THE MOBILE CENTURY

Life and Work in the Digital Era

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The Mobile Century

Provides a uniquely global, multi-dimensional forum for thought leadership about the transformational nature of digital technology over a mobile platform - in all areas of life and work.

Thought streams include the challenges of innovation, economic development and entrepreneurship, as well as advances in health, education, finance, retail and government.

The Mobile Century reaches beyond the siloed approach to the many challenges of the digital era, to identify synergies and opportunities for advancement in innovative ways.

The Mobile Century is a publication of The Global Telecom Women's Network. GTWN began as a small network of senior women in the telecommunications industry more than twenty years ago, and has grown and changed as the industry it represents has also evolved. It now represents the interests and thoughts of women in all of the "t" industries – including telecommunications, information technology and TMT.

HEWLETT PACKARD ON THE EDGE OF INNOVATION

INTERVIEW

Ms Meg Whitman, CEO of Hewlett Packard, was the keynote speaker at the GTWN's third annual Welcome Cocktail at the Mobile World Congress in Barcelona, held at Telefonica's Mobile World Center on 2 March 2015. Reflecting the theme of the 2015 MWC, Ms Whitman shared with The Mobile Century (TMC) how HP is gearing itself to be "on the edge of innovation", and to address the challenges of the new digital technology landscape.

TMC: You surprised the industry and markets in October 2014 by announcing that Hewlett-Packard would be split into two separate entities – Hewlett Packard Enterprise and HP Inc. What do you say to those who have claimed that splitting the company in two will hinder innovation, rather than facilitate it?

Ms Whitman: First, we think that separating is the right thing for our customers, partners and shareholders. We've spent the last three years working to turn Hewlett-Packard around, and we now have the leadership, the go-to-market, the balance sheet, the confidence of our various constituencies and the innovation engine that allows us to separate successfully. Each company will have its own innovation agenda and own ability to fund R&D the way they think is best. We have established a Separation Management Office tasked with driving the process forward, so the rest of the company can focus on their work of addressing our customers' needs and on creating ground-breaking innovations.

TMC: When you became the CEO of Hewlett-Packard in 2011, you were facing the challenge of turning around a 72-year old incumbent in a rapidly changing PC market, as laptops, smartphones and tablets were entering the space. How is this turnaround journey going?

Ms Whitman: I believe that our turnaround journey has been successful so far. We're now in a position of strength and can take advantage of what's happening in the market. We've reignited innovation across Hewlett-Packard. We've fortified our balance sheet. And, we've finally stabilized our revenue trajectory, delivering flat topline revenue for the company on a constant currency basis for the full fiscal year 2014. We were able to deliver this performance while continuing to invest in the critical innovation that will be the foundation of our future. In fiscal 2014, we increased R&D spending by 10 percent over the prior year. We also increased investments in every segment including cloud, infrastructure, 3D printing, and The Machine. I believe we have the strongest portfolio we've had in a decade. The innovation engine is alive and well at Hewlett-Packard, and I expect that our pace of innovation will only accelerate as we progress through 2015 and separate into Hewlett Packard Enterprise and HP Inc.

TMC: How has your experience in previous roles helped you to address the challenges you have faced at Hewlett-Packard?

Ms Whitman: Something I learned when I was at eBay is that it's really hard to kill founder DNA. For Hewlett-Packard, that's a really good thing because innovation and partnership is in our DNA. So, when we started the turnaround, I knew that it was essential for us to pivot back hard to the channel and reinvest more in innovation and engineering. I also learned about the importance of having the right people in the right job at the right time with right attitude. Someone who excels when a company is growing quickly, like in the early eBay days, is not necessarily someone who excels in a turnaround. And to succeed in a turnaround, you absolutely need the have the right leadership in place.

TMC: You obviously believe that clear team leadership is essential for company success. What is your secret formula for success as a leader?

Ms Whitman: I talk about having the will to win with Hewlett-Packard employees a lot. To me, it means executing, communicating, collaborating and being accountable. Things are never going to be perfect. There's always going to be some disadvantage that has to be overcome. But winners don't wait around for perfect conditions. Winners improvise. They fight on and they refuse to lose.

TMC: Turning to one of the biggest innovations facing your industry, how do you see the future of 3D printing and Hewlett-Packard's place in this new market?

Ms Whitman: There is a lot of excitement around 3D printing today, mostly in the consumer space. However, the larger opportunity is for the hyper growth commercial space, and that's where we're focusing. We will transform the printing industry with our 3D printing technology, MultiJet Fusion. We have overcome the barriers of speed, quality, and cost and laid the foundation that will revolutionize industries and change additive manufacturing. MultiJet Fusion allows for functional parts to be printed 10 times faster than the fastest 3D printing technology on the market today, enable the creation of parts that have the combination of robust mechanical properties and precise high-resolution details - all at a lower cost. This is a real game changer and the type of innovation that you should come to expect from us.

TMC: So how do you see 3D printing fitting into the existing Hewlett-Packard printing business?

Ms Whitman: Part of HP Inc.'s strategy includes tapping into our 30 year print expertise to create MultiJet Fusion. With 3D printing, we're leveraging our investments and intellectual property, including more than 5,000 patents from our core. We are focused on disruptive, breakthrough innovation and bringing our vision of a seamless physical and digital world to life with what we call Blended Reality. This is an entirely new concept and vision which enables us to move objects from the physical world to digital, manipulating, mashing and creating something that we can then bring back into the physical world through 3D printing.

TMC: Despite an increasing focus on the important role of women as leaders in business, it is still considered newsworthy to have a female CEO of a tech company. What is Hewlett-Packard doing to ensure that women are more broadly represented in the executive ranks of the company?

Ms Whitman: We have a clear focus on developing and promoting women at all levels. The National Association for Female Executives (NAFE) in the U.S. named Hewlett-Packard as one of the top 50 companies for women executives in 2014. Hewlett-Packard was recognized, in part, for its 18-month Ascend sponsorship program for female VPs and Directors, which emphasizes global job rotations and has shown to increase internal promotions to executive positions. I make it a point to connect with this group at least two or three times during the program. At Hewlett-Packard, the CEO, CFO and lead independent director are women, which is **s**omething I've very proud of.

TMC: Many younger employees, in particular women, are seeking out companies and employers who represent a positive set of core values, and who "walk the talk" by demonstrating those values in their everyday business. What are HP's corporate values, and how is the company demonstrating them?

Ms Whitman: The HP Way is perhaps one of the most well-known corporate philosophies. Trust, quality, integrity, teamwork and innovation were all founding principles of Hewlett-Packard. These characteristics are very much part of our culture today because they were instilled in our culture at the very beginning by Bill Hewlett and Dave Packard – they're part of our DNA. In turning around Hewlett-Packard, we found that some of these principles were a little buried. But we've given them a chance to grow again

and they are thriving. Especially innovation. The innovation engine is humming at Hewlett-Packard. We've gone to market with some truly transformative innovations and we have some really exciting solutions in the works that I can't wait to share with the world.

TMC: Many thanks for your insights and for your inspiration as a role model for other women in the tech sector.

SOCIAL KNOWLEDGE:

THE NEW CURRENCY OF THE KNOWLEDGE ECONOMY

Renee Lalonde, CEO iTalent Corp

INTERVIEW

TMC: What lessons have you learned, as a successful female entrepreneur, about the differences between how men and women run their businesses? Do you think that men or women have any particular innate advantages? And how do you see women's role in the tech sector relating to Social Knowledge Management, which you and your business partner, Fred Walters, have pioneered?

Renee Lalonde: iTalent share a common vision of innovation and entrepreneurship in the tech space, and we also believe wholeheartedly in the important role that women can play in this industry.

Women in the tech sector are faced with an environment and a culture that can be very male dominated. In my opinion, and in my experience of discussing this with other women in the industry, most do not want to have to compromise their perspectives and personalities as women, just to succeed in business. And frankly, we do not believe that this is at all what is required now.

As a woman entrepreneur in the tech sector, I learned that to succeed as entrepreneurs, women would have an advantage through their natural capacity to share and collaborate with others. I realized also that in the Knowledge Economy, successful businesses would need to do much better in organizing, discovering, retaining, iterating and sharing their collaborative knowledge. The key message here is the principle that value is what is shared, not just what is known.

Our book, Social Knowledge: Organizational Currencies in the New Knowledge Economy which I co-wrote with Fred, responds to the increasing demand in the enterprise to capture and fully utilize employee generated knowledge assets. We view SKM as a new discipline that businesses will benefit from. Our book aims to help organizations prepare for, and grow in the new Knowledge Economy.

TMC: So, what is the key to success for businesses who want to maximise their opportunities in this new environment?

Renee Lalonde: The key to our approach is that it leads every individual to focus on collaboration and sharing knowledge and experience. Neither women, nor men, can solve all of the challenges before us. We need to recognize each others' talents and strengths, and support each other where we have any areas where we are less

experienced. This is what social entrepreneurs do naturally. They share, collaborate and support each other. It is also what I know that the members and supporters of the GTWN do as a matter of course, which is why I support your work.

TMC: Can you give us an example **of** how this can make a difference to an organisation's culture change journey?

Renee Lalonde: Social Knowledge Management helps our clients unlock valuable collaborative assets that represent the true scope of knowledge management. Our goal is always to rise above the traditional knowledge management solutions to provide specific strategies that enable companies to retain social knowledge as part of their corporate memory. The key is effective communication within connected organizations – something that many companies find challenging. The goal is to increase the intellectual capital created by your employees.

Social knowledge gives you two kinds of very important insights: knowledge of your community, and knowledge about your community. The first is important because it will help you find and develop expertise. The second is important because it will help you wield influence. Effective executives need both. By focussing on collaboration, team work and knowledge sharing, the senior management team can easily identify who is most supportive of the SKM culture – and who may need more support on this journey.

TMC: One of the challenges of the Knowledge Economy is its global nature. Business leaders are discovering that it is no longer sufficient to become a success in your own particular region.

