Reputation, the next real estate

TRUST HAS BEEN CITED AS THE CURRENCY OF THE 21ST CENTURY, SAYS **S ANANTHANARAYANAN**

As technology supports the marketplace and transactions become transparent, malpractice in trade is getting both difficult and not as profitable as legitimate business, which gets done faster than ever before. And more and more deals are being struck based on trust, with safeguards, but primarily on the assumption that people are on the level. At the personal level, tokens of reliability that one carries can act as credit cards of great value.

There are now concepts of *collaborative consumption*, which really amounts to trusting the next person, *open source*, where developers, particularly of software, are giving the moguls like Microsoft a run for their money and the idea of the *mesh*, where resources that represent capital, like idle cars, are being shared to provide service, income, less load on infrastructure and great economy.

Writer and speaker Rachel Botsman, making the case for collaborative consumption, speaks of the experience of the residents of Paris allowing an extra room in their house to be used by visitors to the city. There was hardly any use of the system in 2008, when it was started, but now there are private rooms being let out in practically every street! While the Internet has made the system possible, what has really changed is that technology has made it possible for people to trust strangers to occupy space in their homes, to the benefit of both and saving for the community.

Mario Gutierrez-Roig, Carlos Gracia-Lazaro, Josep Perello, Yamir Moreno and Angel Sanchez, from different institutes in Spain and Italy, report in the journal *Nature Communications* their study of how trust and cooperative behaviour undergo changes in people as they grow from children to adolescents,


Lina Gansky


Rachel Botsman

as young adults and then older. The findings of the study are that while older people are more trusting, the mechanisms usually invoked to explain cooperative behaviour are age independent after adolescence, and that special methods need to be developed to promote similar behaviour in youth.

In cooperative behaviour, there is an expectation of reciprocation and trust arises from rationality — in the belief that cooperation is good economics — and cheating for better returns cannot last. Cooperative behaviour is seen as genetically wired in, for instance in pack animals, where each one will die for the pack, or in the sexual reproduction of bees, where female workers surrender motherhood to the queen as more of each worker's genes get transmitted when she has sisters, rather than through children. But social programming, rather than genetics, appears to rule in situations like the *Prisioners' Dilemma*, which the *Nature Communications* researchers used in their study of human cooperation.

In the classic Prisoners' Dilemma, the police make an offer to two prisoners, who are kept apart, of degrees of remission if they confess to a crime. If they both confess, they both get light sentences. But if one confesses while the other holds out, the one that does so goes free while the other gets a heavy sentence. And if neither confesses, of course, both go free. The rational choice for either prisoner is to confess as this keeps him/her safe from the heavy sentence, at worst. But the best possible outcome is when both hold out. Hence the conflict — for both to hold out is cooperative behaviour, but each risks the heavy sentence if the other should cheat, and to cheat is the rational thing! By and large, the police succeed in solving the crime, except with members of highly organised gangs, or fanatic groups.

TABLE 1

Age group	1	2	3	4	5	6	7	Control	School
Average age (years)	12.33	21.10	30.25	39.96	49.54	60.00	72.56	36.75	12.17
Minimum age	10	17	27	36	46	56	66	13	12
Maximum age	16	27	35	45	55	65	87	57	13
Number of subjects	24	16	20	24	24	12	20	24	52
Length of coop sequence	1.50	2.36	3.11	2.15	2.92	2.80	3.68	2.92	1.72
Length of non-coop sequence	2.51	2.62	3.55	2.81	2.72	3.20	2.75	3.24	2.02

The researchers used a form of four-player Prisoners' Dilemma game to look for cooperative behaviour in different age groups, with the same experiment with players of mixed ages as a control. The setting for the experiments was the Board Games Fair, a festival at Barcelona in 2012, where multiple trials could be conducted with randomly selected participants and without informing the participants of the study that was going on. Participants were grouped in age ranges of 10-16, 17-25, 26-35, 36-45, 46-55, 56-65 and 66 and over. And then, the control groups, with participants roped in, irrespective of their age. It is worth stressing that the Games Fair was an exhibition and a social event and the participants neither knew each other nor had training in the kind of game they played.

