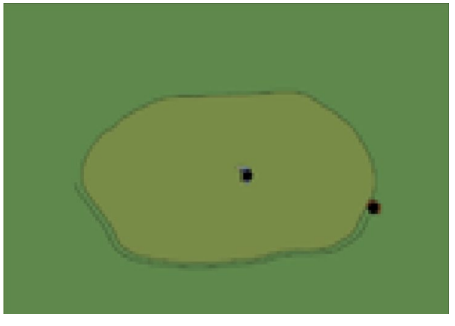


They consult their textbook

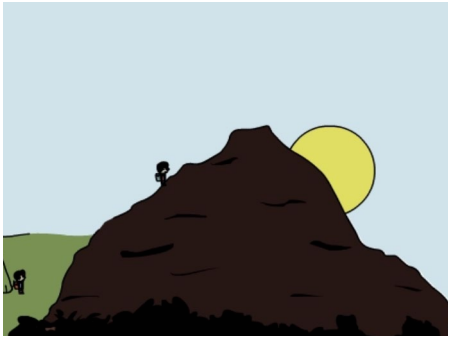


Length x Breadth = Area

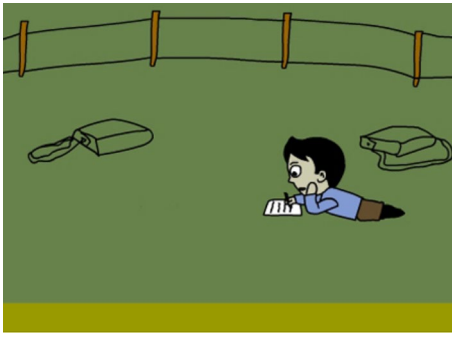
Which gives them the formula for measuring the area of a rectangle



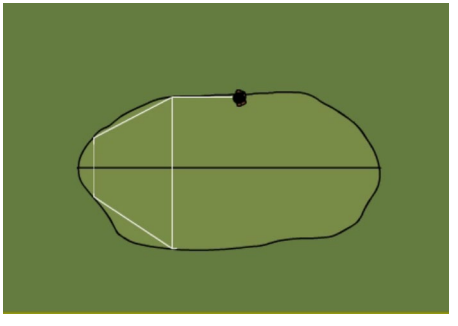
Raj points out that it is not the right solution as the field they are measuring is irregular in shape



Rahul sticks to the textbook solution and returns home claiming that he has found the area of the field

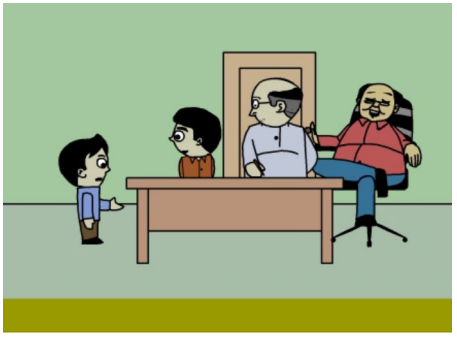


Raj is still not satisfied with Rahul's solution and tries to investigate a little more



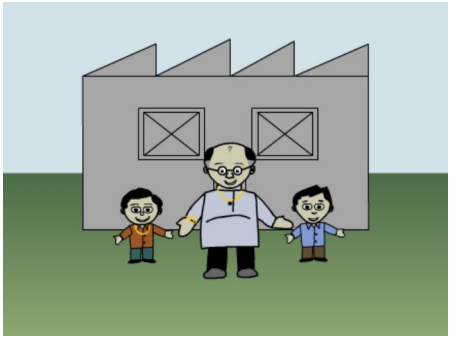
Finally, he comes up with the idea of dividing the field into known shapes like rectangles, quadrilaterals and trapiziums And finds out the actual area of the field is much bigger than what Rahul measured

Meanwhile Father meets the dealer to fix the price of land and is sad as the land may not fetch him enough



Raj reaches on time to stop the deal and explains that the measure of their land is much bigger than what Rahul presented

After a little investigation, it is confirmed that Raj's method of measurement was right



With the extra money earned in the deal, Father starts a new business successfully and they live happily ever after.

Customer: Is a father who has lost money in business and wants to sell his ancestral land to raise some money to start a new business.

Provider 1: Raj, his first son whose help father has sought to help him get the measure of his land.

