Using Technology to Innovate in University Admission Preparatory Courses

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Abstract

Ducante, an education startup founded by the author, inspired the present work to discuss the process of building an educational startup and whether it is possible to innovate in high-school level education. This work covers every technical aspect, including business, engineering, and design, of building a startup that aimed to improve education in Brazil, by introducing some key concepts and discussing how the founders applied them during the startup development. Finally, it presents all results of such startup and a subjective statement of the author regarding using technology to innovate in University admission preparatory courses.

1. Introduction

On August 2016, along with Gustavo Silva and Leonardo Padilha, I decided to found Ducante, a startup that aimed to democratize high school level classes and improve Brazil's educational system by enabling poor and less privileged people to have access to core education. We aimed to use continuous learning data to improve the quality of offline classes. We took a course entitled Digital Entrepreneurship (MAC0467)[1], taught by professor Fabio Kon, supervisor of this monograph, that aimed to join computer science students at Universidade de São Paulo (USP) with business administration students at Fundação Getúlio Vargas (FGV) to develop new startups.

Beyond our motivation to improve education by applying statistics and computer science knowledge in the education industry, we also had a few personal motivations, that we considered would be highly beneficial to our computer science careers:

- **Design and implementation of a large system.** We, as students, craved to work on projects that would extrapolate the work scope of typical college work.
- **Product development.** Apart from technical challenges, we aimed to learn how to understand user's needs and how to solve their problems.
- **Social value.** We aimed to work on something that would produce genuine value for our society.

Finally, this present capstone project is highly motivated to share what we did right and wrong, inspire new students to start new startups and document the days we spent building something somewhat fun and challenging.

2. Goals

Primary goals of this work include:

- Sharing problems we faced while attempting to improve education in Brazil;
- Sharing how we build and ran Ducante, an educational startup, as a company;
- Sharing how we drove our experimentations and development;
- Explaining and sharing the decisions we made, what worked and what did not;
- Exposing business analysis we did, including anonymized data from our users;

Finally, we desire to inspire people to work on new tech solutions for the educational sector.

3. Problem & Strategy

When we registered to attend "Digital Entrepreneurship" (MAC0467), we already knew we wanted to work on the education industry for problems at the high school level. Inspired on the methodology Customer Development, described on the book "The Four Steps to the Epiphany" by blank:fs, we decided to talk and interview students and professors from preparatory schools for University admission exams to understand better their problems and how we could develop a solution for these problems.

After a few interviews, we identified that many students do not have financial resources to invest in their education.