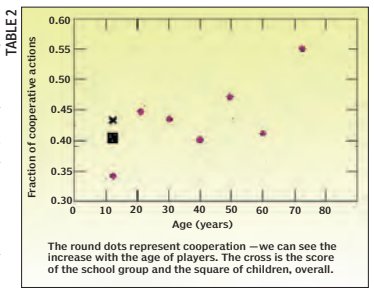
The results are summarised as shown in Table 1. As the object was to find reasons, like past behaviour, that influence a decision to cooperate (C) or defect (D), the averages taken are of the length of a sequence of a kind of decision. As results at the Barcelona fair showed that young children behaved differently, the experiment was also done, for verification, with children of 12-13 years at a school.

The tendency to cooperate can be seen to increase with age in Table 2. Analysis of the sequence of the previous behaviour of all players was reported to show that while mature players did cooperate, the behaviour of children and adolescents was marked by dependence of the current decision on previous action and also response to peer behaviour. "Admittedly, children have not developed cognitive and strategic abilities related to social and moral implications…" the authors observed.

But the study revealed, as the authors said, that "mechanisms such as reputation and reciprocity, which are based on social perception, might be universal for humans, that is, they are not relative to the age of the individuals". And looking at the behaviour, termed "moody" of children, the report suggested specific strategies be devised and employed to promote consistent pro-social behaviour. "… fostering the participation of older individuals in the key social decisions or collective negotiations and keeping them longer in the workforce may be judicious procedures," the authors said.

The more selfish, simple reasoning of young minds may, of course, have its value in learning to survive and be responsible in cooperation and trust later in life. The role of mature and clearly more successful advisers, as parents and superiors, is already firmly in place. In organizations, too, while older workers may be the more cooperative, the creativity of younger persons motivated by simple self-interest may not be worth losing.

TABLE 2



The round dots represent cooperation — we can see the increase with the age of players. The cross is the score of the school group and the square of children, overall.

But for all that, technology today seems to be doing what is needed to consolidate cooperation and trust in human relations. While conscious cooperative behaviour is predominantly the factor in human societies, as compared to other species, the pressures of modern life, growth of population, the energy crisis and global warming are moving people of all ages to share and cooperate in ways unthinkable a few years ago. The Internet and social media have removed barriers of distance, the cell phone has put us in contact with the rest of the world — "Except the person beside you, she is busy with her cell phone," says Lisa Gansky, entrepreneur, investor, speaker and author of the bestselling book *The Mesh*, which describes the concept, for instance, of capitalising idle time of your car — and cooperative living is taken as a given.

So while trust becomes the watchword to deal with the millions out there on the web, there are tools like *Timerepublik*, a resource trading platform where persons publish their skills and trade services, not for cash or kind but in units of time. And the wealth of time that a participant collects by reaching out represents his/her value and reputation and credit — the new currency.

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ABILITY TO SELECT

TAPAN KUMAR MAITRA EXPLAINS HOW UBIQUITIN TARGETS PROTEINS FOR DEGRADATION BY PROTEASOMES

The most common method for targeting proteins for destruction is to link them to *ubiquitin*, a small protein chain containing 76 amino acids. Ubiquitin is joined to target proteins by a process that involves three components: a ubiquitin-activating enzyme (El), a ubiquitin-conjugating enzyme (E2) and a substrate recognition protein (E3). Ubiquitin is first activated by attaching it to El in an ATP-dependent reaction. The activated ubiquitin is then transferred to E2 and subsequently linked, in a reaction facilitated by E3, to a lysine residue in a target protein.

Additional molecules of ubiquitin are then added in sequence, forming short chains.