Provider 2: Rahul, Who has also been asked by father to help him get the measure of land. Provider 1 and 2 ideas challenging each other: Rahul uses the knowledge of measuring the area of a rectangle while Raj recognizes that the same formula is not applicable in this situation as the field is of irregular shape. Rahul clings to the old knowledge and returns back with a wrong solution while raj persists till he finds the right answer to the problem.

Anticipation of Raj: He argues that since the field is irregular in shape, it cannot be measured from the same formula used for measuring the area of a rectangle. Here Raj is working for himself as the client. He is serving the situation rather than making his father happy.

Anticipation of Rahul: The only thing he is concerned with is how to get back fast and win a reward from father.

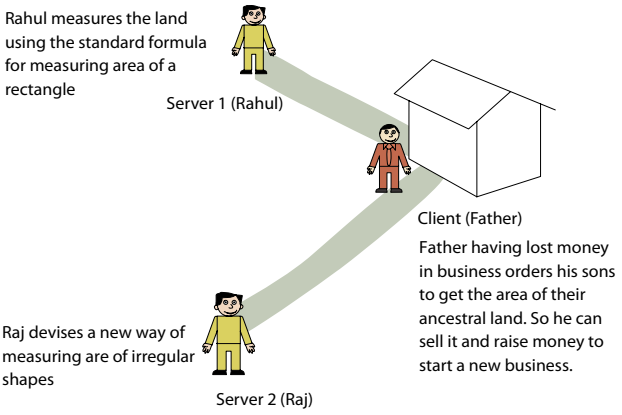


Figure 3: Plot representing story of Rahul and Raj

The diagrammatic representation of the story can be seen in figure 3.

Note: The above sample is only a story plot; the actual narrative is in the form of an animation film with dialogues. The story must be judged based on how the plot is structured to explain the concept.

Fractal nature of the story model

What we have shown is only one basic unit of the model. This unit can branch out into more complex story plots. This happens when we make the client as server, connected to another unit (see figure 4).

Another aspect of the model is that one can create complex stories with many concepts explained simultaneously. Such stories are about products or services. For example the story of fluorescent bulb. In this story one can explain the concept of a filament, elements, good and bad conductors of electricity, current, heat and light emitting charged ions by creating two competing bulb manufacturers as the main protagonists of the story. Both manufacturers want to give a better choice to the user, the customer whose concern is reducing her

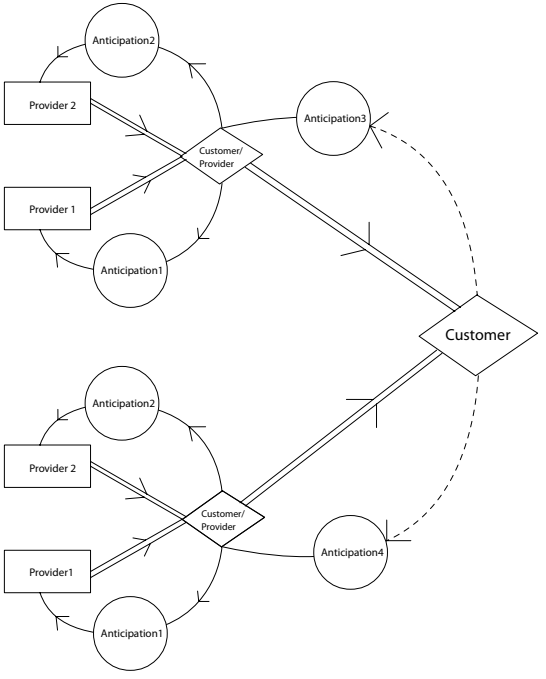


Figure 4: Branching of Multiple plots

electricity bill. This way we have a chain of customer who become providers for the next customer in the chain. And in order to compete and stay at an upper hand, they find specific limitations of the existing product or element and find a new and better product, (a low electricity consuming bulb for example). By knowing what is different in the new entity, contrasting from the old one, knowledge at various level of the given subject gets transferred (see figure 5). It is not necessary that the story will begin at the same point. The same story can begin in a different way based on the narrator's choice. For example the story of fluorescent bulb may begin where researcher one has observed light emitting qualities of certain charged ions. He may have to challenge the existing belief of producing light through heat and electric resistance. His success is in showing that his discovery works.