Moreover, many students have hard times to motivate and engage themselves, and many of them do not have time to study at all. The main reason for that was they were splitting their time with study and work. Our solution was to offer high-quality resources for students at low, accessible price combined with study guides. In some sense, it was a Duolingo for University admission exams backed by their school teachers.
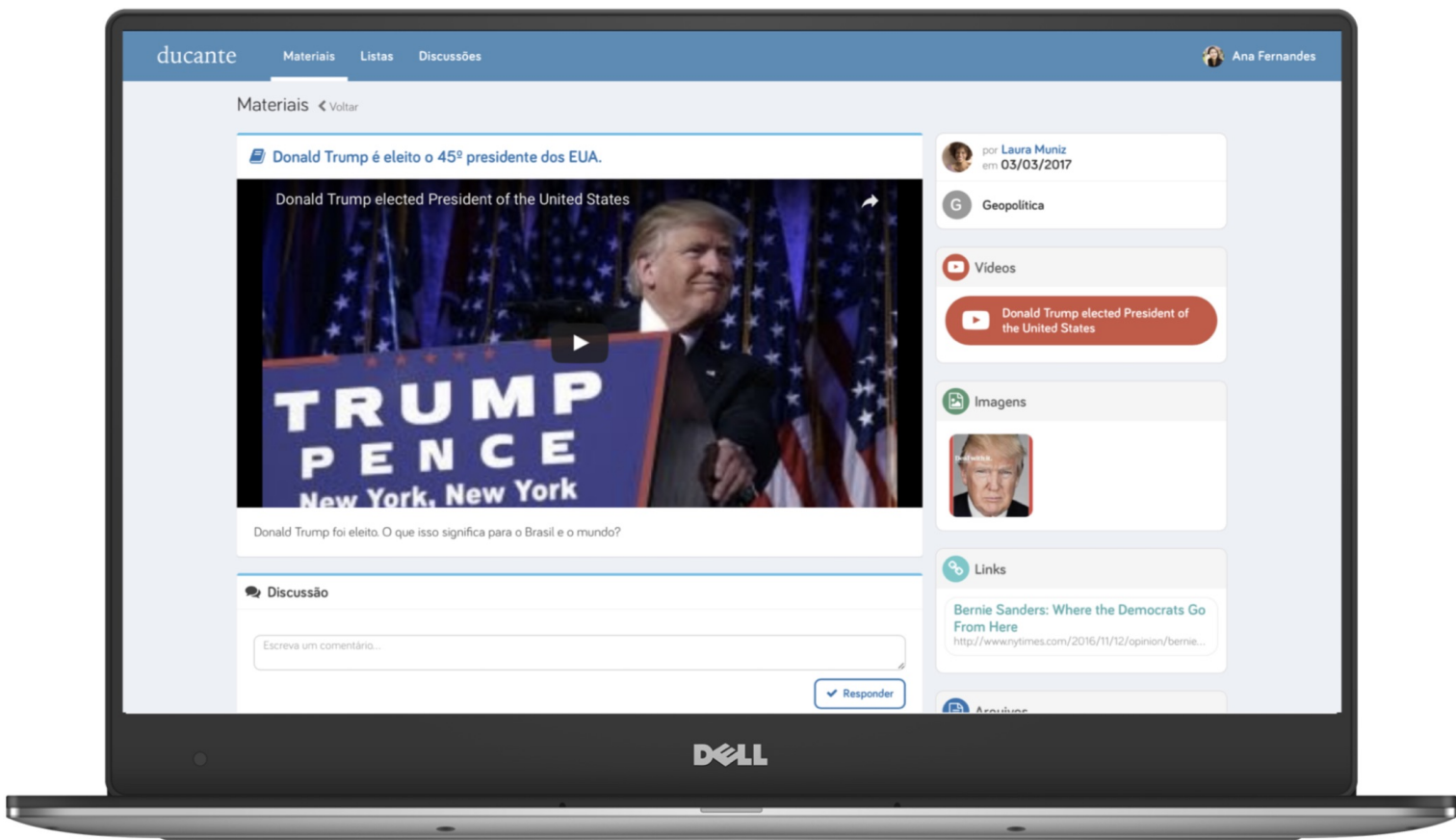

Figure 1: *Digital classroom about US president Trump's election in 2016*

Our vision for Ducante was clear ever since: innovate on the education industry over a combination of business model innovation with technology innovation. This type of innovation worked for several companies before in different industries, since the technology advances started to allow large-scale distribution at low cost. For example, companies like Netflix and Amazon found on the Internet a highly scalable channel to sell and distribute their products at lower prices than their competitors. Our vision for Ducante was no different. We aimed to, through technology efficiency, offer high-quality educational resources to a large number of students at low cost. The latter type of innovation would imply using technology in a different way that was being used at classrooms. What we had in mind was to gather learning data and statistics to generate knowledge and predict progression.

4. Designing for Engagement

While we were designing Ducante, we always had an excessive concern about building a user-friendly and addictive software. We believed that this would be essential, as we were looking to making a tool with great engagement over a long time. We understand that studying can be a tedious and tiresome task for many students. Moreover, studying can be a struggle to fight on a daily basis, either for lack of time and energy, or lack of will and encouragement.