Renee Lalonde and Fred Walters meeting with KITS engineering students after giving a presentation

Companies are looking for support in order to reach their customers, wherever in the world they may be. How is iTalent supporting its clients to address the global nature of the Knowledge Economy, and what cultural challenges are you finding?

Renee Lalonde: iTalent is already a global business, with our base in San Jose, California, and already a number of offices around the world in India, China and Europe. We are therefore ideally placed to help our clients to support our clients wherever they are. We find that the key to cultural awareness and acceptance is to look to the role of women, especially in many of the developing markets.

As social entrepreneurs, we are actively promoting the role of women in the technology sector wherever we open an office. For example, we have announced a partnership with Kodada Institute of Technology and Science for Women (KITS) in order to increase gender diversity in the Indian tech sector, and also to support female entrepreneurs in India. This partnership emerged naturally from our recently launched office based in Hyderabad, India, near High Tech City.

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KITS was founded by Neela Satyanarayana in 2008, and is the first women's engineering college in the Nalgonda district in India. KITS is affiliated with Jawaharlal Nehru Technological University (JNTU) and offers B.Tech, M.Tech, MBA, and diploma courses. The college's goal is to empower women globally to become industry-ready engineers and architects of change in the world of technology.

The partnership will feature an internship program, through which iTalent India will select female engineering students from KITS to work on technical projects at the company's office in Hyderabad.

Internship candidates will gain real-world experience in a global technology company while preparing as students to enter the workforce. We're offering female engineering students at KITS an opportunity to put their education to use while working with a Western company that supports women in technology. Over time, this partnership could result in a solid talent pipeline for the company while creating job opportunities for top candidates at KITS.

All of us at iTalent are committed to increasing its gender diversity at its India office. I strongly support women in technology, and am committed to bringing more women on board at the company's Hyderabad Development Center.

TMC: Are there any other examples you would like to share with our network, which you see as indicative of how we can better prepare the next generation for the Knowledge Economy?

Renee LaLonde: We have also recently announced a new partnership with Wichita State University's Applied Technology Acceleration Institute (ATAI). ATAI promotes a practical approach to solving complex technology problems. This initiative will give WSU students an opportunity to participate in some of the latest trends in this space and help prepare them for new jobs emerging in the social knowledge and collaboration technology sector. We at iTalent are extremely excited to be working with ATAI, and students, to deliver cutting-edge social solutions that will dramatically enhance the student and partner collaborative experience at WSU, which in turn will be available to be shared within the community at large.

TMC: On behalf of the GTWN I congratulate you, Renee, and your colleagues at iTalent for your foresight and dedication to these goals. We wish you every success, and look forward to updates on your progress in future. Many thanks.

iTalent CEO, Renee La Londe is a successful business and tech entrepreneur, and an inspiration and role model to other young female professionals and entrepreneurs who are either contemplating starting or have already started their own venture. In 2005, Renee left her role in corporate America (as Senior Director @ NetApp) to start her own high tech, IT consulting services company. From bootstrapping to self-sustaining profitability, iTalent is now experiencing explosive growth even against big name consulting companies and has secured partnerships with heavy hitters such as Jive Software, Box, Salesforce, Zendesk and Lithium. Clients include eBay, Cisco, Yahoo, PayPal and LinkedIn.

Renee recently won the bronze Stevie Award for Female Entrepreneur of the Year, and participated as an expert speaker on innovation and entrepreneurship at the GSMA Connected Women conference in Atlanta, USA in October 2014. Her business partner, Fred Walters has over 25 years of experience in transformative initiatives in Silicon Valley. Together they recently launched the book Social Knowledge: Organizational Currencies in the New Knowledge Economy. Renee has also been recognized as one of Silicon Valley Business Journal's Women of Influence 2015 and was nominated as a Women 2.0 Founder to Watch. iTalent won the Best in Biz 2014 International Gold Award as Most Innovative Service of the Year.

HOW TO PUT FUN AND FASHION INTO WEARABLES

TECHNOLOGY

Wearable Experiments is rapidly developing wearable technology that is invisible, waterproof, durable and above all design-focussed.

Young Australian fashion designer, Billie Whitehouse and her business partner, electrical engineer Ben Moir, set up their company, Wearable Experiments (We:Ex) as a socially driven wearable technology company with a mission to bring together fashion and technology with a functional design aesthetic, and use creative problem solving to help us all live well and have a better quality of life.

According to Billie, often in technology design, the human element is missing, especially a more feminine approach which makes the technology more relevant to the needs and wants of women. Until now, a lot of wearable technology has been designed without a design brief – that is, it doesn't answer the question "what problem is this solving", but is tech for its own sake.

Growing up in a family of designers (the Whitehouse Institute of Design), Billie has always focussed on how to make technology invisible to the user. Intimacy, emotions and transparency are important for design, as is making the technology both beautiful and invisible.

The wearable technology market is estimated to be currently worth about $US 12.6 bn; however, there is huge growth potential here, as the industry has missed large chunks of the potential applications of technology, esp as it gets smaller and cheaper.

So far, wearable technology has largely ignored the five human senses, in particular the sense of touch. The skin is the largest organ in the human body, but has not been used for communication.

So how do you design wearable technology for movement? Humans exist in four dimensions – three spatial and one temporal. We need to take all of these dimensions into account. We need to focus on softness and touch as a way to expand wearable tech into areas of more appeal to female consumers, in particular.

Different areas of the body respond differently to touch. For example, the elbow responds to being touched by generating a feeling of empathy with others. That is why waiters in NY, for example, if they want a good tip, will touch the client's elbow (not the shoulder or the hand) as a way to get the customer to feel empathy with and therefore generosity towards the waiter.

The tech sector needs to understand this human interaction more and utilise it as a way to make their products more acceptable and empathetic to the user. We could also use the other senses, including smell, to communicate a holistic experience for the user, rather than just a visual impact.

We:Ex have explored using the other senses in a number of other projects. For example, the Fundawear

experiment designed to enable long-distance couples to interact as if in the same room through their smartphones. Also the Alert Shirt, which was designed as a special promotion for Foxtel sports.

The Alert Shirt brings the user experience into alignment with the experience of the actual sportsperson on the field, through haptic feedback. There are a number of large sporting bodies interested now in developing the shirt for training as well as fan use. The key to an innovative business such as We:Ex is to be able to bring something to market very fast – typically in under 3 months. To do this, projects are divided into separate streams and developed in parallel by different teams, so that a delay in one area does not delay the whole project.

Equally important is not to forget the importance of discovery as part of the user experience. We need to delight and make the complex simple, with a sense of humour, to make the new technology more empathetic. At We:Ex the "connected home" is referred to as the "empathetic home" to emphasise the need to focus on the user experience at a human level.

There is an increasing interest in implanted or digestible technology, and several experiments have already been run on this. However, in designing such products, it is important to fully understand the end user in these cases, including the biology of the user, to avoid unintended consequences. For example, some implantables are only usable by people with white skin (as darker skin cannot be penetrated sufficiently by light).

There is enormous potential for growth in the wearable space, in the sport, fashion, and health sector, provided that the needs of the wearer are put foremost, and the design team really focuses on good design principles, rather than just the technology itself.

This article is based on a presentation by Billie Whitehouse and Ben Moir of Wearable Experiments given to Telstra staff in Sydney on 11 December 2014.

http://wearableexperiments.com/

Wearable Experiments (We:eX) is a socially driven wearable technology company. Their mission is to bring together fashion and technology with a functional design aesthetic, and use creative problem solving to help everyone live well and have a better quality of life.

Billie Whitehouse is the designer of Fundawear , which was the catalyst to Billie founding the company WE:EX [Wearable Experiments]. The Fundawear campaign received a Silver Lion at Cannes Lions International Festival of Creativity.

Ben Moir, Billie's business partner, is a founding member of We:eX with responsibility for technical development and integration of electronics into fashion garments and accessories. He is formally trained as an Electrical Engineer. Ben is the designer of the 'Alert Shirt' - a fan jersey that uses wearable technology to enable fans to feel what the players feel live as it happens during the game; and the Navigate Jacket, which gives consumers their eyes back and removes the screen from their hands.

PROFITING FROM THE START-UP REVOLUTION - WHY ANGEL INVESTING MAKES SENSE

John O. Huston, Founder & Manger, The Ohio TechAngel Funds

BUSINESS

People often asked what the value of angel investing is as part of an investment portfolio. I always answer: "compared to what?" In my experience over the past fifteen years as an angel investor, the answer to this question depends entirely on the expectations on the individual investor.

Angel investing is one of the alternative asset classes, alongside such alternatives as building up a good wine cellar, buying jewellery or artwork. But in contrast to these other alternative investments, angel investing has many 'psychic' returns that the others do not have. By this I mean that the angel investor, apart from the potential return on at least some of his investments (if he invests wisely), has the knowledge that his investment is creating local employment and developing the local economy and the lives of the local community.

On average, angel investors lose money, so it is important for these investors to have other motives behind their investment. The top 20 investors make all the money – in line with the (80/20) Pareto Rule. In the world of angel investing, hobbyists rarely make returns. Those like me, however, who become addicted to it, find that they come to a point where they can no longer live without the buzz and excitement, and feeling of contributing to the local economy, which angel investing provides.

So how do we manage the deal flow, and what sort of criteria do we use to filter out those investments which we will not invest in? We always look for deals with recurring revenue streams, at a minimum of $10,000 to $20,000 per month. We don't invest in pre-revenue start-ups, and we only look at those companies which already have a minimum level of monthly revenue, and which can be scaled up in a reasonable time frame. Having an exit strategy is vital, so that investors can recover their capital, hopefully with a decent return, and reinvest as new offers come up.

So what about the age-ole question of whether you should back the "jockey" or the "horse", that is, should you look most closely at the team behind the concept, or the concept itself? Unfortunately, the answer can mostly only be determined with the benefit of hindsight. No-one sets out to invest in an idea which has no merit, nor indeed, in a management team which cannot drive the idea forward to the next growth stage. The number one reason that our investments have failed in the past has been due to us short-funding the found, and not giving the company enough capital to enable them to take enough risk to expand at a sufficient rate.