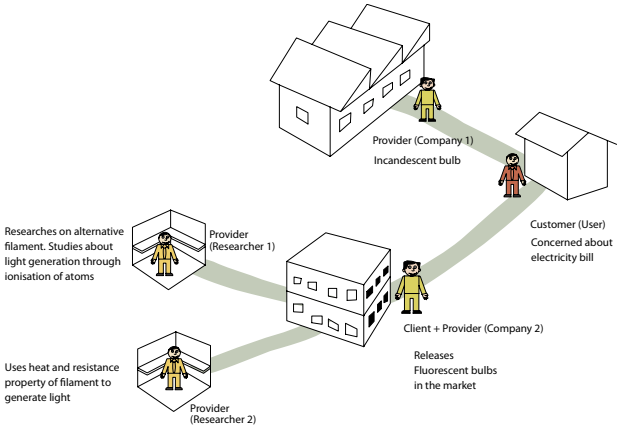


Figure 5: Fractal Plot representing story of incandescent bulb

The bulb manufacturer in turn who is able to produce low power consuming bulb, wins in the end. Researcher 1 and company 2 are winners as they create new knowledge and a new product.

We call this model fractal like because we see self similar pattern of challenge repeating at various levels. The branching can have any number of possibilities, but the basic structural unit remains the same. Fractals are actually mathematical models that generate imagery that has repeated self similar patterns. We are using the word fractal only to borrow the self similarity part from it.

Relevance of the story designing methodology: Knowledge sharing as a story

The significance of this model is that, using this model, students and teachers above secondary school level can design their own educational stories and present them in a manner they like. If they can identify the distinction between a particular piece of knowledge and what existed before that, a new story can be built. When the story is presented, it can be corrected by the peer group, if some information is left out. Here learning happens in the course of designing the story, more than watching it passively. The student needs to research about a concept in order to build a story around it. Even if a story is bad from literary point of view, the act of making the story will lead to a proper understanding and retention of the concept.

Testing and validation of the model

The validity of this model still needs to be tested among students and teachers about the quality of educational stories they are able to build using this model. The testing needs to be of two variables: comprehension and retention of the concept explained through the story.

Conclusion

The way educational content is organized in textbooks, may be the cause that students are compelled to memorize things without understanding. These stories provide a way by which educational content can be also communicate the belief that a piece of knowledge is ever evolving, one leading to another.

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Functions of Grid, a key for flexibility in framework

Prasad Bokil

Introduction

The grid is a well known device in graphic design, mainly in typography. It generally consists of a fixed set of guidelines. Although it plays an important role in design process it always remained underneath the visual discourse of communication. In visual communication, the visual space is not just a medium but itself becomes the agent of communication which engages with the viewer. For any two dimensional display, this space can be in the form of any plane surface—from ancient stone wall to hi-tech digital screen. The communication through this 2D space is the function of the individual visual elements, their interrelationship and the distribution of space. Grid, as a syntactic device, can provide the basic framework at each of these levels and more than that as an expression of a certain mental attitude it can induce the culture to the upcoming visual[1].

As a device, the grid is exploited in the field of typography but rarely appears in the discussion of any non typographic design applications. Etymologically the very concept of grid is still deprived of the proper attention in the research domain. The grid in use is limited, even though not restricted, to create rectangular space distribution which is used to decide the placement of elements and their alignment in vertical and horizontal direction. Grid is employed for the arrangement of different elements but hardly for the shaping of the internal structure of element. It would be worth to deconstruct the concept of grid from typography to overcome its limitations and to make it open for new explorations. Undoubtedly many interesting experiments are done under deconstruction but there are hardly any efforts to theorize it. Let's try to elaborate the typology of grid based on structural functions without any barrier of time and place of creation.

