

INTERNATIONAL COUNCIL OF ENGLISH BRAILLE 6th ASSEMBLY: Designing the Canute with the Blind Community

Author: Ed Rogers, Director of Bristol Braille Technology CIC

Date: 7th of March, 2016

BBT, G14, BV Studios, Bristol, BS3 4EA, United Kingdom

Tel: +447908569214

Email: ed.rogers@bristolbraille.co.uk

(Not for general distribution)

Abstract

Too often blind users find themselves recipients of assistive technology which they get little choice over; either because it is so expensive that it is only available by a prescriptive hand-out scheme, or because the device was designed with minimal input from the wider blind community.

This paper will explain how the Braillists' model up-ends this relationship between user and industry by entering into a partnership with technology companies from the early stages. It will describe how the Canute – a radically affordable, multi-line Braille e-reader – was co-developed by a blind community group called the Braillists and a company of sighted engineers called Bristol Braille Technology. It will argue the case for greater use of this “nothing about us without us” model in the assistive technology industry to reduce the perceived distance between those who used Braille and those who developed the technology around it.

“If I had had a Canute ten years ago I would have done a mathematics degree.”

— Jen Bottom (Chairwoman, **Reading Braille**)

Background

Bristol Braille Technology¹ had been developing refreshable Braille concepts since its incorporation as not-for-profit social enterprise in 2011, always with the aim of helping to reverse the decline in Braille literacy². Late in 2012 we began work on our first multi-line concept; Canute, which will cost less than a Perkins Braille or an iPad. Canute demonstrates the cost of electronic Braille can be reduced to approximately \$1 per cell, with up to 16 lines of Braille. This is intended to put digital Braille within the budgets of blind people all around the world, starting with the 85% of blind people in Britain who are unable to afford existing Braille displays.³

By early 2014 the core Canute technology had been developed to the stage where it was clear that the idea had promise. In 2014 the company consisted of half a dozen sighted engineers working part-time, with many volunteering their labour. It operates out of a shared community workshop called the Bristol Hackspace and had, at the time, no more than £10,000 in backing. The team therefore recognised that the severe limitations of money, time and a lack of direct personal experience with blindness made them incapable of properly exploiting this exciting new mechanism. As a result a meeting between a dozen Braille enthusiasts from the local area and the company was arranged.⁴

At the first meeting the company explained its aim of helping to reverse the decline in Braille literacy and asked those assembled their view on Braille as a medium. A common refrain was a perceived distance between those who used Braille and those who developed the technology around it; a sense that they were being ‘gifted’ solutions rather than being consulted or presented with genuine options.

The meeting had been convened with the fairly simple goal (for the company) of finding Braille users willing to volunteer their time to test and feedback on the Canute. However it quickly became clear that there was an opportunity for something far more significant; a genuine partnership between engineers and Braille users. The former had the bare minimum resources necessary to develop prototypes, but none of the experience or market research required to turn this into a viable product. The latter possessed a wealth of personal and professional experience with blindness and Braille, of its strengths relative to other mediums, of the uses to which it could be put that were being chronically under-explored with current technology, but felt disempowered and unable to shape Braille technology.

Over the next couple of meetings this group of Braille users decided to announce themselves as a separate and independent community advocacy group called the Bristol Braille, ⁵ with an aim that could be expressed with the saying, “Nothing about us without us”.⁶ After

Sight Village 2014, when the Braillists were represented by members of the Canute team,⁷⁸ their numbers swelled to over eighty. By mid-2015 they had become simply the Braillists, with groups in Bristol, Dublin and Reading and an ever increasing membership. At the start of 2016 the Braillists stands at over two hundred, is poised to open new groups around the UK in Sheffield, London, Birmingham and Worcester and is in the process of registering as a charity.⁹

This growth has been fuelled by both the promise of playing an active role in promoting the medium, the chance to shape the technologies that relate to it and by an assertion of equality in these development partnerships with companies like Bristol Braille Technology. These partnerships are only one aspect of how the Braillists aim to promote the medium, but it is the main aspect that this paper will focus on.