Ultimately, my view is that the secret to angel investing is persistence – of the board and the management team, as well as the community of angel investors. Only those who become totally committed to winning will have the fortitude to get through both the tough and the good times.

John Huston launched his angel group in 2004 after retirement following a thirty-year, distinguished banking career. Currently investing in their fourth fund, the Ohio Tech Angel Funds invest solely in Ohio-based tech start-ups. With 340 members, it is the largest angel investment group in the US market. John previously served as Chairman of the Angel Capital Association. Inspired by Golden Seeds, his wife, Carol Clark, has also founded X2 Angels, which supports local tech companies managed by women.

TOP TECHNOLOGY TRENDS IN THE DIGITAL ENVIRONMENT

TECHNOLOGY

Gema Estbean Garrido
Global VP,
Knowledge Networks, and Member of the Disruptive Council
Telefonica

Mosiri Cabezas Ceballos
Global VP
Digital Transformation and Business Acceleration
Telefonica

INTELLIGENCE IS EVERYWHERE

The world is becoming increasingly mobile and connected. From watches to jewellery, smartphones of all sizes, phablets, tablets, laptops, desktop computers... all feature sensors, screens and chipsets. All of these devices are enabling an almost infinite computing capacity which is no longer restricted to specialised sites, such as data centres; it is ubiquitous.

In this review of current technological trends, we want to focus on those major new technologies and applications which on the one hand, are having an enormous impact on "the digital age" we are all beginning to experience, ; and on the other hand, will cause major disruption in many industries which adopt them. They will even change society as a whole. The first group includes the so-called Internet of Things (IoT), as well as Big Data, Software-Web-Cloud; the second group includes 3D Printing and Smart Machines (the latter being a term coined by Gartner to describe "digital robotics").

IoT

The Internet of things, places, people and information (which Cisco refers to as the Internet of Everything) will bring together people, processes, data, and things to make networked connections more relevant and valuable. IoT presents private and public sector organisations with an unprecedented opportunity to drive new sources of value — including the potential to automate many manual processes. The most value will come to those organisations which focus on improving their data capabilities (integration, automation, and

analysis) and overall process agility — not to those who simply connect the most devices to the network. Success requires new workforce skills, effective team work between IT and OT, an extended partner ecosystem, and a platform approach.

Examples of potential benefits include improvements in the management of cities (a potential saving of up to 62% in energy costs for public lighting) and the monetisation of things that were previously unimaginable. For example the ability to pay-per-use for a number of services (such as insurance or parking etc.). Other possibilities include improved operational management, for example, by embedding sensors which streamline maintenance during the construction of a building.

IoT will enable everything from the remote control of assets, or telemedicine. This in turn will lead to great advances being made in health management. In addition, we will see many more improvements and efficiencies in business processes simply through millions of people and things being connected to the Internet.

A good example is ThyssenKrupp Elevators, whose CEO, has spoken about how the sensorisation of the firm's lifts has meant a disruptive change for the company:

"*We wanted to go beyond the industry standard of preventative maintenance, to offer predictive and even pre-emptive maintenance, so we can guarantee a higher uptime percentage on our elevators.*"

"Now, the elevators can actually teach technicians how to fix them"

Over the past two to three years, we have seen many investments made by technology manufacturers in acquisitions, alliances and research and development, in preparation for the demand for IoT. For example, the acquisition of Nest by Google for $3.2 billion.

During 2014, the "hottest" sector for investment was "wearables"; with the 10 largest investments in this sector totalling $1 billion (Misfit, Jawbone, Thync, Quanttus, Ineda…). Companies such as Qualcomm, Intel and Cisco, through their venture capital vehicles, were the most active in this space.

The automotive industry has also been an early investor in IoT capability. Investment by the automotive sector in this area has increased fourfold since 2009. Examples of IoT based companies and applications include automatic management of fleets (Telogis, Airbiquity), Smart Parking (Streetline, Parko), advanced navigators, and self-driving or accident prevention technologies.

At the CES held in Las Vegas in January 2015, the impact of this explosion of connected technologies became clear through the many announcements of new IoT enabled devices. Samsung's President and CEO, Boo-Keun Yoon, raised the possibility of a new type of device connected to the Internet: a "smart" office chair which heats up automatically when it notices that the user has entered the room and feels cold.

Samsung has not yet announced whether it actually intends to develop smart office furniture like this. However this example demonstrates how seriously the world's largest electronics manufacturers are treating the concept of the Internet of Things. Samsung already manufactures TVs, ovens and many other devices that are connected to the Internet, but according to Yoon's predictions, by 2017, 90% of its equipment will be connected to the Internet and by 2020 all of it will. Cisco calculates that that year, there will be 50 billion devices connected to the Internet. According to Cisco, over the next decade, the Internet of Things will generate $19 trillion from both profits and cost savings for companies.

3D PRINTING

Many people have only just started to take notice of 3D technology, but it is actually twenty-five years since 3D printing technology was developed. But now we are really starting to see this disruptive technology begin to flourish.

There are two clearly differentiated markets for 3D printing. Until now 3D printing has been seen as something of a niche market. Many analysts have estimated that only about 1% of consumers will adopt it. Current 3D printers for the consumer market are based on low-cost extrusion

technology, cost $500-$1,000 and are designed for advanced users or "prosumers" who want to create their own objects. However, this situation is likely to change, with HP's recent announcements of their plans to develop a suite of applications for families, professionals, gamers and beyond.

The second market for 3D technology is In a business environment, where the technology allows unique products to be created for customers in a scalable manner. This process can incorporate co-creation with the customers themselves: - for example in medical devices and dental products. The use of 3D printers to replace parts makes it possible to reduce inventory, storage and stocking for certain companies. It can also extend the life of certain products, as parts can be replicated by 3D printers.

According to Gartner, this market will experience cumulative compound growth in revenues of 81.9% between 2012 and 2017 because 3D printing:

- enables a faster development process and prototype products to be infinitely more agile;
- enables a huge reduction in costs associated with the above;
- reduces the need for training of specialised personnel; and
- accelerates the innovation process, making it possible to create parts that were previously complicated, costly or impossible to generate in the production chain.

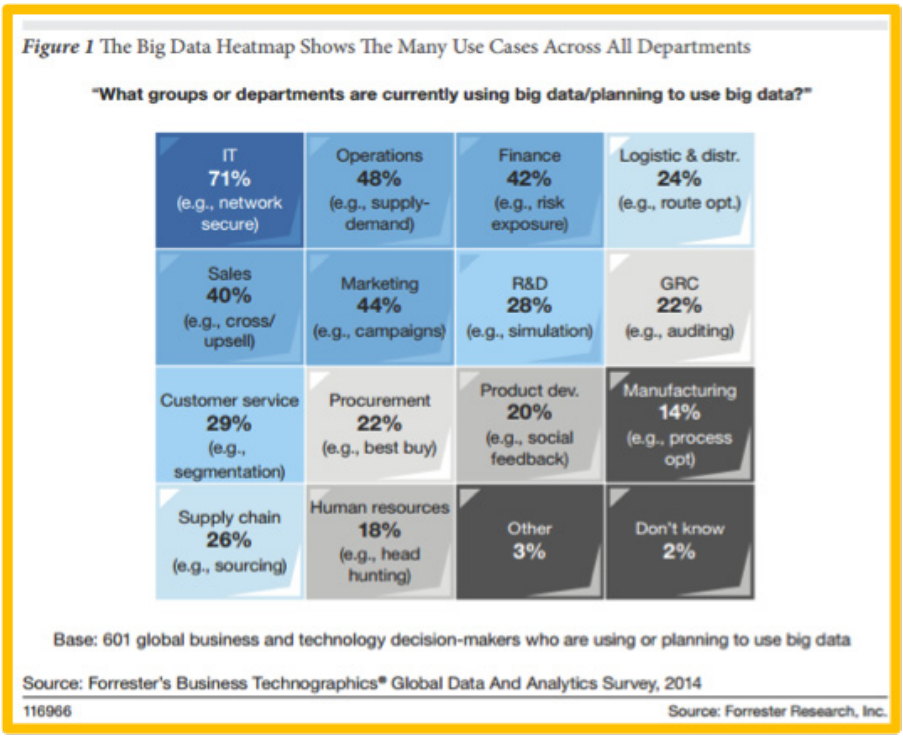

Figure 1 The Big Data Heatmap Shows The Many Use Cases Across All Departments

"What groups or departments are currently using big data/planning to use big data?"

IT 71% (e.g., network secure)	Operations 48% (e.g., supply-demand)	Finance 42% (e.g., risk exposure)	Logistic & distr. 24% (e.g., route opt.)
Sales 40% (e.g., cross/ upsell)	Marketing 44% (e.g., campaigns)	R&D 28% (e.g., simulation)	GRC 22% (e.g., auditing)
Customer service 29% (e.g., segmentation)	Procurement 22% (e.g., best buy)	Product dev. 20% (e.g., social feedback)	Manufacturing 14% (e.g., process opt)
Supply chain 26% (e.g., sourcing)	Human resources 18% (e.g., head hunting)	Other 3%	Don't know 2%

Base: 601 global business and technology decision-makers who are using or planning to use big data

Source: Forrester's Business Technographics® Global Data And Analytics Survey, 2014

116966 Source: Forrester Research, Inc.

BIG DATA

It is clear that the huge amounts of data being generated by the knowledge economy is now seen by many companies as a new and powerful resource that is there to be captured and used to advantage.

While big data first became the 'next big thing' about three or four years ago, it is interesting to see how this new market is progressing today. According to Gartner, the market has moved beyond the initial concept stage and is becoming more focussed on applying data analysis to enable more efficient business practices. Of companies those surveyed by Gartner in 2013, 64% had already

invested in big data or were planning to do so, whereas just 8% had put the technology into production. This is to say that we are still just at the outset. And we are becoming aware of an important parameter associated with big data: the need to ensure the security of these trillions of data that are becoming more and more valuable.