Grid: history and meaning

The grid is a commonly used term in many fields like architecture, mathematics, engineering and design and its meaning varies from guidelines, framework, supporting structure, channel of material flow to network of information flow. The use of grid for visual layouts is not at all new. In visual art, we can find the inscriptions and the evidences of grid from the medieval period or even before. (Hurlburt, 1978) In Europe, the early form of grid was mainly point based which during the renaissance period gained the form of field based Cartesian grid. (Williamson, 1986) Whereas in India, the grid was always a part of tradition and it has been practiced with the faith to the extent of religious doctrine. It had a large variety in form and application[2]. The past few centuries, the meaning of grid has shifted from interface between physical and super-physical worlds to interface between physical world and its perception by the rational cognition. (Williamson, 1986)

The modern grid which is in contemporary use was fully developed in its current form and use by second decade of twentieth century. In the early twentieth century the philosophical trend which denies 'art for art sake' started emerging in the form of constructivism. This concern for usability contributed to the foundation of new design. Around the same time the first design school, Bauhaus school, started in Germany which had a great impact on the modern design. This new design philosophy was inclined towards rationalism and minimalism. Bauhaus, departed from traditional patterns of decoration style, was quite open for experimentation. Soon it got influenced by the Stijl movement with strong dogma of geometry. This established the beauty in simple forms with straight lines and right angles removing all unnecessary curvatures and angularity. Obviously such design identified the rectangular grid with vertical and horizontal guidelines as a very essential device and became popular in the group of

theoreticians in academia. It was Jan Tschichold, trained as a calligrapher through the craft tradition, who was responsible in popularizing the use of grid in typography. Inspired by him many graphic designers like Max Bill, Emil Ruder, and Josef Müller-Brockmann started practicing and advocating the rectangular grid. (Samara, May 2005)

Many experienced designers talked about the use of grid for efficient designing. European designer Massimo Vignelli mentions the definition of grid given in the NASA standards manual as 'a predetermined understructure that the designer can employ to give the publication cohesive style and character.' (Vignelli, 1976) But in design practice, more than the definition it is the consensus which gives the notion of grid on the gross level. It follows the general meaning of framework, guidelines or understructure which is then connected to its application value like effective layout, cohesive style, etc. For our purpose, without being subjective, we will define the grid in graphic design as—

'a framework in the form of geometric pattern which creates the consciousness of the space and guides the designer to create and arrange the visual information in the demarcated space.'

Changing needs for application of Grid

An influential event that has occurred during last few decades is the opening of global market for design. It started the trends in two conflicting directions. One is to design to serve the global user as a culturally neutral group and other is to serve local market with culture influenced user group. In other words, there is a severe need of standardization to serve as much people as possible and at the same time one need to be different to get noticed. This exerts a lot of pressure on decision making while creating any visual. Grid can play very crucial role in standardization provided it has the flexibility to give scope for variations. Recent development in the digital technology has created tremendous virtual space and with it created a lot of challenges to manage it. The two major opportunities created by this new technology are in the field of dynamic media and interactive media. The viewer is allowed to interact through an interface and as a response the layout changes. Interestingly the semantic distribution of space is no more static. It exerts extra pressure on the grid to change onsite. The use of grid in modern design many times is limited to the static visuals and hardly stretched beyond for the dynamic applications. Mainly, this is because, the Cartesian grid determines the static positions rather than the flow or the contours along the time. With the changing scenario of motion graphics, the functions of the grid should be extended to the level of new dimension. There is a great demand for more fluid, flexible, information heavy, customizable, ever changing but still homogeneous graphic solutions created within least possible time. This is a challenge for today's designer.

Advantages of using the grid

Most of the design applications use or may use grid for effective planning of visual information. Grid is an important device useful in decision making while creating visual layouts. The advantages of grid can be seen from different perspectives—space, content, resources, planning and management.

1. Space organization

Controlling the space in any graphic layout is always a main concern. In graphic design the careful control of measured space is required to achieve balance, structure and unity. (Swann, 1989) The grid can assist to think in terms of modules for controlling the space. (Vignelli, 1976) Grid can be used to create a hierarchy of space.

2. Content management

It is much easier to design a layout when there is less matter to display. But when there is lots of content and variety in the type of content it is a challenge for the designer. Grid helps in management of space by semantic content distribution and creates a sense of compact planning, intelligibility and clarity, and suggests orderliness of design. This orderliness leads towards not just better readability but better understanding and retention. (Brockman, 1981)

3. Work distribution: Great collaborative device

Design, being interdisciplinary, most of the time is of a collaborative nature. It's a collaboration of different kind of

content in the same space or collaboration of different people working on the same content. If there are more than one person working independently and their different works need to be merged in to one single design then grid provides the platform to merge these parts together. In case of publication design, say magazine design, there are many people who work together on different levels—copy writers, illustrators, photographers, designers. Then grid provides the structure and guidelines for them to interact and individually contribute towards a common visual space.