Meanwhile development of the Canute had entered a far more rapid phase.¹⁰ The commitment to regular design and testing meetings with the Braillists, which kept the team focused and held it to account with the people who would be using the technology, gave Bristol Braille Technology the impetus and drive it needed. This combined with greater funding¹¹ (as a result of the more compelling case and increased credibility the partnership gave the project) propelled the Canute from a two cell prototype early in 2014 to a 112 cell prototype by mid-2015.¹² The next design is due in April 2016 and will have either 256 or 512 cells, complying entirely with the latest plans set with and by the Braillists.

How it works in practice

1) The core technology for displaying digital Braille is developed by the engineering team who have been briefed on the user's needs by one or a number of the Braillists. These briefings can be informal – such as by attending Braillists meetings – or formal – such as blind awareness sessions given by professional accessibility advisers from within the Braillists. These briefings will then help shape the technological specification.

For example: Few in the Canute team were aware of the range of forms blindness takes and the range of experience with Braille users will have. One consequence of this is that while the very experienced Braille user may prefer softer dots (i.e. depressing easily on contact), these can be troublesome for learners, those who go blind later in life or users with diabetes. This knowledge led to the team focusing on hard dots (which cannot be depressed at all and are often compared to signage Braille).

2) The core technology is presented to the Braillists in a 'naked' form; i.e. without ergonomic or user interface features. This is to check that the Braille itself is of sufficient quality. A debate then ensues about the best use the technology could be put to, given the commonly understood aim of helping to reverse the decline in Braille literacy. In this debate the engineers will frankly describe the limitations of the technology with regards to each proposed use-case (e.g. ebook reader for individuals, multi-user textbook reader for schools,

&c).

For example: Early Canute prototypes (mk1–6) had the dots temporarily raise almost a centimetre above the surface while the entire page refreshed (line by line refresh was not at that point possible). This was a result of a necessary simplification of the mechanics, without which it would have been impossible to complete the early prototypes. Advice received previously had insisted that this would be unacceptable to a user for reading more than a few lines. However once explained to the Brailleists they narrowed down the uses which could still be meaningfully tested in the field (primarily ebook reader for users trying to improve their Braille skills) and designed a test programme which accommodated this. The latest Canute (the Mk8) no longer has this limitation, but this compromise at the time was important for allowing progress to continue.

3) The previous two steps may have to be repeated a number of times before a consensus is reached (especially if the course of the project is altered by hitherto unrealised mechanical issues in the design). But once it is the team will continue to return to the Brailleists as they develop the machine, thus checking its progress towards the agreed specification.

For example: The Canute Mk5 (12 cells by 4 lines of Braille) was a significant improvement in the overall reliability of the Braille patterns rendered, but in doing so had unwittingly compromised the quality of the dots, which had become irregular in their profile. Meeting the Brailleists for a bi-monthly catch-up flagged this issue, resulting in a delay in moving on to the next prototype in favour of an revised Mk5.

4) Once the machine has been demonstrated to meet this basic specification the Brailleists will run a testing programme amongst its members, when prototype units are loaned to blind people for use in their own homes, or assist the running of a testing programme with its contacts elsewhere in the blind community. During this programme the Brailleists directly involved in testing will meet regularly to feedback to both the rest of the members and the engineering team. This feedback forms the basis for a revised and improved machine. This continues until the machine is deemed ready for market.¹³

For example: During the course of the Mk6 testing programme the user interface (i.e. menu structure, face-buttons and methods for loading ebooks onto it) was comprehensively redesigned by the Brailleists. The revised layout was presented to the engineering team at the end of the programme, who have since implemented it fully in both hardware and software.

By these means a small not-for-profit company, asset-locked to the blind community,¹⁴ primarily staffed by the sighted, can usefully serve the needs of Braille users around the world. And those Braille users can have a machine which was designed with and by them rather than for them. There are a number of reasons why this particular model has worked so well for both parties over the past few years. These reasons also explain why the model deserves to be more widely considered within the assistive technology industry.

