Financing the Construction and Operation of the BARC

Abstract

Any system such as BARC needs to be funded in one way or the other to make it a reality. This section conducted a high-level investigation with regards to potential funding approaches for such a project.

1 Funding Models

Though there is a multitude of ways to fund a project such as BARC, three basic popular models were considered.

Purely-For-Profit model, where investors invest in the project with the purpose of realising a positive return on investment. Are investors willing to invest in a technology that has the potential to generate revenue but gives very little indication of the quantum and therefore what the return on investment will be? Venture Capital investors typically are interested in products targeting large lucrative markets and/or unique market opportunities with the capability to grow revenue well beyond 100 million USD to produce maximum return on investment.[1] Though a product like BARC does address a unique market opportunity targeting a large market (the rural unconnected) it will be extremely difficult to entice for-profit investors looking for a quick return.

Public-Private-Partnerships, where the public sector partners with private sector entities to meet a growing demand for infrastructure development such as BARC. The private portion in the partnership is still profit focussed and will more than likely only finance the portions where profit could be extracted leading to

[1]Stengel, G. 2013. *Want Venture Capital? Here Are 10 Must-Haves*. https://www.forbes.com/sites/geristengel/2013/11/20/want-venture-capital-here-are-10-must-haves/#61906c3d9489. Accessed 23 November 2017.

C. Kotze, *A Broadband Apparatus for Underserviced Remote Communities*, Southern Space Studies, https://doi.org/10.1007/978-3-030-15766-1_6

asymmetrical risk exposure.[2] Political motives can be detrimental to project continuity should a change in regime take place.

Social Entrepreneurship, which is about applying "practical, innovative and sustainable approaches to benefit society in general, with an emphasis on those who are marginalized and poor."[3] This model is typified by projects driven by independent social entrepreneurs that focus on using innovation to deliver social impact in areas such as agriculture, education, health, sustainability etc. The model allows for the creation of for profit and non-profit entities. Andela is an example of such a for-profit organisation, supplying first-class education to software developers from Africa in an innovative way, involving no tuition fees.[4] It recovers the cost of education and a profit by providing remote software development services to international companies. A project such as the BARC, where effective social impact will be dependent on its long-term survival, will be more suited to a for-profit model than a non-profit model to ensure future technology reinvestment.

Convincing the community to buy into a product with not yet proven value will require a funding model allowing the product to demonstrate how its use will translate into practical benefit for the community. In his book "Diffusion of Innovations" Rogers (1995) defined the "rate of adoption" as the time it takes for a user population to adopt an innovation. The rate of adoption follows a curve with a few early adopters paving the way for increasing adoption to a point where a critical adoption mass is reached, or not entrenching the innovation or leading to failure. A funding model thus has to take into account an initial period of "free" use by the community to support an adequate adoption period. Davis (1985) proposed the Technology Acceptance Model (TAM) originally to identify predictors of user acceptance of the use of Information Systems (IS) technology in organisations. The initial model predicted a positive technology acceptance if users have a positive inclination to use the system, which in turn will be influenced by the user's perception of the product's usefulness and ease of use (Davis 1985).

Various amended models of TAM have been put forward subsequently in an attempt to understand scenarios characterised by lower levels of education and income that the initial version did not account for. Musa (2006) made a case for modifying TAM to account for limited accessibility in developing countries and argues that the true benefit of technology adoption comes from "meaningful applications that enhance standards of living"—i.e. value. To ensure BARC has the intended long-term social impact it needs to increase in value with an increase in use: the principal behind the "freemium" funding model popular with internet start-ups. In the case of the BARC the introduction of social services such as healthcare and education can serve the purpose to anchor the system initially, followed by the introduction of commercial services. Services with the ability to

[2]PPPLRC. 2018. *Government Objectives: Benefits and Risks of PPPs*. https://ppp.worldbank.org/public-private-partnership/overview/ppp-objectives. Accessed 1 May 2018.
[3]Schwab Foundation. 2018. *What is social entrepreneurship?* https://www.schwabfound.org/what-is-social-entrepreneurship. Accessed 22 May 2018.
[4]Andela. 2018. *Andela builds distributed engineering teams with Africa's most talented software developers*. https://andela.com/about/. Accessed 13 May 2018.

generate revenue for the community will ultimately increase the tangible value of the product with use. Communities benefiting commercially from such a product will be more likely to increase usage of the system, which will in turn promote user retention and participation.

2 Proposed Funding and Revenue

In this model each BARC can be seen as a single business with a cost and profit centre reporting into a central control model. Each BARC will be represented by a certain number of shares issued against the unit, which when allocated to investors, will cover the costs represented by:

- **CAPEX**—Acquisition and Installation
- **OPEX**—All operational monthly costs for a period of three years, i.e. broadband satellite subscription, remote monitoring, maintenance, etc. Each BARC will have an initial allocated broadband data quota per month. Communities can request an increase in the total data allocation per month, which will be charged additionally.

Shares will be allocated in three blocks as follows:

1. 25%—to the community in the form of an interest-free loan payable after the initial 3-year induction period is complete.
2. 60%—to a primary sponsor investor for the first 3 years.
3. 15%—retained by the BARC holding company to be sold to independent investors.

