

Reflections, Perceptions, and “App”-lications

I. Reflections + Perceptions

Through the short visit of just two weeks, it is naive to simply propose a one-off solution to Fiji’s housing crisis in Suva. To give a quick overview, Fiji has been in a state of rapid urban growth since 2002, where urban population had increased to 52% of total inhabitants. Fijians and Indo-Fijians have flocked to the urban areas in order for better education for their children, and promises of a better future versus the recent poverty increase in rural areas. The two largest cities (Nasinu and Suva), hold 40% of this urban population. 15% of said urban population is made up of 200 informal squatter settlements, and is expected to increase to a 100,000 (8.5% of total population) in the coming years¹. But from an outsider’s perspective, more specifically an *architectural* perspective, the squatter developments found in Suva *cannot* be defined as just a lack of affordable housing, which in effect would normally call for the demand of builders/contractors/architects—Instead, one can consider the problem being rooted also to (if not more so), the political, land, jobs, and governance issues of the country.

From current statistics and Research on Fiji, as well as the interviews with a variety of Fijian families in different housing situations, we determined that the problem isn’t a lack of knowing how to build, but instead of lack of the ability **to** build securely, efficiently, and quickly. The question is how outsiders can help in this housing crisis in a way that establishes said security via incentive, efficiency via awareness, and speed via technologies. In many developing countries, Fiji being one and the focus of this paper, housing happens autonomously without the need of architects or planners. Furthermore, in said countries, there is not enough supply of such professionals to meet the demand—urban growth has passed and will continue further exceed the amount of people who would be able to assist. Those studying to be practicing architects in Fiji for example must get their degree overseas. Practicing surveyors currently is at 55 / 77 registered surveyors, making the ratio of 1 surveyor to 15,000 Fijians.² So in essence, this paper will discuss first a reflection of the interviews and knowledge gained from our time in Fiji; secondly, will be a proposal of how the development of an accessible software application to teach, inform and document efficient ways of expanding the home can be a “soft” approach to aiding the rapid autonomous urban growth in Fiji as well as in other developing countries worldwide.

We know how to build

¹ Republic of Fiji, National Housing Policy. December 2011

² Un Agenda 21, Land in Fiji, <http://www.un.org/esa/agenda21/natlinfo/countr/fiji/land.pdf>

A common question we asked to those living in informal settlements was “Are most Fijian’s comfortable with building their home themselves?”. Both Mrs. Lowata Moaokosi and her sister Vanini, Jitoo squatter residents proudly stated, “We are Fijian. We know how to build.” This sum up the fact that most Fijians know how to build, it’s in their culture and is passed down from generation to generation. Community ties were generally strong in the older, more established squatter developments. This enabled the organization of classes and groups that would come together to teach both basic and advanced building techniques, such as the Women Action for a Change, a group the two aforementioned sisters belong to. Of the 8 families that we personally visited, 7 affirmed us they have no problem building their own home and all of those that had the ability to extend their home, most had done so in one form or another.

Advanced Building / The Double Story Stigmatism

So if home building isn’t the problem, the question then becomes, “How capable are the locals in advanced building technologies and techniques?” We also spoke so some local contractors who work with the Ministry of Housing on a variety of Site and Services projects as well as other development projects. When asked if most locals could build a second story for example, they laughingly affirmed that for the majority this is no problem., however what keeps them from doing so is purely cost and a general lack of current practice in the communities. One must consider for instance, that if you build vertically, there is a 20% increase in cost of the extension versus a purely horizontal extension. Secondly, you must dedicate an existing portion of the interior to pure circulation. Going horizontal is generally seen as the most affordable, and natural way of extending the home, especially when insecure land tenure and natural disasters are so prevalent. As such, a negative stigmatism has risen in communities where those who decide to build up are looked down upon. One example we found of this was in the “Bangladesh” settlement, which has been recently “formalized” i.e. urban upgrading. What was once a squatter settlement on government owned land, is now been subsidized and leased as 99-year land titles to the residents, to be paid off gradually. Lots have been declared and assigned, electricity and waterlines have been put into place, and roads and street lights have been established. While many residents of the roughly 78 family communities have started to replace their tin and timber with concrete walls, as well as expand, only **one** family we spoke to actually had gone vertically to two stories. We spoke with Mohin Arbaaz, an architecture student and son of a contractor/physical therapist. He told us that when the family went up a second floor, there was a huge controversy in the community, and the family was temporarily treated with a moment of disdain. He attributed it to jealousy, but the pure fact that it was negatively looked upon to extend up, one’s house is an ominous attribute of this long established existing Fijian community. More formalized building strategies thus are possible, but currently cannot be considered a developing trend. Density is quite low in urban areas in Fiji, and although it is pricier, it can help to improve the overall quantity and quality of housing if

multi-story building strategies were more encouraged in urban upgrading projects, and possible incentives from the government were introduced.