In addition, it is becoming possible to contextualise big data through the use of new business analysis systems. So from the data, we can work out the answers to the questions of who, what, when, how and why.

The relevance of understanding the context of data is growing and is extremely important for businesses and the user experiences of the future. By knowing where our customers are, what they need, what they use and how they do it, we will be able to interact with them automatically (through an automatic personal assistant) or immediately, through a human-interactive service.

Unlike the traditional data warehouse and business intelligence approaches aimed mainly at improving decision-making, big data also enables in-depth knowledge of the business and how to optimise it. Examples include the automation and even redesigning of processes based on the results obtained from analysis in:

- marketing and sales growth
- improvements in operating and financial performance
- risk management
- innovation in products and services.

The technology trends that will undoubtedly have the greatest disruptive impact will be what

Gartner calls the "smart machines". This term refers not only to robotics and artificial intelligence as we have always known them, but also to new elements including natural language processes, analytical techniques, semantic and advanced searches and advanced representation techniques. These techniques will enable machines to understand problems and contextualise them, to emulate human responses to questions in natural-sounding language. They will also enable machines to optimise the allocation of resources, take decisions by using probabilistic models, predicting future status, and learning.

According to Gartner, by 2018:

- smart machines will be capable of managing 10% of the workforce, acting as intermediaries between organisations and workers.
- 30% of our interactions with technology will be conversations with smart machines (eg Siri).
- at least one smart machine manufacturer will have been reported to authorities because one of its products has taken a negligent or illegal decision.
- at least one advanced economy will have developed a legal and ethical framework for smart machines.
- and by 2020, four out of 10 high-performance workers will use clones to increase their productivity in certain tasks.

SMART MACHINES

What the renowned gem of German expressionist cinema of 1927, Metropolis, foretold is already here. In this film set in 2026, Rotwang's anthropomorphic robot supplants the personality of one of the main characters, Maria. This is now a possibility.

This development triggers a number of additional questions which will be brought increasingly into the spotlight, such as the legal and ethical framework s that would

apply to the "decisions" taken by a machine, especially if these could potentially damage society or break the law. The potential of smart machines will also involve radical changes in the area of user experience and machine-user interfaces, that are nowadays far richer than ever. The London Business School has called this the "Post–Knowledge Era", where two out of every three jobs will involve non-routine or knowledge-based tasks. So adding smart machines to this equation will have an increasing impact, through either increasing the power of the self, the "I", or by replacing human actors with smart machines in a number of different tasks.

SOFTWARE-WEB -CLOUD

Underpinning all of the above technological developments are some implicit enabling factors. These are technologies that permit agility, the reallocation of resources in a virtual and dynamic manner and business logic and which enable the customer's needs to be prioritised.

These new technological paradigms are cloud, software and web. They are based on distributed databases, layered service interfaces, agility in iteration and development, and other components related to service. In this new environment, we will no longer use concepts such as Java or .NET We will instead embrace others like Python, Ruby and Node.js.

Virtualisation of networks is already happening, and it is enabling us to control all the layers of our networks and services through software defined elements. This is true not only in the world of IT but also in telecommunications. Key to this digital future is the Internet platform that enables these elements to be much more agile, innovative and iterative. In short, digitalisation is not only impacting all areas of business, but most of society as well. This process is unstoppable; the new digital technologies which are now becoming generally available to consumers, are also enabling innovation to occur in ever faster cycles. Let us all enjoy the many benefits of this new digital world!

Authors' note: This article is principally extracted from Gartner Symposium ITXpo Barcelona Nov'1. Sources used: Gartner, Forrester, Ovum, Analysis Mason, Business Insider, HP, Cisco, Wikipedia.

THE GLOBAL PERSPECTIVE

Kate McKenzie, Chief Operations Officer, Telstra and GTWN President for Australia

AUSTRALIA

What a busy start to the year it has been! I am pleased to say that 2014 was a very successful year, both domestically and internationally for Telstra. My colleagues and I have continued to address the challenges of promoting an innovation-led culture change, while also adjusting our business to the changing realities of the Australian and Asia-Pacific marketplace – both issues that we will continue to address in the year(s) ahead.

By an innovation-led culture change, I mean that we are promoting an innovation mind-set as a key driver of Telstra's business strategy. We know that real innovation will require us to leverage the diversity of experience, skills and perspectives of all of our people. We are doing this through a number of initiatives led by the Chief Technology Office (CTO) in my Operations team.

We have established an Innovation Hub open to all Telstra employees, to bring innovation and the need to constantly improve our processes and customer advocacy to the top of everyone's agenda. The Hub is a place to discover new ideas about business process change and customer advocacy, share these ideas amongst virtual teams, and collaborate on building solutions. I am pleased to say that this has led to much more team-based work, and the sharing of knowledge and experience across the company. Secondly, a number of our initiatives are aimed at spreading an agile start-up culture through us holding hackethons and innovation challenges. Through Muru-D Telstra is making its contribution to the startup scene here in Australia. Our start-up accelerator, Muru-D , was launched in October 2013 and is led by Annie Parker and co-founder Charlotte Yarkoni. We are fortunate to have lots of passionate entrepreneurs in Australia who have chosen to take the path less travelled and build a business from scratch.

The first group of nine Muru-D startups graduated in 2014, and we have been thrilled to see where the teams ended up after the six month program.

To spread the innovation message even further, four of the startups were followed and filmed for the entire six months thanks to the Chief Entertainment and Telstra Media teams. The program, called 'The Story of a Startup', follows these extraordinary entrepreneurs through the whole Muru-D process, giving everyone a taste of life as a startup. The program aired on 17 January this year on LifeStyle channel in Australia.

1 [Muru-D is "road or path to" in the Eora language, along with the capital D that stands for digital. The name implies the road to digital and it also represents our goal of combing cultural awareness and modern digital technology.]

Our innovation-led culture change program in Telstra is an essential tool in preparing the company for what the GTWN is calling "the mobile century" – the new global, mobile digital environment where new technology and new consumer expectations are changing our industry and every other industry.

This is also an environment in which the female economy will play an ever increasing role. Of course, the GTWN has long recognised the important role that women play in the tech sector, but this is now being reflected more broadly across the industry as a whole. In Telstra we are also giving much more attention to the role of women in all of their various roles – as consumers, employees, small business entrepreneurs, industry leaders and experts – as well as the changing demographics, skills and expertise we will need to serve our female customers.

As an example of the measures we are implementing, I have put in place new recruitment guidelines to ensure that 40 percent of all new hires in Telstra's Operations team will be female. Despite gender inequality being evident throughout the technology industry, we are choosing to tackle this head on to set an example for the industry and for anyone considering a career at in ICT. In addition to our measures to ensure more inclusive work conditions (through a policy of making all roles flexible), all selection panels will have one female representative, and all candidate shortlists will include at least one female. Hiring managers will also need to interview the best female candidate on the shortlist. This isn't just about bringing more females into Telstra Operations; it is about what is good for our business, and the importance of valuing diversity and the unique perspective and attributes of women, to enable us to be truly innovative.

So, as you can see, Telstra is continuing to evolve and change in response to many new challenges in our operational environment. A key measure of all of the above activity is customer advocacy, and is particularly relevant to our innovation culture change. To reward individuals who have put the customer at the heart of what we do, we have established a Pay It Forward program.

As part of this recognition program, 20 Telstra advocacy stars will be rewarded with a trip to Gallipoli, Turkey, for the 100th anniversary of World War I. During the trip they will assist in the centenary commemorative services on Anzac Day, 25 April 2015. I am sure this will be a life-changing experience for them all and will be a clear demonstration of the importance we place on brilliant customer advocacy.

And finally, I wanted to say how important it is for us to stay globally connected in this time of rapid change in our industry. In Australia it is reasonable to feel removed from the global trends. I was therefore pleased to have the opportunity to accompany a number of Telstra senior executives in late 2014 on a tour of Asia, the United States of America, the United Kingdom and Europe. Meeting with many of

Kate McKenzie was appointed Telstra's Chief Operations Officer in October 2013. This role is responsible for Telstra Operations, Chief Technology Office and innovation portfolios to better integrate technology development and implementation.

Prior to her current role, Kate was Group Managing Director, Telstra Innovation, Products and Marketing from March 2010. In this role, Kate oversaw product, promotion and pricing across Telstra, including the major product units – Mobile Products, Fixed Voice and Broadband, Network Applications and Services, Data and IP as well as the National Broadband Network (NBN) team and the Chief Technology Office.

Kate oversaw the rollout of Telstra's new brand identity, was at the forefront of the turnaround in Telstra's mobile business and led the company's transition to the. Previously, Kate was Group Managing Director of Strategic Marketing and before that, Group Managing Director of the Telstra Wholesale business unit. Before joining Telstra in 2004, Kate was Director-General of the Department of Commerce in New South Wales and has previously held a range of senior executive roles in government departments and offices.

our peers and new entrants in the industry showed us how much we have in common, despite differences in size and geography. It also gave us valuable insights into the different approaches being adopted by the smaller, more agile start-ups in the digital space.

Overall, the coming year promises to hold many new challenges. As we move forward together into this new digital economy and society, I believe it is even more important for us to support each other through our international networks, like the GTWN, the GSMA and its partners. By promoting an open exchange of experiences and debating emerging issues, we can work together to achieve the best outcomes. So, a very big 'thank you' once again to the GTWN and its members for your continued support. I look forward to working with you to make 2015 a rewarding year for all.

EUROPE

Ingrid Silver, Partner, Dentons and GTWN President for Europe

Many commentators have dubbed the 21st Century as the Asian Century and it would be difficult to dispute this claim against the backdrop of strong and sustained economic growth in Asia over the last 30-plus years.