The primary long-term value proposition of a product like BARC stems from its ability to increase the value of a network by increasing its user base, i.e. the "Network Effect (Swann 2002)." David Sarnoff was an American broadcast radio pioneer and one of the first people who attempted to create a "law" to predict the value of a network, in his case an analogue radio broadcast network. He suggested a linear relationship between the number of listeners and value of the radio network, which came to be known as Sarnoff's Law (Swann 2002). Through the years as digital networks started penetrating the market, new laws were established to predict the value of digital networks, based on the number of users. Each of these laws were derived under different conditions and/or assumptions. The following are four examples of these laws, (V = network value, a = monetary unit and n = number of network users):

- Sarnoff's Law—$V = a \times n$, mostly applicable to broadcast services and dictates the network value to be proportional to the number of radio listeners or television viewers, typically applicable to advertising revenue (Swann 2002).

- Metcalfe's Law—$V = a \times n^2$, applicable to communication networks, as opposed to a broadcast network, values the network as proportional to the square of the number of connected users (Metcalfe 1995).
- Reed's Law—$V = a \times (2^n - 1)$, expanding on Metcalfe's law by taking into account the value increase of a network ascribed to the effect of collaboration between subgroups within a network (Reed 1999).
- Odlyzko's Law—$V = a \times n \log(n)$, arguing that, though connectivity between network users offers a value advantage over broadcast networks, not all connections in the network have an equal value, therefore network effects are not as strong as proposed by Metcalfe and Reed (Briscoe et al. 2006).

Though both laws of Metcalfe and Reed have been criticised for not being applicable in all situations they still support the concept that user growth ultimately drives increased network value. In a 2015 study of social networks Facebook and Tencent, Metcalfe's Law was validated even though the two companies have major differences in business model and technology (Zhang et al. 2015). The goal of BARC is to add new users to the internet and therefore does have a value that could be monetised to an extent. But what are the ways to fund a product of which the eventual success is very difficult to predict, where the initial two years of installation are almost guaranteed to show no direct return?

The potential revenue opportunity in terms of the network effect of BARC can be viewed as analogous to the introduction of the web browser in the early 1990's —an unknown product allowing the user access to an unknown concept (the internet). In the early 1990's, Mosaic—the first user-friendly web browser that made it possible for anyone to use the internet without the need for special knowledge—was given away for free. The principle was to spark interest in the internet, which was largely unknown to the public at large. Mosaic's uptake was so successful that it was credited with a three-fold increase of web users, which in turn sparked a factor of 100 growth in web sites. This prompted a commercial opportunity for Netscape Corporation to produce a commercial version of Mosaic in the form of Netscape Navigator. Since the product was initially given away for free, the revenue had to be recovered indirectly from the user via nodes in the value chain. Firstly users had to download the product providing information such as en e-mail address, creating value by forming the first database of potential on-line shoppers which could be monetised.[5] The company subsequently created direct revenue by selling webserver software to service provider companies, a service needed to create additional demand for the browser software, rapidly driving user numbers—by 1996 the USA already had an internet user population of 20 million.[6] A further revenue stream came through the selling of the software "indirectly" to users

[5]Cooper, S. 2014. *Whatever happened to Netscape?* https://www.engadget.com/2014/05/10/history-of-netscape/. Accessed 29 May 2018.

[6]Manjoo, F. 2009. *Jurassic Web, The Internet of 1996 is almost unrecognizable compared with what we have today*. https://slate.com/technology/2009/02/the-unrecognizable-internet-of-1996.html. Accessed 18 November 2018.

through reseller agreements with internet service providers and hardware manufacturers. An IBM PC could be shipped with a Netscape bundle included; the user paid for the PC but the software was perceived to be free, the software enhanced the usability of the PC in the user's eyes and was seen as a purchase decider in the eyes of the vendor.

This model was used as a base to develop a funding model for BARC as the product will need an adequate period for the community to accept the technology initially. The first step to consider was to isolate potential revenue streams from the product which could be used to sell the value of the product to investors in order to fund the initial adoption period of the product. A number of potential revenue streams were identified:

- Communications—The availability of the product in a remote areas can enable for-profit organisations such as banks to reach these communities previously excluded from the market. A bank could act as an initial sponsor, and could subsequently recover the investment through micro-transactions from payment systems. Micro-transactions are transactions with a very small value, e.g. the purchase of tokens within mobile apps and games.[7]
- Data Network Effect—The ability of a product to increase its value as more data is collected which in turn prompts additional use and yields more data, is known as the Data Network Effect (Mitomo 2017). By placing the product in remote areas, the aggregation of collected sensor data can be marketed to interested parties.
- Infrastructure as a Service—Taking a leaf out of the "cloud" provider book, the product could be used to provide occasional power and communication services for visitors. Aid organisations supplying community services like teaching and healthcare during occasional "in situ" visits could "lease" services during their stay.
- Geo Location information in conjunction with Blockchain technology can be monetized through commercial transactions. One way of achieving this would be to issue a "Geo Tag" for the location from a certification portal. Such a tag could be used for location validation as a security feature during e-commerce transactions, using micro transactions to generate revenue which could be deposited into the specific BARC's account.

The product through its use will potentially open new sources of revenue to encourage stakeholder investment both from existing as well as attracting new shareholders.

[7]Anderton, K. 2018. *The Ongoing Controversy Of Microtransactions In Gaming. Accessed Infographic.* https://www.forbes.com/sites/kevinanderton/2018/03/07/the-on-going-controversy-of-microtransactions-in-gaming-infographic/#5e5a0e01d9c5. Accessed 22 May 2018.