Being led by 3,000 years of experience

There is currently a proliferation of entrepreneurial technology start-ups, incubators and accelerator programmes.¹⁵ These present opportunities for blind accessible technology as they are constantly searching something to “solve” and new markets to disrupt. The blind community would do well to be ruthless in cornering its share of this growth in innovation; not just by engaging and encouraging blind entrepreneurs, but also by exploiting the larger pool of sighted entrepreneurs. The former – perhaps best represented by NV Access¹⁶ – is an area which the Brailleists are interested in getting involved in the future. However here we will discuss only the obvious problems that present themselves when attempting the latter;

1) Sighted entrepreneurs commonly have little to no experience of blindness, let alone of something more specific like Braille. Much of their time is liable to be wasted attempting to lead the solution because that is the role that an entrepreneur may feel they should play. This is hardly the fault of individuals involved; it is a natural result of our society’s current enthusiasm for stories of miraculous over-night success and the disruptive potential of start-ups.¹⁷

2) There is a danger of this partnership appearing unequal, especially if one party is under the impression that it is doing charitable work for the other party, which is then expected to show gratitude for the results. This can often be perceived to be the case for assistive technology for blind people and has the potential to lead little further than mutual resentment.

By approaching this entrepreneurial space as a collective like the Brailleists, which has established in advance both its aims and its means,¹⁸ those problems can be avoided;

Addressing 1) Rather than leading the solution, the entrepreneur may be more usefully engaged lending their talents and energies to a solution worked out alongside those who have lived in that world.^{19,20} Indeed, while the entrepreneur may well have several years or decades of experience producing various assistive technology products the Brailleists have, as an example, around 3,000 years of collective experience with Braille.²¹ But this can only be realised if the blind users are pro-active with their assistance, thus reassuring the entrepreneur that their partners realise the risks being taken by the company in developing a new product.

Addressing 2) To avoid a benefactor/client relationship the Brailleists established a modus operandi to formalise these relationships. It formed over the course of two years of debate and practice, revolving especially around the Canute project. To declare independence from Bristol Braille Technology, therefore to declare that itself more than a focus group, was only the start. The most important aspect has been the establishment of the principle of constructive engagement; in other words, the assumption of influence and responsibility rather than the assumption of disempowerment and entitlement. Therefore when the Brailleists seek out new partnerships with entrepreneurs they insist from the start these partnerships are symbiotic rather than charitable.²²

My own experience is illustrative. For many years – indeed since 2008, before start-

ing Bristol Braille Technology in 2011 – I was a sighted person attempting to solve a blind person’s ‘problem’ (lack of affordable digital Braille). Progress was painfully slow until we founded the Braillists.²³ I have no doubt it would have remained slow, but even had it not, it would be highly unlikely to have progressed in the right direction. No less importantly the experience has been greatly morale boosting. The enthusiasm with which the Canute Mk5 was received by the Braillists became the primary motivator for the team when beginning work on the highly ambitious Mk6, while the demonstrations of the Canute’s progress were also crucial in binding together the early Braillists.

The relationship is not simply a matter of humility on the part of the entrepreneur and the assumption of responsibility on the part of the Braillists; it is a weight lifted as both parties can take on the roles they are best suited to, boosted by a shared enthusiasm.

The International Maker Movement

This melding of small companies and the community is especially important for assistive technology for blind people because of the disparate and relatively niche nature of the market, not to mention the uniquely challenging engineering considerations innate to Braille and other tactile mediums.²⁴

Whereas ‘mainstream’ technological advances can be financed on the hope of hundreds of thousands of sales, this is not always possible in the assistive technology market. Even when hundreds of thousands of sales are feasible, they are likely to require far more intensive (and therefore expensive) efforts on the part of the distributors to secure. This is inevitable given that blind people are not only in a minority, but divided by the degrees and particularities of their visual impairments. In the case of Braille only a small minority of a small minority can benefit from it as a primary medium, and they are often socially isolated, therefore even more difficult to reach.^{25 26}

At the same time the engineering challenge behind many aspects of blind accessible technology, most particularly Braille, requires would-be innovators to take greater risks with what often turn out to be technological dead-ends.²⁷ The Canute is the fourth concept Bristol Braille Technology has seriously pursued and it has had to go through at least three major redesigns, completely replacing the central mechanisms. Mainstream electro-mechanical development has gone in largely non-tactile directions over the past decades, leading to the situation refreshable Braille now finds itself in; relying on 40 year old piezo-electrical technology to drive a single Braille line matrix of pins.²⁸