The truth of the rise of Asia, and in particular China, has also been brought home to me at Dentons on a more personal level in recent months. We recently announced our combination with leading Chinese law firm 大成 (pronounced 'da CHUNG'), which will establish the world's largest law firm. So what will this mean for how legal services are delivered in future, and more importantly, what does it say for the relative influence of Europe and the US compared to Asia, especially in the TMT sector?

Dentons was formed as a result of a combination of three large law firms with long histories in the West. But it became clear to us that we needed to respond to the increasing demands by our clients for a more globally inclusive perspective. Our strategy of building the law firm of the future aligns neatly with our telecoms, media and technology clients who are increasingly seeking growth through convergence across geographies and greater collaboration across technology and creative platforms.

Fundamentally, both legal services and the TMT sector must adopt the same approach to their customers as we enter a truly global economy: to keep innovating, provide creative content or solutions, and develop distinctive brands in their marketplace – building loyalty and deepening customer advocacy.

For both industries, customers are increasingly both local and global: local to particular markets, but with requirements for customer service that reflects an understanding of specific cultures and local traditions; and global in terms of outlook and the development of new product offerings and innovation that will resonate in each of the markets in which businesses operate.

When I spoke at the Global Telecom Women's Network event in 2014, I talked about the 'era of ubiquity' and the need to focus on the present to maximise the benefits of current technology in each of our lives. I still support this statement and am constantly delighted at the extent of the current functionality on our phones, PCs, mobile devices, TVs and wristwatches.

This innovation is often driven by the synergies generated by convergence and consolidation in the industry. 2014 saw a raft of TMT deals totalling approximately $150 billion. Some of the most high profile of these deals took place in the US - including Comcast's bid for Time Warner Cable, AT&T Inc's bid for DIRECTV, and Facebook's acquisition

of WhatsApp. Following these deals last year, market sentiment for 2015 is demonstrating an equal expectation and confidence that high-value and high-profile deals in global TMT will reach even greater heights. Major corporates are looking to spend their cash piles, while the ever-acquisitive private equity houses are positioning themselves for even greater strategic returns.

So what are the trends that we will see emerging, and consolidating, through 2015 and beyond? In terms of product innovation I'm confident we will see further development in advertising technology across mobile, online and video; in fintech, as financial services companies look to replace and update their legacy systems driven by customer demand for remote access; and a stronger push for cloud computing as many corporates look to move data to the cloud.

In mature markets, and for a wide variety of businesses, the mining of consumer data, and the will to engage customers via more effective and efficient marketing activity, herald a major growth opportunity for companies providing data analytics. We expect to see increased mergers and acquisitions activity in this space as 'business intelligence' becomes a valuable commodity.

Other growth trends to watch this year are the increasing development of mobile payments, big data and security, along with interconnectivity forecast by the growth of the Internet of Things as users demand more alignment between mobile applications, the internet and e-commerce. Many of these trends are being showcased at Mobile World Congress.

On the other hand, we don't anticipate any lessening of regulation this year – in many cases quite the opposite! This continues to make our lives interesting, and we will continue to work closely with colleagues in competition, IP, employment and tax practices on these complex issues.

2015 is an exciting year for our industries, both legal and TMT. We will be working within the confines of various regulatory environments, seeking ways to navigate clients through the challenge of seemingly disparate legal requirements. This is a challenging but exciting opportunity for me personally, and for all my colleagues around the globe, to use our creativity to find the most suitable outcome for everyone.

I'm continually enthused and motivated by the brilliance of the creative industries we work in, and the leading role that women are playing. I look forward to being able to continue our discussion on these important issues of globalisation in Barcelona and beyond.

Ingrid Silver leads the Dentons UKMEA Media and Entertainment practice and has been involved in the TMT sector for more than 18 years. Ingrid has extensive experience of advising 'blue-chip' multinational clients and coordinating advice across multiple jurisdictions. She has extensive experience advising on services such as online advertising, convergence and interactive and mobile content. A key part of Ingrid's practice involves specialist advice on corporate transactions for key entertainment industries.

UNITED STATES

Michele Merrell, Vice President Global Marketing and Communications, CSPI and GTWN President for the US

As we convene for the 2015 Mobile World Congress in Barcelona, we once again meet at an extraordinary time in the mobile industry. Technology that was once seen as only science fiction in the movies continues to be our reality of today, and continues to rapidly transform our world. Indeed, if the technology has been visualized, it is quite possible that it already has been, or will be built. Traditional mobile industry boundaries and geographies are disappearing and the entire world of instantaneous communications continues converging. We are seeing a future where there is a predicted 30% increase in connected things – from appliances to cars – globally, from a 2014 statistic of 4.9 billion connected devices to 25 billion by 2020. This is supported by worldwide smart phone sales, which tipped 1.3 billion sold in 2014 - which equates to 3.5 million every day, or 148,400 sold every hour (Source: IDC, Smartphone Marketshare Q3 2014).

From a U.S. perspective, the U.S. wireless industry continues to lead the world with superior networks and investment, and it also provides consumers with tremendous choice and value. Take a look at the facts that clearly show our vibrant and competitive mobile industry in the U.S. that must continue to meet the challenges of meeting exponentially increasing consumer demand.

- Currently, over 97% of U.S. consumers have a choice of at least three operators and U.S. wireless penetration exceeds 104% (CTIA Wireless Indices, 2014).

- 90% of households in the U.S. are 35% wireless and 16% mostly wireless. This means four out of every 10 adults live in a wireless only household.

- U.S. mobile data usage doubled from 2012 to 2013, and will increase by 650% by 2018 (Cisco VNI Mobile Forecasts).

- Every day, more than 8.8 billion MB of data is used in America.

- Reaching $50 billion in 2014, mobile payments in the U.S. are expected to increase to $142 billion by 2019. These mCommerce payments made via apps and mobile websites will account for $91 billion of the total mobile financial transactions in 2019, while peer-to-peer payments will represent $17 billion. (Source: Forrester Research, US Mobile Payments Forecast, 2014 to 2019, November 17, 2014).

One of the biggest challenges, which also present a significant growth opportunity for the mobile industry, is that consumers continue to be consumed with connectivity and speed of their devices. As the mobile ecosystem continues to expand, this coupled with demand for high-bandwidth applications and services such as gaming and videos, keeps the pressure on the availability and quality of broadband connectivity. This has implications for the U.S. operators, who will have to continue pursuing technological advances to handle demand, as well as long-term spectrum availability and efficiency issues to assure continued mobile broadband momentum.

Mobile device security will also be a continued area of focus for the mobile industry. There are increased risks of hacking and malware as device adoption continues at a rapid rate, including the increased popularity of bring-your-own-device (BYOD) in the workplace. These trends could exacerbate the potential exposure to critical company data using malware or other hacking techniques. Reducing the vulnerability of mobile devices to hacking, including embedded anti-malware software into devices and enhanced authentication features, will be a key priority for device manufacturers and wireless operators.

In 2014, we moved further toward a cashless society, and mobile payments technology will continue to gain traction going forward and will eventually result in a further decline of conventional retail banking. As the market for U.S. mobile payments continues to expand from $52 billion in 2014 to an estimate $142 billion by 2019, consumers are constantly looking for increased speed and ease of use. It is inevitable that Google and Apple will become major players in core retail banking, either directly

or through joint ventures, as they both own a strong channel direct to consumers. Moving toward a completely mobile/digital banking solution with a SaaS solution in the cloud, where physical bank branch offices are less important is now a reality.

The U.S. mobile industry competitive landscape is highly concentrated where four of the largest operators generate about 80 percent of industry revenue including AT&T, Verizon, T-Mobile and Sprint. All four are under relatively new leadership with seasoned mobile industry veterans, with John Stratton at the helm of Verizon as of February 2015, Sprint under Marcelo Claure as of August 2014, Glen Lurie heading up AT&T Mobility in the same timeframe, and T-Mobile under the leadership of John Legere as of September 2012. All four are extraordinary leaders in the mobile industry and are relentlessly focused on delivering value for their customers. Heighten competition continues to drive more pricing options available, and this will result in better value for consumers in the U.S. market as the operators continue launching advertising campaigns with retaliatory data pricing against one another. M&A activity will still be at the forefront as a growing number of smaller wireless operators continue to struggle to compete against the larger national operators that are able to scale their networks and engage each other in aggressive price wars and expensive advertising campaigns. Increasing demand for data services, as well as the quality of the network that provides it, is becoming the differentiating point in the marketplace. To meet this demand, the wireless operators are working toward continued improvement of their networks' data services, with an end goal of a better customer experience. In the end, building customer loyalty and holding significant churn rates down will be paramount to the success of these operators. And on top of this, the debate on Net Neutrality continues. The controversial regulatory and legal battles going on in the U.S. around this will continue into the foreseeable future as the FCC pushes its mandate for increasingly faster speeds and mobile internet access for all consumers anytime and anywhere. In the midst of all this continued change, Americans are able to enjoy the world's best mobile industry - from networks to devices to apps. It will be interesting a year from now, to see where these four mobile industry giants – led by Stratton, Claure, Lurie and Legere - have taken their companies, and how the mobile landscape in the U.S. continues to reshape itself.

The vibrancy of the mobile industry, its importance to our economy and our future, and the need for our global marketplace to be a competitive and robust one helps promote competition, fosters the growth of new technology, and brings these opportunities to the entire world. It is attracting the attention of not only new companies, and workers and investors in the mobile space, but is now expanding into other industries as well. Growth in the mobile industry will continue to spread and to change. The mobile industry has been and will continue to be at the center of the innovation universe as it continues to grow and expand.