How does one encourage said density, or even just expedite the process of home improvement? Part of this can be addressed by global communicative technologies, which can alleviate local governing bodies and organizations of current overlapping tasks and responsibilities. If Fiji can build and information technology is increasingly becoming more accessible, it [technology] can serve as a link to a more refined urban growth strategy.

Relocation Developments lack scalability

In total, we visited 4 different housing categories during our time in Fiji. Already prior discussed was **1) squatter developments and 2) urban upgrading** [formalized land and service rights for squatter developments] in which it was learned that Fijians are more than capable of building their own homes and will continue to expand as family size increases or income permits. The other 2 categories we looked at were **3) Relocation** [transitioning from squatter homes to public multi-story housing, farmlands outside of the city, etc.] and **4) Transformation** [low-cost housing that has been expanded outside of original intention]. The last category, transformation, can be grouped with urban upgrading (and it's predecessor, squatter developments) in that they are all autonomous, in essence evolutionary states of the same practice—the inhabitants build and expand roughly on their own accord. Relocation, however is an entirely different situation, stemming from western society where one moves into a home built by someone else and has it's own rules and stipulations. The positives of these projects is that they address density issues and/or move squatters into a more stable housing situation...but the negatives that one finds is the scalability of said projects.

The three relocation projects that we visited were 1) a 50 year old multi-story apartment complex known as Mead-Road done by the PRB (Public Rental Board), 2) PCN LagiLagi Development, a new development being produced by the PCN (People's Network Community) 3) Lomaivuna Farming Pilot project and 4) the new Raiwai multi-story complex being funded and built by the Chinese government. The last 2 of the four were in development currently so it tough to say how successful said projects will be but they both have their positives and negatives.

The positive of the LagiLagi development is that the sizes of the units were quite spacious and also professionally contracted out. The 1st phase of this development consisted of 3 story walkups and single-family homes (for elderly and handicapped). Many squatters anticipated on moving into these units and were very excited about the possibility. The negative of this development that we could see is the lack of significant density on the site. The 1st phase consisted of 148 self-contained units, but the planning of the buildings did not seem to take full advantage of the site that it now is being built on. Also a negative, is the cost of such a project. The government and PCN is developing this project and will subsidize payments of

the squatters. The civil was \$827,000 and contracting was originally estimated at \$4,000,000., but due to delays contracting is now at \$8,000,000³ making the cost estimate per unit \$59,641. This amount has almost doubled due to delays. Furthermore, the amount of units will not be enough to support the amount of families that have to move, so in essence, these types of projects do not seem sustainable., given the fact that scalability is limited here due to planning and cost.

The Raiwai housing project definitely is addressing density, but most local Fijians seem apprehensive about this project. The main problem seemed to be that the units were too small. To quote one of the families in the Jitoo settlement, “We think the Raiwai housing is too small for us to be relocated to.” This was a common shared option between the local informal communities. The rationale was that in the squatter settlements, they have the ability to expand as they need, they achieve density and organization on their own accord, and their actual homes are quite sizeable—if they are going to relocate to formalized housing and pay more, they wanted the same or better sized housing. Design cost of the development was \$500,000 and construction is estimated at \$9 million. With 208 units, this estimates to approximately \$45,673 / unit⁴. This type of multi-story housing can be compared to the already 50-year old mead road development project we visited which also was a small unit size (one room with kitchen near door, and external enclosed bathroom / shower). Although it was very small, families of more than 8 members had been living there for as long as 32 years. The intention of this mead-road was for transitional purposes, families saving up for land or homes—but given the proximity to the center, families have stayed for generations and thus units have become overcrowded. Rent costs, which are income based, have been taken advantage by certain residents. Some agree that restrictions should be enforced to put limited tenure on residents, but then the question is, “Should we punish those who are increasing their earnings by kicking them out of their housing?”. It is difficult question, but to look at the facts—these apartment buildings **are** too small for families of 8 and they cannot be expanded. It is in the culture that Fijians live with their extended families, and this style of living does not work past a certain point in their lives. Scalability is key, and if it is prohibited here, then conditions will get worse as families grow and there is simply not enough governance available from the PRB or government to impose proposed restrictions on families.