These chains serve as targeting signals that are recognised by large, protein-degrading structures called *proteasomes*, which are the predominant proteases (protein-degrading enzymes) of the cytosol and are often present in high concentration, accounting for up to one per cent of all cellular protein. Each proteasome has a mass of roughly two million daltons and consists of half a dozen proteases associated with several ATPases and a binding site for ubiquitin chains. Shaped like a short cylinder, the proteasome binds to ubiquitylated proteins and removes their ubiquitin chains. The proteins are then fed into the central channel of the proteasome and their peptide bonds are hydrolysed in an ATP-dependent process, generating small peptide fragments that are released from the other end of the cylinder.

The key to regulating protein degradation lies in the ability to select particular proteins for ubiquitylation. This selectivity stems in part from the existence of multiple forms of E3, each directing the attachment of ubiquitin to different target proteins. One feature recognised by the various forms of E3 is the amino acid present at the N-terminus of a potential target protein. Some N-terminal amino acids cause proteins to be rapidly ubiquitylated and degraded; others make proteins less susceptible.

Internal amino acid sequences called *degrons* also allow particular proteins to be selected for destruction. The progression through the final stages of mitosis is controlled by the anaphase-promoting complex, which targets selected proteins, such as mitotic cyclin, for degradation.

The anaphase-promoting complex accomplishes this task by functioning as a sub-degradation, presumably because they are dispensable to the strate recognition protein (E3) that binds to target proteins the cell, containing a particular type of degron, promoting ubiquitylation of these target proteins by E2 and their subsequent degradation by proteasomes, which also play a role in general ongoing mechanisms for eliminating defective proteins from cells.

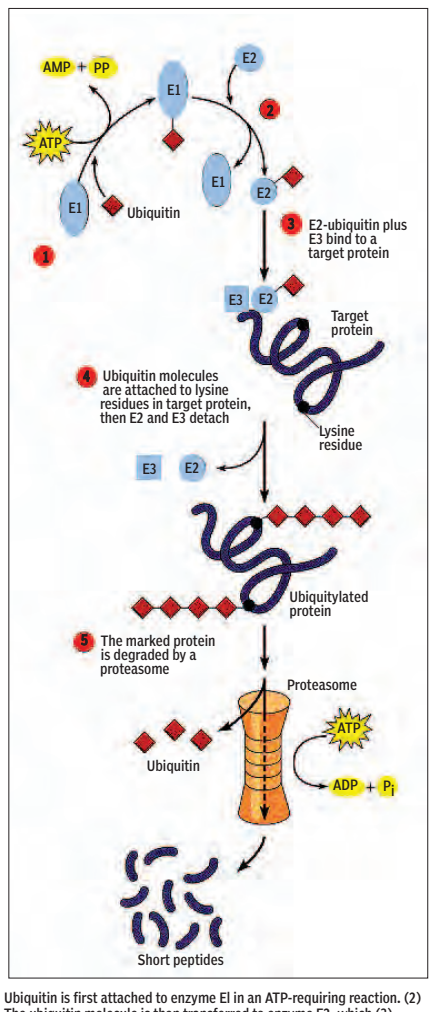
Recent observations suggest that up to 30 per cent of newly synthesised proteins are defective in some way and are immediately tagged with ubiquitin, triggering their destruction by proteasomes.

Although the ubiquitin-proteasome pathway is the primary mechanism used by cells for degrading proteins, it is not the only means available. The lysosomes contain digestive enzymes that degrade all major classes of macromolecules, including proteins. Lysosomes can take up and degrade cytosolic proteins by an infolding of the lysosomal membrane, creating small vesicles that are internalised within the lysosome and broken down by the organelle's hydrolytic enzymes. This process of microautophagy tends to be rather non-selective in the proteins it degrades. The result is the slow, continual recycling of the amino acid building blocks found in most of a cell's protein molecules.

Under stressful conditions, however, such non-selective degradation of proteins would be detrimental to the cell. For example, during prolonged fasting, the continued non-selective degradation of cellular proteins could lead to depletion of critical enzymes or regulatory proteins.

Under these conditions, lysosomes preferentially degrade proteins containing a targeting sequence that consists of glutamine flanked on either side by a tetrapeptide composed of very basic, very acidic and/or very hydrophobic amino acids.