4. Cohesive style and character

All brands are very careful about their identity. They spend lots to maintain the identity in terms of quality, services and visual appearance. When many people are working on a project then grid acts as a helping aid in interaction among them which ultimately brings the cohesiveness in the design. As years go by the grid helps to build not only the character but the philosophy of the brand. (Brockman, 1981) Grid helps to maintain the consistency of identity both across a period of time and across the range of products.

5. Resource management- time and money

As seen before, the grid is useful in managing space and content. It is obvious that it saves a lot of designer's time as it reduces the guess work by creating possible nodes for placement in layout. It also reduces the probability of rework. Ultimately this results in improvement of efficiency saving the production cost.

In spite of these advantages, many of students and even professionals consider it as a monotonous mechanical device which constraints their creative freedom. Books which demonstrate the grid and its use mention the fear of designs becoming dull and lifeless unless used imaginatively. Alan Swann, in his book 'How to understand and use GRIDS', while accepting the importance of grid talk about the need for freedom from the rigid grid to achieve dynamic and creative effects. People who don't know how to use the grid 'creatively' or where to break the grid to achieve the dynamism may get trapped into the monotonous repetition. (Swann, 1989) To be able to use the grid creatively one should know how to mould it according to the need of application and for that matter one should know what the all grid can do on the structural level. Knowledge of variables to formulate the grid will help the designer to create variety of grids with lot of flexibility.

Functions of grid

There can be three ways in which one can classify these functions- Internal, interactive and external. The functions which get highlighted in the design literature are mainly from interactive or external category. They either take into account

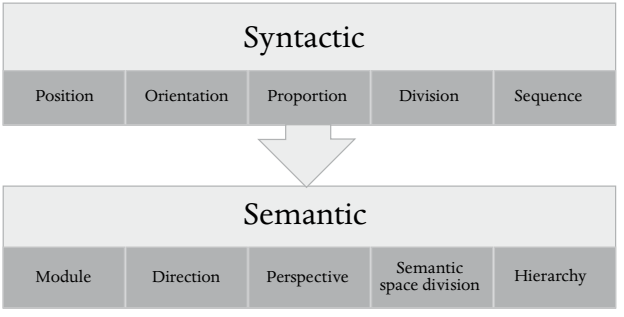

Figure 1: Syntactic and semantic functions of grid

the effects achieved in output or practical advantages of using the grid. We have already covered them in the previous section as advantages.

Here we will discuss the internal functions of the grid. The internal function is the function satisfied by the grid within the two dimensional visual space[3]. These functions work on three levels — form making, inter relationship among various forms and the distribution of the total space. In broader sense, the grid assists to create visual elements, divide the space in smaller units, give position to put the visual elements, align the elements and helps to arrange and order them as required. If we further break it down to the formal level, then five such formal functions can be observed. These are Position, Orientation, Proportion, Division and Sequence. These functions are purely syntactic in nature and work on the root level of space management in graphic layout. These are the

variables of grid formation. Further in combination of two or more they grant some secondary functions which handle the complexity of layout design. The grid can even be semantically loaded and then further classified as shown in figure 1. The examples illustrated below will help to understand these syntactic and semantic functions.

1. Position: The grid gives the point reference to put the visual elements in the two dimensional field. This grid is in form of points or intersecting lines which mark the positions either in rows or in scattered form. It nails the elements in the graphic layout to the surface. Sometimes it is just the centre

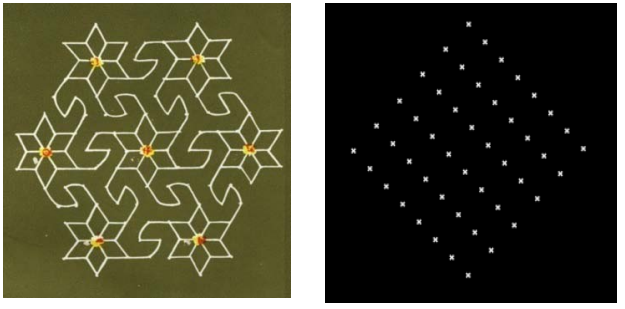

Figure 2: Syntactic functions of grid — Position

of the image which gives the starting point to draw. (Singh, 2000) Fig 2 illustrates one of the rangoli patterns found in central India. It is a common practice to mark the points at specific interval to create these patterns.

