The Ring

The journal of the Cambridge Computer Lab Ring

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Who's Who

Stephen Allott (T MA80) has joined SeedCamp, Europe's seed fund. It has a portfolio of over 285 companies who have gone on to raise over $2 billion in follow–on funding from leading global investors.

Emilian Bacila (CTH BA15) is working as a developer at G–Research.

Oliver Chick (CAI BA11, MEng12, PhD16) is working for Apple in London.

Peter Cowley (F MA77) has been elected President of the European Business Angels Network (EBAN), the trade body representing the early stage investor and start–up community throughout Europe.

Peter is the author of 'The Invested Investor'. The book, aimed at angel investors, entrepreneurs, and anyone interested in start–ups, shows what it takes to be an angel investor and is designed to reduce mistakes, increase honesty and create more successful exits.

Robert Durkin (G BA07) is now CTO at Heartier.

Ahmed Elmi (W BA17) has started at Meltwater Entrepreneurial School of Technology in Ghana where he is an Entrepreneur–in–Training.

Paulo Ferreira de Castro (RA07) is now working as a software developer at balena.

Shaw Chuang (K PhD01) has returned to the University of Cambridge as an Industrial Visiting Fellow.

Amir Hajizamani (JN BA11) has recently joined Deliveroo as a product manager.

Matej Hamas (R BA15) has joined Lyft Level 5 as a software engineer.

Mark Howard (CHU BA04) is now working for Form3 as a senior developer.

Xiang Jiang (F BA11) is working at ARM.

Michael Kay (PhD), founder of Saxonica, was an invited speaker at a debate at the Oxford Union discussing the impact of the internet on social justice. Details at xmldebate.org.

Andreas Koltes (PhD15) is now Head of Embedded Software R&D at Diehl Defence in Germany.

Thomas Lefley (G BA15) is a software developer at PortSwigger.

Philip Milne (MPhil86) is Head of AI Lab at Deutsche Bank in London.

Tomas Pfister (CAI BA10) is Research Lead at Google Cloud AI in California.

Ripdumn Sohan (PhD08) is Chief Architect at Solarflare.

Ilinca Sorescu (N BA15) is working for Google.

Bjarne Stroustrup (CHU PhD79) has won the 2018 John Scott Award.

The John Scott Award is given to 'the most deserving' men and women whose inventions have contributed in some outstanding way to the 'comfort, welfare and happiness' of mankind.

Bjarne has also been named the recipient of the 2018 IEEE–CS Computer Pioneer Award.

This award is given for significant contributions to early concepts and developments in the electronic computer field, which have clearly advanced the state–of–the–art in computing. Bjarne Stroustrup is being recognized 'for bringing object–oriented programming and generic programming to the mainstream with his design and implementation of the C++ programming language.'

Simo Tchokni (CAI BA12, MEng13) is a software engineer at Memrise.

'The Chinese Wine Renaissance: A Wine Lover's Companion' by **Janet Wang** (N MA05) is due to be published by Penguin Books in January 2019.

Thomas Wood (MPhil08) is working for Tesco as a data scientist.

The Ring, Issue L January 2019
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Post: William Gates Building, Cambridge CB3 0FD
Published three times a year. Copy deadline for the May 2019 issue is April 10th 2019

The Ring is the journal of the Computer Lab Ring, which is the graduate association of the Department of Computer Science and Technology, University of Cambridge.

Hall of fame news

Bango

Bango has seen a surge in payments through its platform.

Amazon, Microsoft, Google and Samsung use the Bango platform to collect payments.

CEO Ray Anderson said 'We want to be in a situation where we are processing the lion's share of the biggest merchants' digital business to mobile users.'

Interim results to 30 June 2018 showed end user spend rose 138% to £220 million and remains on track to more than double for the fourth consecutive year.

Improbable

Leading Chinese Internet technology company, NetEase, Inc. has invested $50m in new shares in Improbable, alongside the purchase of some existing shares, taking a small stake in the company.

This investment represents a strategic investment in the potential of Improbable's SpatialOS technology by NetEase, and will strengthen Improbable's competitiveness in supplying game development technology for game makers to the Asia market.

To accommodate its growing team, Improbable is moving its UK headquarters from their first central London office in Farringdon to a new office in Spitalfields. Improbable has also opened a new North American office in Edmonton.

Improbable was named in LinkedIn's Top Startups 2018: The 25 most sought-after startups in the UK.

Jagex

Jagex has launched its third–party publishing arm, Jagex Partners. Jagex Partners will deliver live game publishing and operational services to third–party studios.

John Burns, SVP publishing said 'Jagex is uniquely placed to deliver publishing and operational services for studios developing live games. We want to partner with developers who see their growing into a franchise, attracting millions of players and become a living game that can exist for 15–plus years.'

Runescape, Jagex's flagship living games series, reached $1 billion in revenue over its lifetime this summer.