So the potential financial rewards may be significantly lower when developing blind accessible technology, while the risks can be greatly higher. The industry could continue to wait for mainstream technological development to solve its problems (as a by-product of catering to some much larger market). Or it could perhaps advocate for philanthropists to take that low-reward high-risk bet on its behalf.²⁹

The Braillists relationship with Bristol Braille Technology demonstrates a third option which is especially well suited to the development of blind accessible technology and could be more widely applied than it currently is. It can be seen as an extension of the international “maker movement”,³⁰ best expressed by “hackspaces”,³¹ “hacker spaces”,³² “fab-labs” and “maker spaces”. In these community workshops members pay small monthly fees to have full access to the kind of tools, machines and component stocks which would only normally be available to large established research and development companies.³³ This pooling of resources requires a certain mutual respect for and trust in fellow members, the results of which can be a far more efficient use of machines and space and a far more rapid iteration of concepts and designs, produced by people from all manner of backgrounds and means.³⁴

It follows that the co-operation inherent to the Braillists model, as it applies to the Canute project, pools the talents, resources and experiences of hundreds of blind Braille users with not only the engineering team, but with the combined resources of the Bristol Hackspace, which itself has over a hundred members. Indeed there are members of the Braillists are keen to go further and investigate partnering with blind-accessible maker spaces,³⁵ further deepening the idea of the Braillists as an extension of the maker movement.

No single party in this arrangement would be capable of making meaningful change in the Braille market on its own. Collectively they can make dramatic changes. Taking this approach the risks are far lower; a company can be flexible in its processes as the facilities and resources provided by the communal workshop and the Braillists meeting groups exempts it from many expensive initial commitments, such as tooling, extensive market research and various administrative overheads. For much the same reasons the lower potential reward is less significant; not only does it not have high research and development costs to offset, it also has a ready-made early adopter network on which it can rely.

Connecting with the wider community

In order to kick start this new Braillists organisation, which it was hoped would represent Braille users’ interests by pro-active engagement, Bristol Braille Technology had to put itself in an apparently vulnerable position.

1) It committed to recruiting individuals to the Braillists mailing lists rather than its own,³⁶ even when an individual’s confessed interest was entirely in the Canute. Almost all these people chose to join and engage with the Braillists as a result. In other words Bristol Braille Technology concentrated on building up an independent community with a broader range of concerns than its own product, not on accumulating a customer base. In doing so it was banking on the continued friendliness of this community towards the Canute project.

2) It was completely candid with attendees of meetings about the technology behind the Canute, even though these attendees were not vetted. Instead it was explained at the beginning of each meeting that the proceedings may include some confidential information

not to be shared, that the some prototypes may well be unfinished or broken, that the market strategy may still have flaws, but that this level of candidness was necessary for meaningful co-development.

3) It has continued to sponsor the Braillists for two years by covering labour, travel and meeting costs, despite very insecure Canute project finances.

This vulnerability has translated into a strength– even before the Canute has gone to market the dividends of this approach have been great. The Braillists members contrasted it with the excessive secrecy and closed off nature of many other projects which have, over the years, attempted and failed to reduce the price of digital Braille, leaving little explanation and many dashed expectations.^{37 38} As a consequence they have been willing to reciprocate by putting far more trust in Canute and going to great lengths to introduce Bristol Braille Technology into related networks of users and professionals.³⁹

By these means the Canute project has found friends in the National Council of the Blind of Ireland, ChildVision, New College Worcester and elsewhere.⁴⁰ While it would no doubt have been possible to have made these connexions without the Braillists, it would have been far more difficult and the relationships would have been less accommodating and less open. By placing its trust in the Braillists Bristol Braille Technology gains more intimate access to the wider blind community than it could have by other means. This widespread proactive backing eases the route to market for, so long as the Braillists continues to expand, the number of Braille users with some sort of stake in Canute’s success continues to increase. At the same time the expansion of the Braillists brings greater contact with organisations who are keen to field test units in controllable environments.

It is hard for a small, outsider company to make in-roads into what often appears to be a closed market, or even to know where to look for those in-roads. But by allying itself closely with the Braillists or a similar community group, by focusing its publicity efforts on promoting this group instead of its own narrow interests, it can gain access to self-contained markets on which it can build early market penetration.