2. Orientation: It is a line based function and aligns the visual objects or part of the object along a particular direction. Orientations at different angles can create different expressions. For example alignment with vertical lines can indicate growth; with horizontal lines may lead to longing and angular lines contribute to energy[4]. Use of oblique grid in 1972 Olympic symbols by Otl Aicher (fig.3) induced the dynamic characteristics in the graphics.

3. Proportion: This function has a dual behavior. In linear form it defines the relative positions within the form and in planar form it acquires the enclosure of the content. As shown in fig.4 the grid helps to create the form of Buddha

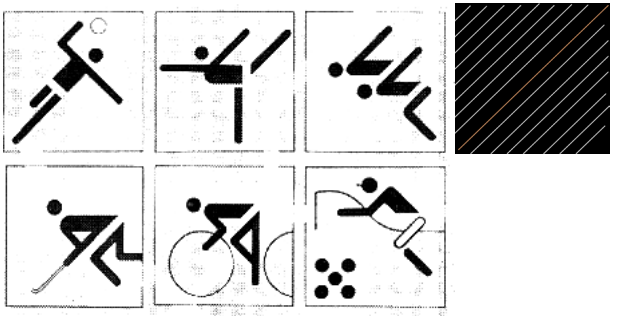

Figure 3: Syntactic functions of grid — Orientation

with specific proportions accepted in the school of Tanka paintings. In the typographic column grid it takes the form of enclosure for the text to fit in.

4. Division: It divides the space and separates the two entities from each other. The space division is achieved by physical boundary line, attribute variation or just a negative space. In the example illustrated here the animals in the bottom row are separated from each other by background attributes as if the space is divided due to the difference in the place. In upper two rows, the architectural features had mapped over the grid which creates the division of single place in separate units.

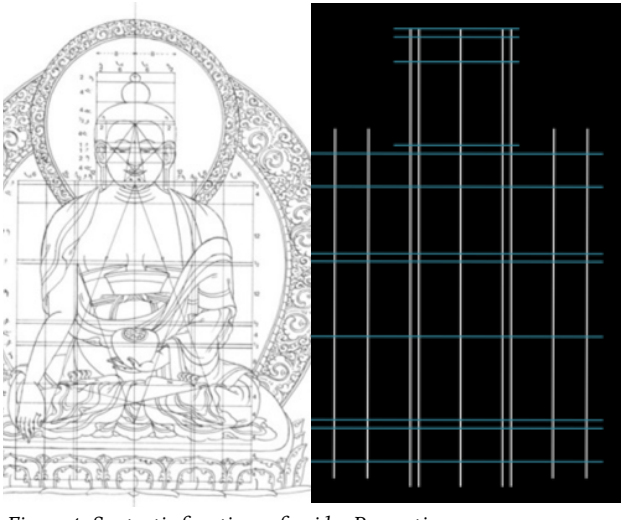

Figure 4: Syntactic functions of grid—Proportion

5. Sequence: It helps to arrange the content in a linear order. When space is divided in small pockets it naturally generates the logical sequence in linear or radial direction. If the sizes are uneven, the sequence that is formed can be explained using the Gestalt principles. Figure 6 shows the natural sequence created by the division of space.

Semantic functions:
The visual information displayed by the artist/ designer is ultimately the representation of the world around or the abstract concepts perceived by her. The syntax of representation is sometimes loaded with the meaning of the content. And the grid then does not remain merely at formal level but carries some meaning with it. Here are few semantic functions served by grid.

1. Semantic module function: This combines few semantic elements with some of the syntactic functions to create a meaningful modular unit which then can be repeated over the space with variation in position and orientation. All paintings

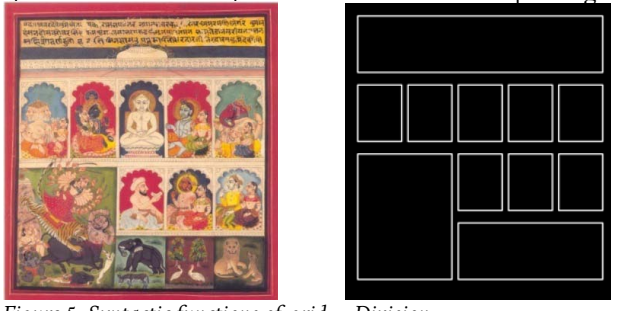

Figure 5: Syntactic functions of grid— Division

by Escher using the tessellation technique are based on the multiplication of a form based on a uniform geometric grid. In the graphics shown in fig.7, the modular unit is mapped on the geometrical grid and repeated over the space.
2. Vector function: It dictates the direction of the visual flow or even the flow of information. It is a combination of Position function and Orientation function. It creates the illusion of motion through the static visuals. In the Mughal painting (refer figure 8) the two elephants crossing the