Linguamatics

Linguamatics has been recognised by Frost & Sullivan with the 2018 Global Product Leadership Award for its NLP text analytics platform. The intelligent solution generates insights from a wide range of unstructured and semi–structured data, empowering clients to efficiently integrate AI into their operations.

Masabi

Masabi has been named as a finalist in the Mobility category of the World Smart City Awards at the Smart City Expo World Congress. Masabi has been recognised for its Justride Software Development Kit (SDK), which allows urban mobility providers such as journey planners and bike, scooter and ride sharing services to integrate the market leading mobile ticketing platform into their applications.

These are the highest profile Smart City awards worldwide, with some 473 proposals submitted from 57 countries. To make the final 47 proposals and the final 6 within the Mobility category is significant recognition of the impact Justride SDK is having in the urban mobility sector.

Moon Express

Moon Express has raised $12.5 million to further development of its spacecraft for commercial and government customers.

In a statement the company said that it closed a $2.5 million bridge round led by Miami–based Minerva Capital Group. It also raised $10 million of a planned $20 million Series B round, led by an undisclosed lead investor.

The funding will support redevelopment of Launch Complex 17 at Cape Canaveral Air Force Station in Florida, a former Delta 2 launch site that the company is leasing from the Air Force to serve as a spacecraft development and test centre.

Raspberry Pi

The Raspberry Pi Foundation is part of a consortium that has secured over £78 million in government funding to make sure every child in every school in England has access to a world–leading computing education.

Working with their partners, STEM Learning and the British Computer Society, the Raspberry Pi Foundation will establish a new National Centre for Computing Education, and deliver a comprehensive programme of support for computing teachers in primary and secondary schools.

Opinion piece

Mark Wheeler: Creating value in a time poor society

In 2016 there were 149.3 billion app downloads, in 2017 there were 178.1 billion and at the time of writing the projected number for 2018 is 205.4 billion (1).

In 2017 there were 2.2 million iOS apps in the store (2) and 3.6 million Google Play apps available to download (3).

The problem? There are only 24 hours in a day (out of the millions of available apps, on average only 10 are used every day (4)).

Retention and engagement statistics shed light on this with 23% of users abandoning an app after only one use, and 62% using an app less than 11 times (5). An average app only retains 23% of its Daily Active Users (DAU) in its first 3 days and after 3 months that number falls to 9% (6). In other words after 3 months 91% of users from an average app are not active.

So how do you create a product that your users don't immediately delete? Enter the Jobs To Be Done framework.

The Jobs To Be Done method

In his book, 'The Innovator's Solution' and expanded upon in his paper 'Marketing Malpractice: The Cause and the Cure' (7), Clayton Christensen introduced the concept that: 'People don't simply buy products or services, they 'hire' them to make progress in specific circumstances' and 'The job, not the customer, is the fundamental unit of analysis.'

The latter is a complete shift in the way to think about your customers. Segmenting them by attributes like job title or location will only result in good product market fit, if those attributes cause them to buy your product, otherwise you are segmenting your market along an axis that is not related to the value you are creating, resulting in giving market segments a product that provides little or no value.

People have an end goal (job to be done) in mind that they want to achieve and they pull products / services into their lives to reach that goal.

Theodore Levitt said "People don't want to buy a quarter-inch drill. They want a quarter-inch hole!'

User interviews

How do you understand a user's Job To Be Done? User research is a great tool to better understand what job your end user is trying to do. This is not an easy process however, as people rarely understand this fully themselves. This is where you as a product creator come in, and use the tools at your disposable to discover the job to be done and create a product to serve that need.

The first thing you need to do is understand the user journey, from start to finish, then you can find ways to add value.

A typical user journey looks something like this:

1) Life as normal

2) Trigger — causes the user to go in search of a product (to solve a need)

3) Consideration phase — looking at what is available

4) Purchase and post purchase

Once you understand your user's journey, you can start to add value at each step. The Harvard Business Review's article 'The Elements of Value' (8) gives some examples of features that people perceive as valuable. As a starting point consider these:

1) Speed — time is a limited resource

2) Cost — money is a limited resource

3) Ease — energy is a limited resource

If you can make a step in the user journey faster, cheaper or easier this can provide new value to users, value that they are willing to pay for.

Warren Buffet said 'Price is what you pay. Value is what you get.'

Summary

To provide true value in today's time poor world you need to fully understand the user and the jobs they are trying to get done. Only once this is understood can you add value they are willing to pay for. Markets can then be segmented along this 'jobs' axis to find people with the same Job To Be Done to sell your solution to.

For mobile apps, the first 3 days after install are critical to providing enough value to cause them to stick around, and the Jobs method is a great tool for discovering areas of value creation.