As well as VP, Global Marketing and Communications for CSPI, Michele is also President of Merrell Consulting Group, a global marketing and corporate communications consultancy focused on the mobile and technology industries. Formerly, she was a senior-level executive for Brightstar Corp, a $6.8 billion global leader in wireless distribution, manufacturing and supply chain solutions. She has also held other senior level positions in the mobile telecommunications industry. She has received many awards and recognition over her career, including the 2014 Florida Achievement Award from the Florida Commission on the Status of Women, while in 2013 she was named by the Diversity Journal as a recipient of their "Woman Worth Watching" award. Michele is a member of the Board of Directors for Cable Bahamas, a publicly held telecommunications company headquartered in Nassau, Bahamas, with operations in the United States. She is also the North American Regional President of the GTWN.

ALIBABA AND THE ONLINE MARKETPLACE

Vicki MacLeod, Secretary-General, GTWN

BUSINESS

The lessons I learned from the dark days at Alibaba are that you've got to make your team have value, innovation, and vision. Also, if you don't give up, you still have a chance. And, when you are small, you have to be very focused and rely on your brain, not your strength. Jack Ma

Another insight into the mind of this entrepreneur comes from Ma's oft-quoted views on the importance of persistence, of following your dream. "Never give up. Today is hard, tomorrow will be worse, but the day after tomorrow will be sunshine."

Following college and five years working as a teacher at about $US 15 per month, in 1995 Ma accompanied a Chinese trade delegation to Seattle as an interpreter. While there he experienced the internet for the first time, and realised that there was no data available online about China. Once back home, he borrowed money from family and friends and set up China Pages and competed with China Telecom for about a year, before he entered a joint venture with them. But he still had bigger dreams, and wanted to set up his own e-commerce company.

Ma explains how Alibaba started: "In 1999, I gathered 18 people in my apartment and spoke to them for two hours about my vision. Everyone put their money on the table, and that got us $60,000 to start Alibaba.

I wanted to have a global company, so I chose a global name. Alibaba is easy to spell, and people everywhere associate that with "Open, Sesame," the command that Ali Baba used to open doors to hidden treasures in One Thousand and One Nights."

Starting out from an office in his apartment, Ma raised investment from Goldman Sachs in 1999 and then Softbank Corporation in 2000. But Ma admits that Alibaba expanded too fast, then by 2002 had only enough cash to survive for 18 months. Ma calls Alibaba "1,001 mistakes." So Ma developed a product for China exporters to meet U.S. buyers online. By the end of 2002, the company made $1 in profits. Each year the company's profits grew. Ma also took Alibaba into search, through a joint venture with Yahoo, and his Taobao online auction site became bigger than eBay in China. Today Alibaba is the world's largest business-to-business e-commerce marketplace. Alibaba Group made financial headlines in November 2014 for its historic IPO by raising $25 billion.

My vision is to build an e-commerce ecosystem that allows consumers and businesses to do all aspects of

business online..... I want to create one million jobs, change China's social and economic environment, and make it the largest Internet market in the world. Jack Ma

How Alibaba Works

Taobao (a C2C business model similar to ebay and Craigslist), Tmall

(a B2C model similar to Amazon) and Alibaba (a B2B wholesale-like business model) are the three main marketplaces. All are among the most visited sites in China and the world. It is based on a freemium model. While businesses are allowed to list their products for free on the platform, Alibaba Group provides a range of advertising and web hosting services that help build exposure and provide legitimacy to acquire potential new customers. Advertisers also have access to advanced targeting features using Alibaba Group's own data management platform (DMP), Alimama. Other subsidiaries such as Alipay (similar to PayPal) and Cainiao (a logistics platform) complete the services offered to buyers and sellers.

Jack Ma, founder of China's largest online site, grew up during China's Cultural Revolution, but showing early signs of a global vision, at the age of 12 he got interested in learning English. Every day would ride his bike forty minutes to a tourist hotel near Hangzhou's West Lake district. He taught himself English over the next 8 years by showing tourists around for free, while also polishing up his school English, and importantly, picking up a view of the world beyond China's borders.

Ma credits the rest of his transformation to global entrepreneur to a chance meeting, in 1979 with an Australian family with two children, with whom he became pen pals. In 1985 they invited Ma to spend his (July) summer vacation with them. Ma says that that month's vacation in Australia changed him forever. Before then, he had been told that China was the richest and happiest country in the world. The trip to Australia opened his eyes and he started to think differently.

ONLINE FASHION : CHANGING RETAILERS' RELATIONSHIP WITH CONSUMERS

Sahar Albaharna

RETAIL

There has been a steady increase over recent years in the number of online fashion retailers such as Asos, Yoox, Shopcade, BlueFly, Belle & Clive and many more. The emergence of such companies has influenced the traditional bricks and mortar fashion retailers including the bigger department stores such as Macys, Selfridges, and Saks Fifth Avenue (USA), Printemps or Galeries Lafayette (France), and Debenhams and Selfridges (UK) for example. In response, they have created their own online retail channels and have tried to leverage their customer base to compete with their digital only competitors. The impact on employment has been mixed, with a number of more traditional sales

assistant jobs disappearing, while new positions in online and social marketing, e-commerce and logistics, have been created.

The online fashion world is changing

Fashion stores have been affected by the shift in consumer expectations and shopping behaviour. In order to stay in business and compete with new online stores, many fashion companies are coming up with creative ways to evolve their business model and engage with their customers electronically, while at home or while they are in store. For example, the luxury retailer, Burberry invited customers into its stores in order to live stream the London Fashion Week. After that, associates distributed iPads to the customers so that they could browse and purchase the items in the fashion show online.

Many retailers have quickly understood the importance of social media and of targeting influential fashion bloggers to campaign for them. The bloggers usually have thousands of followers, which creates a cost effective popular campaign for these companies. Fashion bloggers can influence customers to visit these stores both online and in store.

Besides creating more jobs, the online shift has also created more companies. One of the main challenges faced by online stores is the high number of returns. Because customers cannot try the items before they purchase them, they end up returning them if they do not fit. Companies such as Fits Me have emerged with the concept of a virtual fitting room. The website's robotic mannequin takes the customer's body measurements and mimics their shape so that they can see exactly how clothing would fit them . According to Mashable.com, the site has been such a success that the online German retailer Quelle saw three times the clothing sales and reduced returns by 28%[1] .

Some online fashion retailers and their business models

Yoox is an Italian internet mail order retailer of men's and women's multi-brand clothing and accessories. The business model of Yoox is based on purchasing overstocked or unsold items from previous seasons from renowned fashion houses such as Dolce and Gabbana, Gucci, and Armani and reselling these items online. The concept is that of an online fashion outlet store. Yoox Group has achieved a net income of Euro 12.6 Million in 2013, which is up by almost 24% compared to 2012 . It is important to note that Yoox has other revenue channels from fashion stores in Europe. This signifies that the combination of online and bricks and mortar is important to cater for different preferences. Moreover, the majority of online retailers have free apps for iPhone and Android mobile phones.

SHOPCADE is a social shopping application. The company has a different business model than Yoox. It is a web and mobile based app that offers a daily fashion fix of top trends and deals to 16-25 year old fashion users globally. The main benefits of social shopping include cost effective advertising and easier reach to potential shoppers through social media applications such as Facebook. According to Wikipedia, Over 750,000 users are actively engaged with Shopcade.

What is trending now?

It is very difficult, if not impossible, to predict how the retail sector will respond to all of these technological changes, as it is a very dynamic industry. According to eMarketer.com, US retail ecommerce will continue its rapid growth, with sales forecast to rise by 15.5% this year. On a global level, the growth will continue to soar as more companies such as Yoox and Shopcade continue to be in tune with customer's buying behaviour and shopping trends.

"We will see more disruption in the next 10 years of retail than we did in the previous one thousand," said Doug Stephens, founder of industry website Retail Prophet and author of The Retail Revival: Re-Imagining Business for the New Age of Consumerism. Stephens has set out his 10 predictions for how retail will change. These are exciting for those who may be bored with the traditional style of retailing, but may be concerning for those who value their shopping privacy.

It seems clear that loyalty schemes and the insights they provide into actual buyer behaviour, are only the first step in how retailers will be using technology and data analytics to gather intelligence about what

shoppers actually do. Wi-Fi and location based services in store will allow retailers to observe shoppers in real time, to give them valuable feedback on their marketing and store layout practices. Apple has recently implemented blue-tooth technology that senses who is in the store and links this information to your Apple profile.

Amazon has raised the possibility of 30-minute drone delivery. This may seem unlikely as a mainstream distribution channel, but bricks-and-mortar stores might start using their locations as distribution centres, while the distinction between online and offline shopping will continue to blur. Pop up stores will temporarily provide a real world presence, where online marketers can gauge customer response. Last year, eBay launched "digital storefronts" in New York and San Francisco that allowed customers to order items for same-day delivery.

The traditional media's relationship with advertising is shifting, as companies increasingly cut out the middle man, and start to sell products themselves. TV shows will also generate revenue directly from audiences, by direct selling of products to make up for the decline in demand for separate commercials. As well, programs will continue to build products into their story-line to overcome the watcher's ability to avoid ads.

DIY checkout will become the norm in retailing in a variety of stores, not just supermarkets, while "social shopping" (based on social networks preferences and word of mouth advertising) will become commonplace, with different products and services linked to consumers via their demographic profiles and feedback from others in their social networks. Rather than a static experience, retailing will become increasingly dynamic, responding to consumer feedback in real time, with retailers having the ability to change pricing multiple times in response to what is happening online.

As shopping becomes an experience tailored to individual preferences and previous buying behaviour, consumers are increasingly becoming concerned about protecting their privacy while shopping online, or indeed in store. There will be a growth opportunity in developing services that consumers will be willing to pay for, but which will help them keep their purchasing behaviour anonymous.

Generational differences are emerging

Will Gen Y and Gen Z have the same expectations of the shopping experience, and the same preferences, that their parents did? Retailers are already grappling with how to address younger consumers. In contrast to their parents, this age group is staying at home longer, and learning to live with less. Combined with less stable employment, this is already leading to a preference for a sharing economy, where everything from cars, to homes, to appliances, can be shared. Everyone has now heard of accommodation sharing site AirBnB, or GoGet car hire. But there are also sharing services aimed specifically at women. For example, Bag, Borrow or Steal allows women to rent a special occasion handbag which they cannot afford to own. Rent The Runway, as the name implies, allows women to wear special occasion designer gowns for an affordable one off use. Social networks and online services are integral to these new approaches to 'shopping'. Given the popularity of these services, this trend is bound to continue.