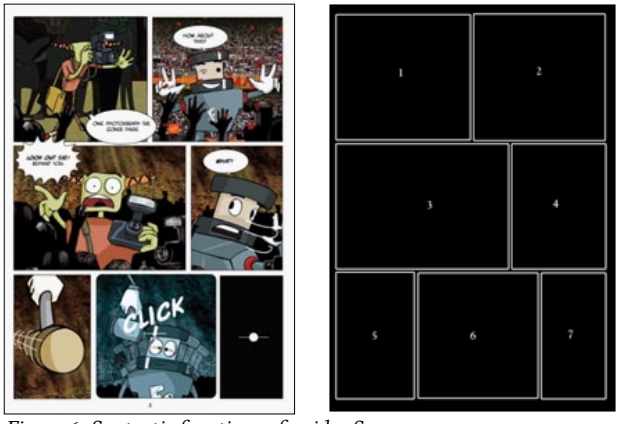

Figure 6: Syntactic functions of grid—Sequence

floating bridge give the feeling of actual dynamic motion in the diagonal direction. This effect is achieved through the alignment and orientation of different visual elements with the oblique grid.

3. Perspective function: The perspective grid (fig. 9) creates the geometric inter-relationship between the spaces which gives the feeling of depth. For non geometric shapes it acts like a guiding enclosure and for geometric shapes such as the architectural elements, it appears more prominently.

4. Semantic space division: The space here is divided not just for the purpose of convenience in spatial arrangement but also serves the demand of the semantics of the content. Figure 11 is the representation of market road with various

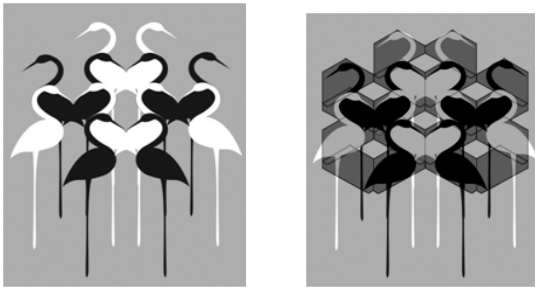

Figure 7: Semantic module functions of grid—Semantic Module

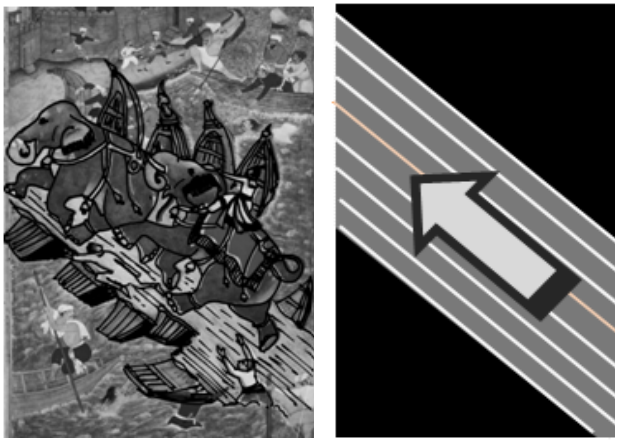

Figure 8: Semantic functions of grid—Direction

shops on either side of it in a queue. The space here is divided as per the semantic division of place.

5. Hierarchy function: The grid also helps to create the hierarchy among the various elements. It is combination of position, proportion and sequence functions. Arrangement of different elements and their relative dimensions are many times determined by logical reasoning and not just by visual necessities. Sometimes, the order and relative scales are determined by hierarchy of meaning involved. (Coomaraswamy, 1934) Figure 11, a Jain painting made on cloth, shows the space division according to the hierarchy of the forms depicted.