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(1) https://www.statista.com/statistics/271644/worldwide-free-and-paid-mobile-app-store-downloads/

(2) https://www.statista.com/statistics/263795/number-of-available-apps-in-the-apple-app-store/

(3) https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/

(4) http://files.appannie.com.s3.amazonaws.com/reports/1705_Report_Consumer_App_Usage_EN.pdf

(5) http://info.localytics.com/blog/23-of-users-abandon-an-app-after-one-use

(6) https://www.similarweb.com/corp/wp-content/uploads/2016/02/086-6_Uninstalls-Report.pdf

(7) https://hbr.org/2005/12/marketing-malpractice-the-cause-and-the-cure

(8) https://hbr.org/2016/09/the-elements-of-value

For the past decade author Mark Wheeler (BA SID10) has been researching the tools and methods to create value with high tech products and services. The products he has designed have been featured in Wired, Forbes, Mashable, Adobe and the BBC.

Research Skills course

Danny Vagnozzi: On the reputation of quantum computers in popular culture

Radical new technologies are almost always received with scepticism and criticism from the public, particularly when accompanied by sensationalist claims from popular science. It is therefore likely that the much talked about quantum computers will experience such a reception when they will eventually replace conventional machines. The most common claims include the following:

• 'Quantum computation is the paradigm of the future.'

• 'Quantum computers outdo their classical counterparts.'

• 'Quantum computers will bring the world we love to an end.'

Although there is some truth in these, each must be demystified in its own context.

The first has been used as an opening to most courses on quantum algorithms, and could easily maintain this far-future status for decades to come. We are still far from building a quantum universal machine: there are practical challenges to overcome, the main being that of constructing a quantum system sufficiently isolated from external environments to be of use.

The second claim is the result of incorrect interpretations of complexity theory. In popular science, it is customary to relate that '*polynomial time algorithms are those which computers can run with ease, whereas exponential time ones are harder*'. It is essential to note that the term computer here means a theoretical machine and time actually refers to the *number of elementary steps* of the algorithm as a function of the size of the input. In practice it therefore makes sense to compare execution times of two algorithms only if the machines on which we run them have the same execution time for each elementary step. In fact, it is to be expected that the first available quantum computers will be considerably slower than their classical counterparts! Another issue is that for many problems we do not have quantum algorithms which outperform the classical state–of–the–art. Shor's factoring algorithm and his solution to the discrete logarithm problem (1994) are the only examples worth mentioning, as most known quantum algorithms are actually based on an oracle model, which is useless in practice. A lack of human intuition in the quantum world is the usual explanation for this shortage of efficient quantum algorithms. Nevertheless, it must not be excluded that this could be due to very few problems existing for which there is exponential separation between classical and quantum computation!

Finally, the truth of the last claim depends on us human beings. Of course, when quantum computers will reach their maturity, Shor's algorithms mentioned above will put an end to conventional cryptography, and new protocols will need to be introduced. Given the incredible security offered by quantum cryptography, this innovation will come with both benefits and drawbacks. However, the march of technology cannot be stopped: the only way is for us to view it with a positive perspective and always recall that, to quote Dr Maris Ozols from CWI, '*Technology can't make the world a better place, but people can*'.

The best essays from the Research Skills module of the MPhil in Advanced Computer Science course 2017/2018 are being published in 'The Ring'. This is the last of these essays.

Computer Laboratory news

Annual Report of the Faculty 2017–2018 Selected Highlights

Dr Richard Gibbens (1962–2018)

It was with shock and sadness that the Department announced the death of Richard Gibbens on 12 August 2018, following a short illness.

Richard was Reader in Network Modelling in the Department, and had been promoted to a Professorship from 1 October 2018. He was a very valued member of the department who was recognised internationally for his research. Richard will be greatly missed by his colleagues and all who worked with him.

Personnel

As at September 30th 2018, there were 183 members of staff: 44 academic; 30 academic–related and Assistant staff; 7 Research Fellows; and 102 post–doctoral researchers.

Three new members of academic staff were appointed: Alice Hutchings, University Lecturer; Andreas Vlachos, University Senior Lecturer; Ryan Cotterell, University Lecturer.

The following Research Associates were promoted to Senior Research Associate: Andrés Arcia–Moret; Daniel Bates; Ekaterina Kochmar; Matthew Naylor.

Numerous staff and student honours, awards and achievements were reported in 2017/2018.

The Department's Wiseman Award is now in its 2nd year. It aims to recognise research staff and students who make a commendable contribution to the work of the Department. The 2017–2018 recipients were:

Daniel Bates; Mario Cekic; Krittika D'Silva; Matthew Danish; Botty Dimanov; Martin Kleppman; Stephan Kollman; Robert Kovacsics; Kevin Heffernan; Amandla Mabona; Chaitanya Mangla; Mariana Marasoiu; Alessandro Montanari; Ewa Muszynska; Jean Pichon–Pharabod; Olesya Razuvayevskaya; Michael Schaarschmidt; Daniel Thomas; Diana Vasile; Alexander Vetterl; Mark Wassell; Conrad Watt; and Poonam Yadav.