Clarity and focus

One consequence of the Braillists leading role in defining the Canute’s design and early stage market positioning has been the clarity of its focus on education and literary consumption.

Before partnering with the Braillists the Canute team had taken the conventional approach of seeking out the advice of experts in the field and studying market research done by organisations such as the Royal National Institute of Blind People.⁴¹ But because this research and these interactions took the form of “Canute is a promising technology; what should we do with it?” the answers tended to be alarmingly unrealistic in their expectations and scope. The refresh speed should be no more than X, it will need to reach Y many people in the first three years to make a difference, everyone expects it to work with Z, and of course

it will have to match or surpass the feature-set of everything from A to W. The palette of options the Canute could choose to adopt was too broad and the design suffered as a result.

But by handing over partial ownership over the project to the Brailleists their members felt compelled to seek the most viable compromise rather than make demands. One of their earliest recommendations was to avoid the term “refreshable Braille display” in favour of “Braille e-reader” and to pitch Canute initially at schools and the parents of blind children. There were, they posited, several compelling educational use cases which maximised the advantages of affordable, multi-line digital Braille. These included; Reinforcing formatting skills by displaying braille page layout with paragraphs, bulleted lists, headings and page numbers. Interpreting tabulated data such as tables, calendars and spreadsheets. Developing maths skills by showing arithmetic working, times tables, simultaneous equations and matrices. Reading musical arrangements containing multiple voices.⁴²

This meant several changes in practice;

1) While the Canute had always been intended to be used in schools, the exact way that this would be ensured had never been broached. The Brailleists membership had extensive experience of education in both special and mainstream schools; as pupils themselves, as Qualified Teachers of the Visually Impaired (sighted and blind), as school technicians, as librarians and as parents (again, sighted and blind).⁴³ They were able to walk the Canute team through the process of using Braille in the classroom, co-designing the user interface in the process.

2) All plans for software development of the Canute’s interoperability with screen readers and mobile phones were put on hold. Instead efforts were concentrated into making a simple, Open Sourced user interface for reading books, written in Python. This could then be modified with ease by the Canute team, staff in schools (those with a background in basic programming) or any of the many blind and sighted IT professionals amongst the Brailleists.⁴⁴ This could happen during the testing programme itself and would naturally develop the user experience into areas that are conducive to the specific circumstances the Canute was initially aimed at. This organic process removes much of the strain from the engineers and ensures that the final product is not just made with the Brailleists’ advice in mind, but actively created by them in situ.

3) The company can rely on the Brailleists to support them in running test programmes with blind children; both with their contacts and with personal efforts. Indeed the programme to be run with New College Worcester in April came about as a direct result of the Brailleists throwing its weight behind the decision to initially focus on education, following feedback from a previous prototype.

The choice to focus on education has helped Bristol Braille Technology explain that the Canute would not be in direct competition with existing single line displays, thus giving the company breathing room to grow into the market without going head-to-head with established players. But far more importantly it placed the very limited resources Bristol Braille

Technology was able to bring to bear in precisely the most effective area for increasing access to Braille, ⁴⁵ in a manner which the Braillists were able to pro-actively support.

This positioning could not have been made so clearly by Bristol Braille Technology alone. Like many other companies with engineering talent and inventive ideas, it was too small to do thorough market research. Indeed its strategy – which relied on moving fast and fluidly through iterations of prototypes, running on fumes as funding for Braille projects is perpetually hard to find⁴⁶ – made it impossible to wait for extensive research even if it were affordable. The Braillists partnership offers a rough and ready alternative to the traditional model of development; to place product development in the hands of well-informed members of the community, with whom you are able to be completely candid in confidence, and to trust in their judgement in the knowledge that they too will be held accountable for the final state of the product. This can be considered “frugal engineering”, a term which began as a study of Indian engineering practices in order to apply them to areas of Western industry.⁴⁷

It is an example of how a small company, largely sighted in its make-up, could only meaningfully find the correct role it should play in making assistive technology for blind people thanks to inter-dependence with the Braillists. It is also an example of how the Braillists – or any group like them – can take control of the direction of travel for their own technologies.