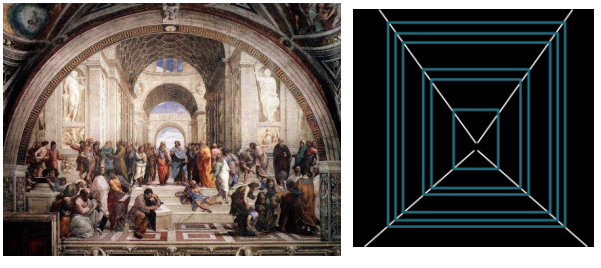

Figure 9: Semantic functions of grid—Perspective

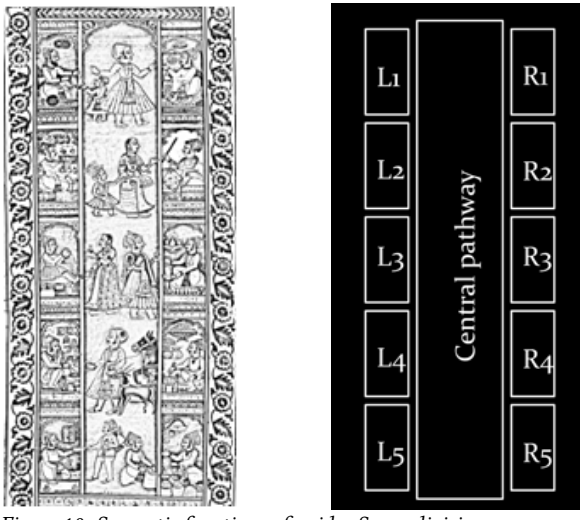

Figure 10: Semantic functions of grid—Space division

Flexibility through the grid

After the discussion of the various functions of the grid, we can say that the form of grid need not be constrained to the Cartesian grid. The forms of grid which are common are Cartesian grid, Manuscript grid, Modular grid, Hierarchical grid and there are forms like Radial grid[5], Oblique grid which are not much in use. There can be variety of forms the grid can take. Different functions demand different forms of grid. According to the application needs, the grid can take various forms from Point grid to Modular grid. It is possible to use more than one form of grid within a space, even overlapping

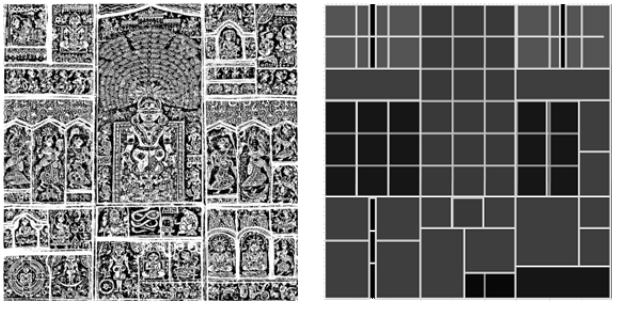

Figure 11: Semantic functions of grid— Hierarchy

each other, to produce interesting possibilities of framework with higher level of flexibility.

In conclusion, the diversity in the layout lies not in a monopoly of some one of these several functions of grid but in a different hierarchical order of functions. The flexibility can be achieved by altering this hierarchy of order of functions. One needs to apply the grid creatively to avoid the rigid and monotonous look. This may be the first step towards unfolding the process for creative use of grids. The functions which are defined here can be treated as variables to create variety of grids. One needs to explore systematically and analytically.

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Figure 5: Jain Art from India by Pratapaditya Pal, Copyright: Museum Associates, Los Angeles County Museum of Art, 1994, pp. 238

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Figure 8: Akbar and a mast elephant on the bridge of boats, from Akbarnama (1600 AD), Copyright: Victoria and Albert Museum, London.

Figure 9: The School of Athens by Raphael.
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Notes

1. The cultural influences can be observed on not only the form of grid but also in the way it is applied. There are many forms of grid and many more ways of following the grid. In a way, the visual created using a grid reflects the culture of the designer.
2. In her book, 'The square and the Circle of the Indian Arts' (1983, Roli International), Kapila Vatsyayan has discussed variety of applications of grid in Indian tradition.
3. The approach here is purely formalist and the context of each art work is not discussed for the matter of simplicity. Although the context adds different layers of meanings to the image, it can not be neglected.
4. In the text of Vastu Sutra Upanisad (verse 24, 25, 26) it is suggested—how the mood of form is governed by the lines which it follows.
5. Alice Boner in her book, Principles of composition in Hindu sculpture (1962) discussed the radial grid and how it is implimented in Indian sculptures.

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