Research

Research grant income in the last financial year was £9.4M, an increase of £1.6M on the previous year.

Teaching

Undergraduate numbers increased slightly in 2017–2018; our first year intake was 102 students (99 in 2016–2017). For 2018–2019 the intake has risen to 130 students. Around 90% have chosen the Computer Science 75% option. The proportion of female students in 2018–2019 has risen to 24%, as opposed to 18% in 2017–2018 and 14% in 2016–2017.

The proportion of students obtaining a First or II.1 in 2018 rose to 92%.

The MPhil in Advanced Computer Science continues to run smoothly with 28 modules spanning the wide range of research interests found in the Department. Applications remain strong, with 326 students applying for entry in 2018–2019.

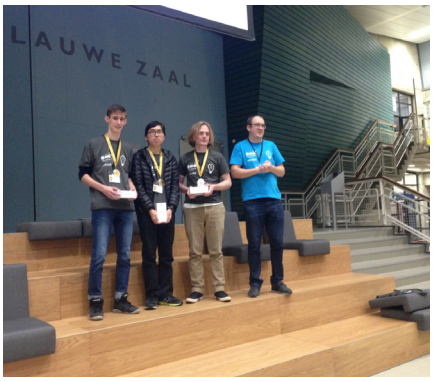
Outreach

The CSAT Practice[+] Platform was launched in July. This online training learning platform aids candidates in their preparation for Computer Science and Maths more generally, and gives them a feel for the sort of question they might face in the admissions test.

Team Treenity wins the North Western European Regional Contest 2018 — Hayk Saribekyan reports

The Northwestern Europe Regional Contest (NWERC) is a contest in which teams from universities all over the Northwestern part of Europe are served a series of algorithmic problems. The goal of each team is to solve as many problems as possible within the 5 hour time limit. Potential solutions are submitted and corrected by an automated judging system. The team that solves the most problems at the end of the contest qualifies for the International Collegiate Programming Contest (ICPC) World Finals to be held in Porto in April 2019.

The Cambridge teams at NWERC were selected based on the results of the sub–regional UK and Ireland Programming Contest (UKIEPC), in which more than 150 teams participated. As Cambridge took the top four places at the sub–regional UKIEPC it was represented at NWERC by more teams than any other participating university.



Team Treenity, the NWERC 2018 Champions. From left to right: Zoltán Molnár–Sáska, Jeck Lim, David Wärn

The teams were Triniceratops (Paweł Burzyński, Mariusz Trela, Kacper Walentynowicz), Treenity (Jeck Lim, Zoltán Molnár–Sáska, David Wärn), Me[♠]talci (Dimitrije Erdeljan, Vladimir Milenković, Dušan Živanović) and Prime Goal (Ivan

Ivanov, Encho Mishinev, Simeon Stoykov).

Team Treenity was alone in solving all 11 problems within the time limit. Team Triniceratops came fourth, with 9 problems — a qualifying result but for the fact that another Cambridge team was ahead of them. Both teams were awarded gold medals and received prizes. The other two Cambridge teams finished 14th and 22nd.

Thanks go to the organisers at the Technical University of Eindhoven who did a terrific job, and will host NWERC 2019. NWERC 2020 and 2021 will be held in Reykjavik, Iceland. The Computer Laboratory will host the UKIEPC sub–regional contest to decide which teams advance to NWERC.

Congratulations to team Treenity and good luck at the ICPC World Finals in April.

Hall of Fame Awards 2019

We are now accepting nominations for the 15th annual Hall of Fame awards, which celebrate the success of companies founded by Computer Lab graduates and staff.

The awards ceremony will be held at Queens' College on April 3rd 2019 when the winners will be announced by Professor Ann Copestake, and presented by guest speaker Ben Medlock, co–founder of SwiftKey, the company behind the intelligent typing system for smartphones..

The award categories, along with the names of last year's winners are:

1. Company of the Year (Bromium 2018)

2. Product of the Year (PetaGene for PetaSuite 2018)

3. Better Future Award (Sandra Servia–Rodríguez, Kiran K. Rachuri, Cecilia Mascolo, Peter J. Rentfrow, Neal Lathia, Gillian M. Sandstrom for 'Mobile sensing at the service of mental well–being: a large–scale longitudinal study' 2018)

3. Publication of the Year (Petko Georgiev, Nicholas Lane, Cecilia Mascolo, David Chu for 'Accelerating Mobile Audio Sensing Algorithms through On–Chip GPU Offloading' 2018)

If you wish to submit a nomination for any of the four categories, please send nominations to cam–ring@cst.cam.ac.uk

Nominations close on February 25th 2019.