As the product grew, became more mature, and critical features were implemented, we began investing efforts to implement features that would make the platform more attractive and addictive. On this work, we present and discuss The Lean Startup ([2]) and The Hook model ([3]). These two methodologies helped us develop an engaging product that was both interesting and fun to use.
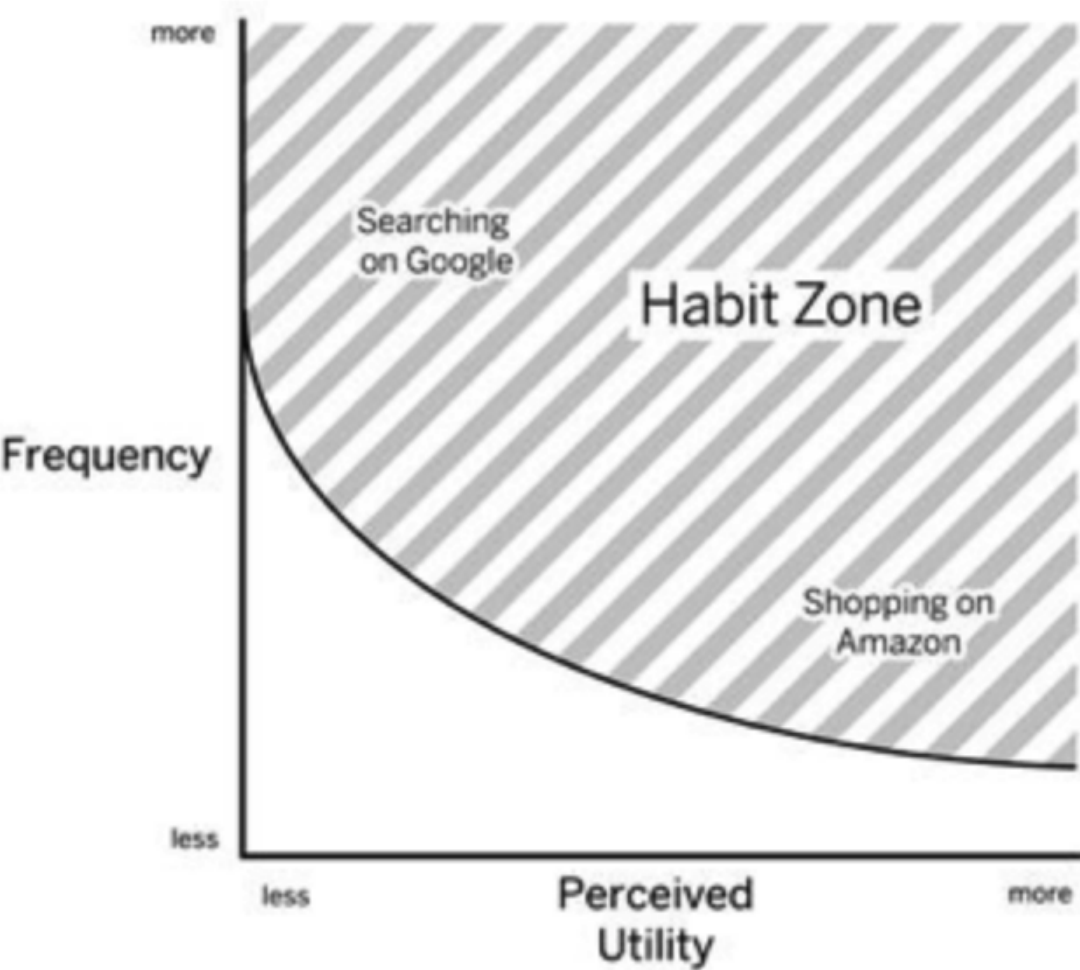

Figure 2: *A view on The Habit Zone. Source: [3]*

5. Technological Aspects

We discuss all technological aspects of Ducante, including high-level architectured, stack technologies (language, frameworks, database), infrastructure and data modeling.