Proteins exhibiting this sequence are targeted for selective degradation, presumably because they are dispensable to the cell.



Ubiquitin is first attached to enzyme El in an ATP-requiring reaction. (2) The ubiquitin molecule is then transferred to enzyme E2, which (3) binds with E3 to the N-terminus of a protein targeted for degradation. (4) Ubiquitin molecules are attached to the protein's lysine residues. (5) A proteasome releases the ubiquitin for reuse and degrades the targeted protein into short peptides in another ATP-requiring reaction.

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Evidence of first race war

SKELETONS DISCOVERED ON THE EAST BANK OF THE NILE IN NORTHERN SUDAN POINT TO OLDEST KNOWN LARGESCALE HUMAN ARMED CONFLICT, WRITES **DAVID KEYES**

French scientists are investigating what may be the oldest identified race war 13,000 years after it raged on the fringes of the Sahara. Working in collaboration with the British Museum, they have been examining dozens of skeletons, a majority of which appear to have been victims of archers using flint-tipped arrows. The bones — from Jebel Sahaba on the east bank of the Nile in northern Sudan — are from victims of the world's oldest known relatively largescale human armed conflict.

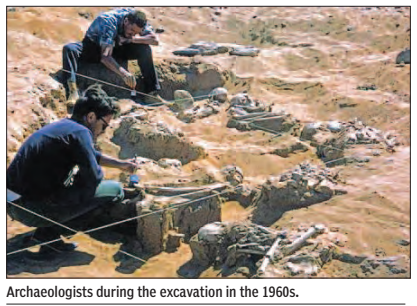
Over the past two years anthropologists from Bordeaux University have discovered literally dozens of previously undetected arrow impact marks and flint arrowhead fragments on and around the bones. This is in addition to many arrowheads and impact marks already found embedded in some of the bones during an earlier examination of the skeletons back in the 1960s. The remains — the contents of an entire early cemetery — were found in 1964 by prominent American archaeologist Fred Wendorf but, until the current investigations, had never been examined using more modern, 21st century, technology.

Some of the skeletal material has just gone on permanent display as part of the British Museum's new Early Egypt gallery. Now museum scientists are planning to learn more about the victims themselves – everything from gender to disease and from diet to age at death. The discovery of dozens of previously undetected arrow impact marks and flint arrow fragments suggests that the majority of the individuals — men, women and children — in the Jebel Sahaba cemetery were killed by enemy archers and then buried by their own people. What's more, the new research demonstrates that the attacks — in effect a prolonged low-level war – took place over many months or years.

Parallel research over recent years has also been shedding new light as to who, in ethnic and racial terms, these victims were. Work carried out at Liverpool John Moores University, the University of Alaska and New Orleans' Tulane University indicates that they were part of the general sub-Saharan originating population — the ancestors of modern black Africans. The identity of their killers is, however, less easy to determine. But it is conceivable that they were people from a totally different racial and ethnic group — part of a North African/Levantine/European people who lived around much of the Mediterranean basin.

The two groups would have looked quite different from each other and were also almost certainly different culturally and linguistically. The sub-Saharan originating group had long limbs, relatively short torsos and projecting upper and lower jaws along with rounded foreheads and broad noses, while the North African/Levantine/European originating group had shorter limbs, longer torsos and flatter faces. Both groups were very muscular and strongly built.

What's more, the period in which they perished so violently was one of huge competition for resources — for they appear to have been killed during a severe climatic downturn in which many water sources dried up, especially in summer time. The climatic downturn — known as the Younger Dryas period — had been preceded by much lusher, wetter and warmer conditions that had allowed populations to expand. But when climatic conditions temporarily worsened during the Younger Dryas, water holes dried up, vegetation wilted and animals died or moved to the only major year-round source of water still available — the Nile.


Archaeologists during the excavation in the 1960s.