1 http://www.vendhq.com retail-trends-and-predictions

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7 http://en.wikipedia.org/wiki/Shopcade

8 http://www.emarketer.com/Article/Retailers-Look-Merge-Offline-Online-Shopping-Experiences-2014/1010812

Sahar Al Baharna is a social entrepreneur and corporate trainer. She is the founder of Humanex, an events and training company based in Bahrain with a focus on women's leadership. She obtained her MBA from IE Business School in Madrid with a specialization in Global Management. Sahar is a supporter of women's empowerment and has organised several women leadership events in Bahrain. She has over eight years of experience in the IT industry and is a mother of two girls. Having experienced what it's like to be a working mother, and seeing many women in the Middle East give up their careers as early as in their mid-twenties because they cannot balance between work and motherhood, encouraged her to create more solutions to empower working mothers. Sahar organised the first women's leadership event in Bahrain in 2010. Sahar is currently based in Melbourne, Australia with her family, and contributed to the development of the third edition of The Mobile Century through work as Associate Editor.

HIDING INFORMATION INSIDE BIG DATA AND THE HYPOCRISY OF PRIVACY

Alicia Asin, CEO and co-founder, Libelium

BIG DATA

In the future, our cities will be full of sensors and generating tons of data to help us find a parking spot, save water in irrigation, monitor pollution levels and make cities more efficient, urban resilient and livable.

But how much data will this be? We are already generating a lot of data. For example, Twitter is generating 80GB/day, which seems a lot, but this is nothing compared to a gas turbine engine that generates 520 GB per day, and per blade. There are 20 blades in each one. Imagine how much data we'll generate when we have all those things connected to the Internet?

The question is: when does data become information? I have a friend who lives in a city that is a pioneer in releasing public data. He is a runner. One day he wondered about the air quality in the city. So he got onto the Internet and found a lot of public data from the city about air quality. But it took him three days, reading scientific papers and European Union Directives, to find out that several parameters in the city's air quality measures were outside the acceptable limits.

So, while it is true that we have access to more information than ever before, we are not experts on every subject. So far, this information overload is very difficult to digest.

My concern is that over-information is a new way of actually hiding information from us — because data is nothing without context. Maybe we shouldn't be afraid of all this data collection. Who could possibly find something useful about us in that

vast ocean of data? Or should we still be concerned?

How many of you were angry when you learned about the NSA using our day-to-day tech tools to spy on us? How many were scared? How many of you have stopped using your iPhone, your Facebook account, or your Google or Yahoo e-mail services since then?

Nobody? I am not really surprised. So far, Angela Merkel is the only person I know who did something about it, switching from iPhone to Blackberry, a device from a Canadian company.

So my question to you is this: do you have to be the German Chancellor to be affected by an invasion of your privacy? Because it looks to me like privacy is not a real concern if you can get something in exchange for it.

There is a new business—an insurance company and a telco offering you to pay your premium depending on the way you drive. It not only collects information on your speed and way of driving, but also your personal habits, such as where you go and when. In exchange, you may have a cheaper insurance policy. It is also obvious to you what information you're disclosing when you sign the contract. Does this arrangement concern you, or is it a fair exchange of data for the consumer benefits?

Let's consider another example. Your smart TV comes with a camera, a microphone, and 46 pages of privacy policy. Who reads all of this? If no one reads the manual, who has time to read 46 pages of terms and conditions about privacy? But we probably should, you know. It says scary things about confidentiality, about having private documents in the same room with the TV. Even when it's switched off.

I've heard a lot of people complain about the second example – Big Brother is watching – but will it actually stop anyone from buying a smart TV?

This makes my second point – the hypocrisy of privacy.

We already agree we don't care about privacy. Convenience trumps privacy. We admit that sometimes we don't care about our privacy because we are getting something in exchange. We are still afraid of who is accessing data and who is generating it. But some data needs to be public – it has to be made public.

In Fukushima, on March 11, 2011, there was a radiation leak. This was of course very dangerous. There was plenty of news about it. We saw one piece of news among all the media coverage – radiation was found in California. A company selling anti-radiation pills ran out of stock.

At Libelium we decided to do something about it. We created a personal radiation sensor. We sent samples to citizens in Tokyo. Something amazing happened. It was spontaneous. People shared the information on the Internet, to keep and maintain a real time radiation map – what they did was establish a totally independent source of information.

The other question you may have is about data integrity –what happens if anyone can insert data into the network? One answer about how this can work is Wikipedia. The idea is: the more people watching out and taking care of the quality of information, the more accurate it will be.

Can you imagine a future city, where government is sharing public data, giving context and being audited by citizens who could also contribute to the data set? If this can happen, the biggest legacy of the IoT will be democracy.Today I wanted to be inspiring. I hope I've helped you move your opinion up or down. I think we all realize that complex questions do not have simple answers.

This article is based on a presentation at Strata + Hadoop World Barcelona 2014. See also

https://www.youtube.com/watch?v=0j70x0DnmMo

http://www.bbc.com/news/technology-31296188

Samsung is also warning people as part of its privacy policy that anything they say around their new television will be "among the data captured and transmitted to a third party" because of a voice recognition feature.

designs and manufactures hardware and APIs for wireless sensor networks.

Alicia Asín is CEO and co-founder of Libelium. Alicia is a computer engineer focused on how IoT can change our world, starting with Smart Cities and smart agriculture. She is a frequent speaker at international conferences on issues related to Smart Cities, wireless sensor networks and IoT. Alicia was named best business manager in Foreign Trade (ADEA 2011); she was awarded the highest recognition for her paper on Computer Architecture (WCAE 2007, San Diego). Alicia is the first woman to receive the National Young Entrepreneur Award at the 2014 meeting of the Spanish Confederation of Young Entrepreneurs (CEAJE). Alicia holds a master's degree in computer engineering from the Polytechnic Center, University of Zaragoza, and is a graduate of the Cambridge Judge Business School and ESADE.

THE FUTURE OF EDUCATION: HOW DIGITAL DISRUPTION IS COMING TO A SCHOOL OR UNIVERSITY NEAR YOU

Vicki MacLeod, GTWN Secretary-General and Senior Advisor, Innovation Culture, Telstra

EDUCATION

Since electrification, the story of the twentieth century has been the race between education and technology (Goldin and Katz, Harvard University, 2010.)

A total transformation of education is approaching fast, whether the educational establishment is ready or not. [1]

Professor Clay Christensen of the Harvard Business School and his colleagues have painted a convincing picture of this transformation in two books. In *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*, Clay Christensen, Curtis Johnson and Michael Horn set out a *proposal for using technology to better serve* students and bring our schools into the 21st Century. Their vision is of no less than a radical change to the way the whole western education system works. If for no other reason, it has drawn criticism from many defenders of the educational status quo.

In *The Innovative University: Changing the DNA of Higher Education from the Inside Out,* Christensen and his co-author Henry J. Eyring expand on Christensen's theory of disruption. According to Christensen, disruption occurs when the needs of consumers at the lower end of the spectrum are not being met by existing markets. Disruption then occurs when new suppliers enter the market and make a product or service affordable, simple and accessible. This would seem to be the case so far in the strong demand for flexible, cheap

(or even free) online learning.

But even more than just a pent up demand for low cost universal education from the underserved, we can see evidence of other economic factors at play. This has become most visible in the US education market, where cheap credit for college loans is a stop gap and is not enough to maintain the younger generation's standard of living in a global competitive marketplace. Many new graduates are finding that their degrees are not getting them the higher paid jobs that they were expecting, with unemployment amongst new graduates.

Dissatisfaction with the traditional educational pipeline is reflected in the many opinions for and against the value of a higher level education now being voiced in the media. Some of these lead to interesting results. Hamilton Place Strategies[2] , for example, analysed the growth in real college costs in the US and plotted this against the net benefits and concluded that a college degree will still be worth the cost until the year 2086, which they see as the point when the two intersect. The Pew Research Center[3], has also entered the debate , their analysis showing that the earnings gap between high school and college or university graduates is the largest it has been in almost half a century. So it would still seem to be worthwhile to get a tertiary qualification, right? Or is it?

In a report, released on January 6 2015, the US Federal Reserve provided the results of its analysis of more than 20 years of data and found that, while it generally takes new graduates some time to transition into the job market, today's graduates are having an even tougher time and many are accepting jobs for which they are overqualified, low-wage jobs or part-time work. According to the report, "It is not clear whether these trends represent a structural change in the labor market, or if they are a consequence of the two recessions and jobless recoveries in the first decade of the 2000s."

Even though U.S. unemployment has fallen to a five-year low of 7 percent in November, young graduates are entering an economy that is still fragile and far from its pre-recession levels. The report found that graduates from fields that provided technical skills or serve growing parts of the U.S. economy fared better. Healthcare and education graduates had lower unemployment rates of about 3 percent and 4 percent respectively, while construction and architecture majors and liberal arts and social sciences majors experienced the highest levels of unemployment of 7 percent to 8 percent. The authors said this trend of higher unemployment for new graduates began with the 2001 recession, improved when the economy recovered, and deteriorated again during the most recent economic downturn.

In many ways, the discussion of the disruption of education by digital technology has started to become a matter of belief – with a division between those who continue to value institutional learning and the traditional roles of the teacher and the pupil, and those who see the future being in individual based learning via online or virtual coach-led environments.

To the latter group, the potential in each student can be unlocked by combining the power of computers, software, and the internet with the human touch of a teacher-as-coach to motivate the student to work hard. Technology in this view of education is an enabler which brings a range of benefits, including:

- customised lessons adapted to each student's individual learning style
- affordable cost
- access to lectures from some of the most talented instructors in the world
- motivational tricks that mimic the effect of video games
- the ability for students to learn at their own pace and in their own time and place.