From the beginning, we aimed to have an architecture based on microservices that would allow us, beyond other advantages when scaling would become a problem, distribute work across the three founders (all software engineers).
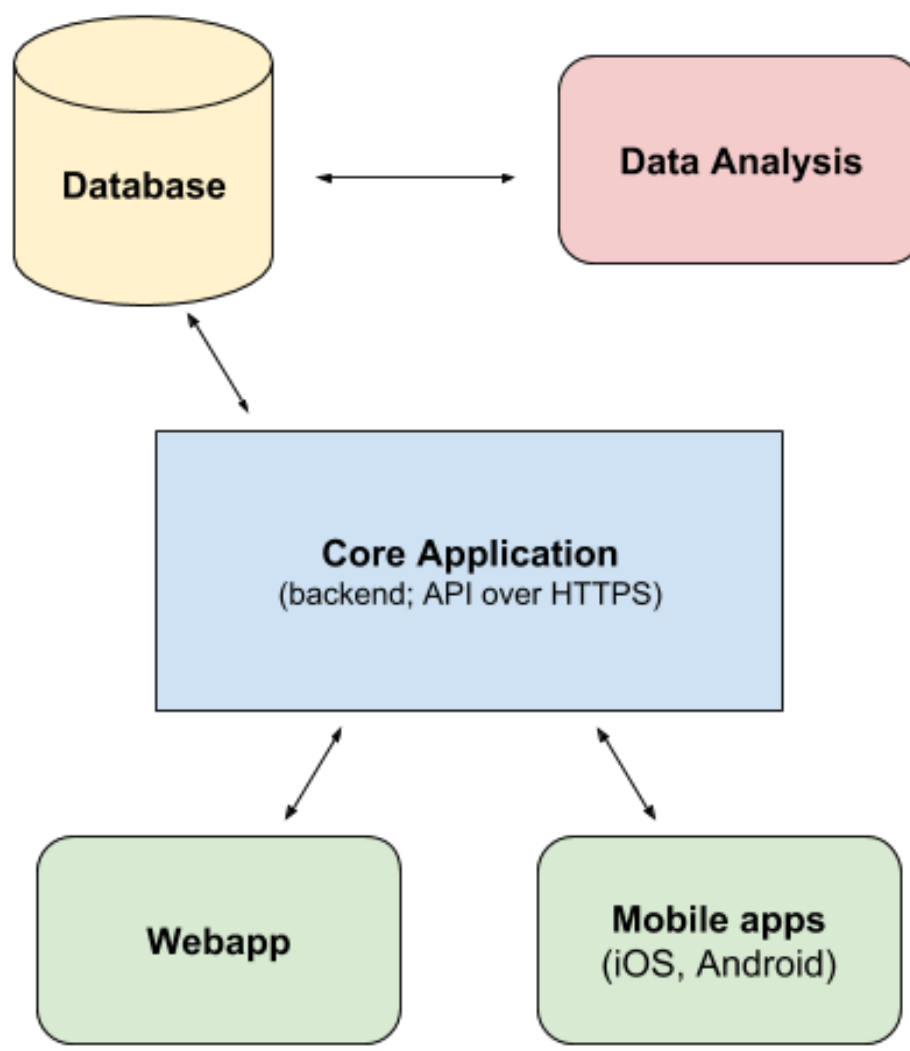

Figure 3: *Software architecture: common backend service across platforms*

We wanted to have a backend application offering an API to access data and business logic consistently throughout other applications. Ducante's architecture (figure 3) was centered on a core application that served all of our softwares (mobile apps and website), through an API over HTTPS. Initially, such core application was a monolithic application developed in Ruby on Rails containing all interfaces to any data or business logic, and we aimed to split this into a set of multiple services as we needed.

6. Results & Conclusion

As we developed Ducante, we partnered with over ten schools, with 1355 people (including 1110 students and 245 teachers) using our platform in a weekly basis. Over 260 content were published, summing over 10k views from students. Teachers created over 50 exercise lists, and students solved them over 1k times. Moreover, we won an undergraduate-level entrepreneurship competition from Instituto NET Claro Embratel, Campus Mobile. Beyond money, we visited the Sillicon Valley and had the opportunity to visit Stanford University and the Lemann Center, Google's and Facebook's headquarters, and attend San Francisco Design Week, a design conference.

We can agree that we learned a lot from this experience, but more important, **we firmly believe that using technology to innovate in University admission preparatory courses is possible**. Although we have failed to find a way to monetize our business properly, we have proved that the industry, especially the students, is seeking innovation. The traditional way of teaching and learning in Brazil have not followed people's new way of living: many students have internet and smartphones access, but they do not exploit this tool to improve their studies efficiently. That is, at a high-school level, most of the smartphone usage in schools are related to calculator or dictionary usage. Students are misusing these devices, that are capable of connecting to the Internet. A vast and healthy blue ocean is yet to be explored by future entrepreneurs.

References

[1] **Blank(2005)** Steve Blank. *The Four Steps to the Epiphany: Successful Strategies for Products that Win.* Lulu Enterprises Incorporated. ISBN 9781411601727.

[2] **Ries(2011)** Eric Ries. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business. ISBN 9780307887894.

[3] **Eyal and Hoover(2014)** N. Eyal and R. Hoover. *Hooked: How to Build Habit-Forming Products.* Penguin Publishing Group. ISBN 9780698190665. URL https://books.google.com.br/books?id=dsz5AwAAQBAJ.