Conclusion

The Braillists was formed by members of the blind community who were disinclined to remain recipients of Braille technology which they did not believe they had enough choice in or influence over, even when it could be afforded. The model of partnering with technology companies that they have adopted – which is just one aspect of the Braillists mission – up-ends the relationship between blind users and the industry that works for them by being mutually binding; the companies commit to being candid with the Braillists and to implementing their feedback, while the Braillists commit to tackling the difficult compromises inherent in design rather than simply lobbying for improvements.

The consequences of this equality between technology producer and user are profound. Bristol Braille Technology does not simply consult the Braillists when it is convenient to do so; it submits its plans and aims to the Braillists for criticism and approval. Moreover it formulates those plans – whether they are designs for a user interface or the intended route to market – in open consultation with the Braillists. In return the Braillists take joint responsibility for the product being developed. The final result is a product of the meeting of two different communities, the “maker movement” and the blind community, who may otherwise be unaware of each others requirements, conventions and limitations, even as the one strives to develop technology for the other.

This model, which builds on worldwide trends like the maker movement, made it possible for ordinary members of the blind community to team up with a few engineers attached

to a local community workshop in order to effect radical change. Prior to the formation of the Braillists many of its members regarded themselves as unable to assert control over the Braille technology on which they either relied or were unable to afford. Prior to its partnership with the newly formed Braillists Bristol Braille Technology had had no hope of meeting the aim it had set itself in 2011, that of helping to reverse the decline in Braille literacy.

While the Canute has yet to go to market and the Braillists is still a young organisation it has already become apparent to all involved with Canute that this model of co-development with the blind community is hugely effective. It is to be recommended to any organisation or community looking make a radical change.

Testimonials

N.B. Appended to the paper on the 18th of August, 2016. Taken from email exchanges.

“I can’t express how enthused I am about the Canute... Keep us posted on anything we can do and on costs for the new products in 2017. I don’t know what your plans for US distribution are, but please consider APH.”

— Larry Skutchan (Director of Technology Product Research, **American Printing House for the Blind**)

“In less affluent countries where Canute could offer a real chance for young blind and partially sighted people to access texts alongside their peers. Very exciting and important!”

— Polly Goodwin (Parliamentary Assistant to Lord Low. Lord Low: Vice President, **Royal National Institute of Blind People**; President, **UK Accessible Formats**; President, **International Council for the Education of People with Visual Impairment**)

“In the future its possible that there’ll be all kinds of applications for Canute: ebook readers, spreadsheets, tables ... In some ways your imagination’s the limit.”

— James Bowden (Reading services product manager for braille at the **Royal National Institute of Blind People** and **UK Accessible Formats** delegate to the **International Council of English Braille**)

“Braille literacy is an important ingredient in maximising the employment prospects of blind people. As a blind parent, I cannot imagine any other way to make notes in meetings or read bedtime stories to my son. Existing electronic braille technology typically show a single line at a time meaning that it is more challenging for a blind child to study poetry, music or computer code. Canute is the first working example of multiline braille eReader that also promises to radically reduce the cost of electronic braille.”

— Dave Williams (Chairman of the **Braille Foundation**, **Radio 4** Presenter, now working with BBT)

“Our Department of Basic Education embarked on a project to introduce Braille Note Apexes to schools. Our braille authority is not at all keen on that project, as we can see many, many potential issues with it and we don’t think it is sustainable, especially not at the price of the Apex. I can see great potential for something like the Canute coming in at a hugely reduced cost. Especially also the fact that it has a multi-line display would make it far more suited to provide some spacial orientation or layout information, particularly in the case of maths, something that is not at all possible with the Apex. I can’t remember if the Canute has or will have the facility to communicate with something like a smart phone or

iPad, but if so, I think the combination of iPad and Canute would far outperform the Apex at a fraction of the price. The other advantage of this would be that the teacher would know the iPad, as it is a mainstream device, not something specifically designed for blind people as the Apex is. The teacher would be in a much better position to assist the learner.”

— Christo de Clerk (President of **South African Braille Authority** & President of the **International Council of English Braille**)

“We’d be interested in purchasing a prototype! We see high potential in your device, and are interested in supporting your project through a prospective purchase.”

— Sam Foulkes (Supervisor of Braille Printing House at **Clovernook Center for the Blind and Visually Impaired**)

“We think the Canute would be very beneficial for our customers across America and would like to be considered for distribution by Bristol Braille.”