Specialists in education point out that what is missing from this picture is motivation. The desire to learn is so important that a human teacher acting as a coach is seen as an indispensible element. Without such a coach, the flexibility for students to learn at their own pace can make it easy to procrastinate and waste time.

In the online environment, teachers will also benefit from their changed role. The main skill of a teacher will need to be in being able to encourage each student to dig deeper into some particular interest that student has—well beyond the teacher's own knowledge. And from this collaboration, teachers themselves will be learning from working alongside their students.

But do parents have to wait for schools and universities to come on board this new approach to learning, or can parents take a DIY approach? These days, any parent with the skill and drive can team up with inexpensive online tools to give his or her child an education. In many parts of the world, education of children

up to a certain age is compulsory, but school attendance is not. When choosing to home educate, parents accept responsibility for planning, implementing, and evaluating their child's learning program in a suitable learning environment. So it is possible that the ability of individual families to opt out of the education system could in future lead to a change in attitude and more flexibility in how schools educate children and whether they use online resources.

In higher education, students voting with their feet will bring pressure on tertiary institutions to change. Many of the most prestigious colleges and universities are likely to cling to their traditional learning models much longer than more progressive institutions. But some are already embracing the new 'flipped' learning model .

The traditional pattern of teaching has been to give students the task of reading textbooks and work on problem sets outside school, while listening to lectures and taking tests in class. In flip teaching, the students use video lessons prepared by their own teacher or third parties. In class students apply the knowledge by solving problems and doing practical work. The teacher as more as a roaming tutor, helping the students when they become stuck, rather than feeding them the basic information. As some of the prestigious colleges and universities start to embrace the new methods, the rest will ultimately follow, especially if those who do are seen to move ahead in the rankings as a result.

Another trend which is transforming attitudes to education is the shift from credentials to certification. Instead of the emphasis being placed on official diplomas and degrees, employers are now demanding proof that a potential employee has actually gained particular skills. Certificates that attest to an ability to write computer code, write a decent report, use a spreadsheet, or give a persuasive speech are going to be worth more and more. These skill-based courses are not necessarily lengthy, either. For example, coding boot camps and code-in-a-day programs are more and more popular. For many students, a skills certificate that is valued by a prospective employer may well be worth more than an expensive multi-year degree with an uncertain employment outcome.

1 With thanks to my colleague Sami Makelainen at the Chief Technology Office, Telstra

2 Reported in http://www.huffingtonpost.com/2014/02/12/college-degree-worth-the-money_n_4774897.html

3 http://www.huffingtonpost.com/2014/02/11/earnings-gap-college-grads-high-school_n_4768780.

4 http://monash.edu/news/show/flipping-the-classroom-law-style and http://blogs.lse.ac.uk/lseteachingblog/2014/11/27/flipping-lectures/

Vicki MacLeod is a telecommunications policy specialist with extensive experience in industry and government in Australia and internationally. She has particular interests in: innovation culture change; the female economy and women's entrepreneurship; digital economy and society policy; regulation and strategy; comparative global trend analysis in ICT and digital media; and the future of mobile applications in health, education and the silver economy.

As Senior Advisor, Innovation Culture in Telstra Operations, Vicki contributes to Telstra's Innovation Program through providing insight into the female digital economy and its importance for the future growth of the mobile industry. She has also been Secretary-General of the Global Telecom Women's Network for nearly twenty years. In this role she provides strategic direction, operational support, and liaison with members and external organisations. She is also the chief editor of all of the GTWN publications, including the GTWN's twentieth anniversary report on the contribution of women to the mobile industry, entitled The Changing Culture of Communication.

2014 SIR ARTHUR CLARKE AWARDS

Recognize Contributions by Women and Men in Space

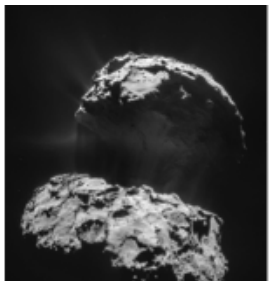
AWARDS

It may not have been planned that way, but the GTWN was delighted to notice that the 2014 Sir Arthur Clarke Award Ceremony, hosted at The Royal Aeronautical Society in London, UK, on Wednesday 8th October 2014 had a healthy recognition of both men and women who have contributed so much to space, science, and technology. The Sir Arthur Clarke Awards, presented annually since 2005 in cooperation with the UK Space Agency and the British Interplanetary Society, recognize notable or outstanding achievements in, or contributions to, all space activities. Current and Emeritus Board Directors include GTWN International Board Members, the Hon. Diana Lady Dougan and Walda Roseman.

Winners in each category are listed below.

1. Space Achievement – Industry/Project Team

This award is for significant or outstanding achievements by a team in all space activities.



Winner: The European Space Agency (ESA) Management and Design Team for the Rosetta comet-chaser mission. After 10 years, and a journey of more than six billion kilometres, in November 2014 the Rosetta spacecraft sent its fridge-sized Philae lander down to Comet 67P/Churyumov-Gerasimenko. Philae bounced when it hit the comet and came to rest in an area where it cannot get enough sunlight to recharge its batteries. So, after about 60 hours of experiments, the little lander is now in standby mode, "sleeping". Analysis of Philae's data continues and Rosetta maintains its orbit around the comet, sending back data of its own. Scientists had hoped the mission could help unlock answers about the formation of the Solar System, the origins of water on Earth and perhaps even life itself.

2. Space Achievement – Industry/Project Individual

This award is made for significant or outstanding achievements by an individual in all space activities.

Winner: John Ellwood – Ex European Space Agency

John has made many significant contributions to several major Space programmes. He was ESA's project manager on the Rosetta spacecraft and played a crucial role in the design of the Solar and Heliospheric Observatory, SOHO, launched in 1995. As ESA Project Manager of the first Automated Transfer Vehicle, 'Jules Verne', he saw the first ATV docking with the International Space Station on 3 April 2008.

3. Space Achievement – Academic Study/Research

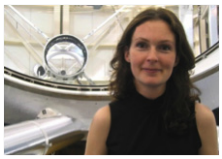
This award is made for significant or outstanding achievements in space research.

Winner: Professor Louise Harra – The Mullard Space Science Laboratory, University College London.

Professor Harra has been a leading figure in the UK and international exploitation of the Japanese Hinode Satellite. She has both coordinated and encouraged many of the 900 publications that have arisen from the mission and also made very significant personal contributions to the exciting science.

4. Space Achievement – Education and Outreach

This award is made for significant or outstanding achievements in space education and outreach.



Winner: Dr Lucie Green – Department of Space and Climate Physics, MSSL, University College London.

Lucie has expanded MSSL's outreach programme to give over 7000 people each year direct contact with scientists and engineers through activities tailored for school students, teachers, adult learners and the general public.

5. Space Achievement – Student

This award is made for significant or outstanding achievements by an undergraduate or postgraduate student of no more than 28 years of age for any space-related activity.

Winner: The Cranspace Team – Idriss Sisaid, Enrique Garcia Bourne, Edward Anastassacos –

Idriss, Enrique and Edward have been exceptionally active and successful in their space-related extracurricular activities whilst on the Cranfield MSc course in Astronautics and Space The team's project website is here: www.cranspace.com and see also a video presentation at http://youtu.be/GLqHgU8tewI on an innovative system for radiation shielding and waste management which attracted the attention of the IAF and the Next Generation Plenary in Toronto in Sept/Oct 2014.

6. Space Achievement – Media, broadcast and written

This award is made for significant or outstanding achievements in space media.

Winner: Sarah Barker and Tom Brisley - Arrow Media

Sarah (freelance producer) and Tom produced the stunning 'Live From Space' series hosted by Dermot O'Leary in March 2014. Four documentaries were produced in total, for Channel 4 and the National Geographic channel, reaching an audience of millions. Their portrayal of life on board the ISS and Planet Earth was hugely inspirational, educational.

7. Lifetime Achievement:

This award is made for exceptional achievement in an area of space activity.

Winner: Colin Pillinger (9 May 1943 – 7 May 2014) – The Open University.

Colin, a renowned planetary scientist, started his career at the beginning of the space age with the analysis of returned Apollo samples. He established a leading research group at Cambridge and then the Open University. Subsequently, he turned his lab-based instruments into space-based ones by virtue of the talented team he had established.

8. International Achievement

This award is made for significant or outstanding achievements which either feature or further an important international aspect in an area of space activity.

Winner: James Lovelock – Author and proposer of The Gaia Hypothesis, UK. The choice of James Lovelock for the prestigious International Award by the Arthur C Clarke Foundation brings together the names of Britain's two best known futurists. Like Clarke, Lovelock's works combine science and imagination in ways which push the boundaries of the impossible to pave the way for progress in fields ranging from outer space to energy conservation.

THE FUTURE IS NOW: PREDICTIONS FROM 1964

INNOVATION

Sir Arthur C. Clarke, science fiction author best known for 2001: A Space Odyssey, described the inherent folly of predicting the future in a 1964 BBC documentary, but then went on to do exactly that – with remarkable, unnerving accuracy. He talked about how the world would be in fifty years' time (i.e. 2014) - about how the advancement of transistors and satellites would radically alter our understanding of physical space.

"These things will make possible a world in which we can be in instant contact wherever we may be. Where we can contact our friends anywhere on earth, even if we don't know their actual physical location. It will be possible in that age, possibly 50 years from now, for a man to conduct his business from Tahiti or Bali just as well as he could from London."

Clarke then described how medicine might change. "One day, we might have brain surgeons in Edinburgh operating on patients in New Zealand." Long-distance virtual surgery was pioneered in 2001 when California doctors performed 17 successful long distance kidney repair operations using surgical robots and video conferencing on patients in Rome.

And Clarke also predicted that at some point science would invent a "replicating device" that would create an exact copy of anything. 3D-Printing anyone?