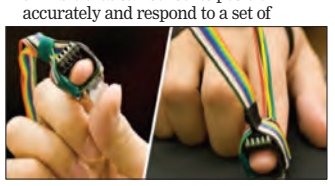
"The skeletal material is of great importance — not only because of the evidence for conflict, but also because the Jebel Sahaba cemetery is the oldest discovered in the Nile Valley so far," said Dr Daniel Antoine, a curator in the British Museum's Ancient Egypt and Sudan Department.

THE INDEPENDENT

PLUS POINTS

Great touch

A thimble-like device called 3DTouch that sits at the end of your finger and allows you to interact with the virtual world in three dimensions may render the indispensable computer mouse obsolete. Anh Nguyen and Amy Banic from the University of Wyoming in the USA have created this intelligent thimble that can sense its position accurately and respond to a set of



preprogrammed gestures that allow the user to interact with objects in a virtual three-dimensional world.

It works as a universal input for more or less any computing device. They wanted to make it as small and unobtrusive as possible so that it can be easily transported, so the 3DTouch comes equipped with a 3D accelerometer, a 3D magnetometer and 3D gyroscope that allow data from each sensor to be compared and combined to produce a far more precise estimate of orientation than a single measurement alone. The 3DTouch also has an optical flow sensor that measures the movement of the device against a two-dimensional surface, exactly like that inside an ordinary mouse.

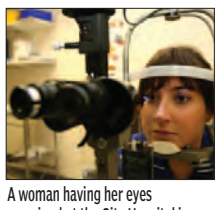
For now, the device is hooked up by wire to an Arduino controller that combines data from all the sensors. The fused data is then streamed to a conventional laptop. "This wired connection later could be replaced by a wireless solution using a pair of XBee modules," researchers said.

They have also built in a number of mouse-like gestures that allow the user to interact with 3-D objects by selecting and dragging them. They have tested their new device to measure its pointing accuracy and say it is reasonably good.

PRESS TRUST OF INDIA

Early warning

Scientists believe they have hit upon a early warning system for identifying Alzheimer's after two separate new studies identified a "biomarker" of the disease that can be spotted in an eye test. Early trials of two different techniques reveal that an indicator for the degenerative disorder can be identified in the retina and lens of the eye. Both


A woman having her eyes examined at the City Hospital in Belfast

methods were able to distinguish between probable Alzheimer's patients and healthy volunteers with a high level of accuracy and the scientists behind both believe that though at a very early stage can be developed into an eye test that could be used to identify Alzheimer patients.

Dr Simon Ridley, head of science at the Alzheimer's Research UK charitysaid, "It is difficult to diagnose Alzheimer's disease accurately and, in many cases, by the time the symptoms have developed, damage has already been going on in the brain for a number of years. The development of a quick, cheap, non-invasive test to detect Alzheimer's would be an important step in helping people receive an early diagnosis, and helping to improve clinical trials so that potential new treatments have the best chance of success."

The scientists envisage using an eye test as the first step to identifying possible Alzheimer cases followed by more expensive procedures to confirm the presence of the disease. These include Positron Emission Tomography scans or spinal fluid analysis. Shaun Frost, from the Australian science agency, the Commonwealth Scientific and Industrial Research Organisation, who led one of the studies, said, "We envision this technology as an initial screen that could complement what is currently used. If further research proves our findings are correct, it could potentially be delivered as part of an individual's regular eye check-up. "

The tests are based on the fact that the eye is effectively an extension of the brain. Both studies looked for signs of beta-amyloid protein, which forms in clumps in the brains of Alzheimer's patients and is a key hallmark of the disease. The Australian study used curcumin, the turmeric spice ingredient, as a fluorescent marker that binds closely with beta-amyloid, allowing it to show up in retina. Volunteers were asked to take supplement of curcumin, which was then detected in the eye using a novel imaging system. Preliminary results on 40 participants showed that the test picked up every participant with Alzheimer's and correctly identified those shown in the brain by Pet imaging.

In the other study, researchers from the US company Cognoptix used an ointment to apply a flouescent label to beta-amyloid in the lens of the eye. Laser scanning was then able to detect the protein.

TOM BOWDEN/THE INDEPENDENT