— Chris Faust (CEO of **Clovernook Centre for the Blind and Visually Impaired**)

“In 2015, INBAF made contact with the Canute development team, Bristol Braille Technologies and the Bristol brailleists, which led to INBAF testing a prototype in Ireland in September 2015. Further trials are scheduled. This area of work was very worthwhile and the two brailleists meetings in Dublin were exceptionally well attended”

— Official Irish Country Report to the 6th Assembly of the **International Council of English Braille**

“An interesting discussion developed during which both the Canute and the Orbit were repeatedly mentioned. The Canute was also described very positively as “having tremendous potential for Mathematics in that multi-line maths could be displayed”.”

— Ilka Staeglin, reporting on the reaction to Canute demonstrations to delegates of the 6th ICEB Assembly (Director of Braille Production at **Child Vision**)

“Modular Infotech Pvt Ltd are leaders and pioneers in India for development of Indian Language software products who have developed the braille products and Modular will be interested to interface its 11 Indian Languages software with the Canute for developing a low cost Refreshable Braille Reader for the over 10 Million visually Impaired people in India.”

— Raghunandan Joshi (Director, **Modular Infotech Pvt Ltd**)

“It’s something phenomenal. I’m already in love with this, and I’m not really a Braille person. I gave up Braille many years ago... but this would definitely intrigue me... I’m completely blown away by this.”

— Andre Louis (musician and broadcaster, Canute tester)

Notes

- ¹Bristol Braille Technology website, accessed 4th of March 2016, <http://bristolbraille.co.uk>
- ²“First General Meeting of Bristol Braille Technology – Minutes”, 11th of January 2011, Bristol Braille Technology http://discuss.bristolbraille.co.uk/News/news_archive#anchor-news-11-01-2011-minutes
- ³“Braille Profiling Report”, Amy Phillips and Lucy Beesley, Royal National Institute of Blind People, report, 2011
- ⁴“April 2014 Update”, 29th of April 2014, Bristol Braille Technology, <http://discuss.bristolbraille.co.uk/News/april-2014-update>
- ⁵Braillists website, accessed 4th of March 2016, <http://braillists.org>
- ⁶“Nothing about us without us”, December 2004, UN Chronicle Vol.41 No.4
- ⁷Radio interview with Ed Rogers in Sight Village 2014, VIP Advisor, <http://audioboo.fm/boos/2330314>
- ⁸Radio interview with Ed Rogers in Sight Village 2014, Leanne Coyle, Insight Radio, Royal National Institute of Blind People
- ⁹Braillists website, accessed 1st of March 2016, <http://braillists.org>
- ¹⁰“Demo of 4 line Canute prototype well received by Braillists”, 3rd of October 2014, Bristol Braille Technology, http://bristolbraille.co.uk/articles/canute_public_media_release.pdf
- ¹¹As of February 2016 the Canute project has been funded by iNet Microelectronics, the School for Social Entrepreneurs, the Product Development Centre, the Engineering Innovation Network, Blatchington Court Trust, the Manufacturing Advisory Service, The Worshipful Company of Information Technologists, Innovation 4 Growth, the Nominet Trust, the Company of Merchant Venturers and the Paul Hamlyn Foundation
- ¹²“First look at the Canute Mk6 in Stationers’ Hall”, 19th of May 2015, Andre Loui, Periscope
- ¹³“Canute Mk6 released for testing”, 27th of May 2015, Bristol Braille Technology, <http://discuss.bristolbraille.co.uk/News/canute-mk6-released-for-testing>
- ¹⁴“Community Interest Companies: Chapter 6: the asset lock”, October 2014, Department for Business Innovation & Skills, HM Govt.
- ¹⁵“Insiders look at the start-up world”, accessed 1st of March 2016, Startupland, <http://mystartupland.com/>
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- ¹⁷“Hero myths and the expendable entrepreneur”, 30th of November 2015, Vikram Babu, <https://medium.com/message/hero-myths-and-the-expendable-entrepreneur-89b2532e82e7>
- ¹⁸“Braillists Mission Statement”, 25th of February 2016, Ed Rogers and others, Braillists
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