The Farming pilot program is relatively new (beginning in 2011), but doesn’t solve the urban growth problem, instead just moving a few to the periphery. This program has known to fail in other countries and again lacks scalability. The family (husband, wife, and two children) we met with who were participating in the program, spoke very highly of it, but of course the husband was already a commuting farmer. So the chance to have a fully funded home, land, and farming supplies was a easy transition for them. This option would not work for everyone, and cannot work for everyone.

³ Cost estimates from Ministry of Local Government, Urban Dev, Housing & Environment

⁴ Cost estimates from Public Rental Board

To sum up, many of the projects being supported by the government authorities and private investors have flaws in that they lack a system in which it can continue long-term—the ability to adapt to increased demands. Additionally the costs far exceed what it costs to upgrade an existing urban development. One of the urban upgrading projects we saw was a total of \$2,152,000 for 73 units, estimating at \$29,479 dollars a unit. This is almost half of what it costs for a multi-story development, and uses the same land that the families are on. Fijians can build so why not allow them to do so? If density is encouraged and policy changes occur, this is not only the most scalable option but also the most affordable as well.

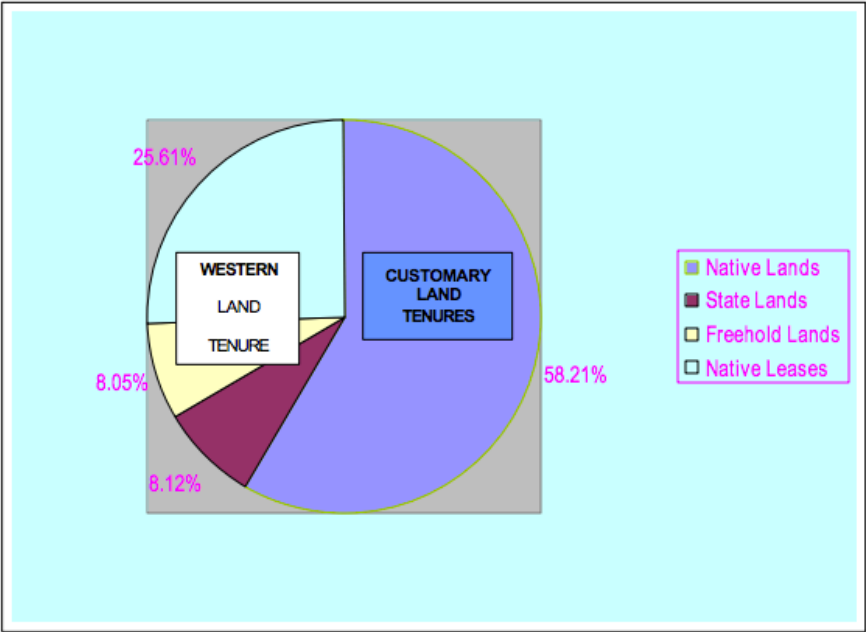


Figure 1: Comparison of Land Tenure by Areas
(Data derived from NLTB Statistics, 1992; Lands Dept, Statistics, 1992)

Land, Land, Land

To sum up reflections and perceptions, it is important to briefly discuss the land in Fiji. It has been discussed that Fijians have the potential to grow and formalize, and that of the options, formalizing the existing land settlements is the best option. But it is important to not that land in general is tied up in a slew of policy. Firstly, if you look at the breakdown of land ownership (**fig.1**), if native leases are included, Native lands make up almost 84% of Fiji's total land area. This land, as per the Native lands Act, *shall be held by native Fijians according to native custom*—This cannot be sold which leaves only 16% available for purchase⁵. The demographic breakdown of Fiji includes Native Fijians (58%) but also Indo-Fijians (Indian descent from British colonial period, 38%). The latter cannot purchase land and generally must lease for usually no more than 10 years. Land acquisition is very difficult, and tenure thus becomes quite an issue.

⁵ Land Tenure Systems of Department of Lands and Surveys, Ministry of Lands and Mineral Resources.

Thus density becomes key with what land is currently being utilized. Lot sizes for many of the urban upgrading sites were quite large, the minimum lot size being 200- 220m² as mentioned in the town planning act. These could be reduced and still be sufficient for homes, which is something else to consider. Overall, it is necessary to understand that these land issues are difficult to address from an outsiders perspective, but can be partially attributed to one of the major reasons that squatter settlements are rapidly increasing. In the next section, the argument will be made for awareness and education via technology as being an advocate in urban growth in the informal sector, being an accessible tool for surveyors, squatters, and interested 3rd parties.

2 . “App”-lications

Intentions

So we understand the problems of informal housing, but how can one help. Important things to note are that people are building and expanding when they can—this is **not** the problem. The problem which we can help address are the following: 1) **The speed** at which this is being done, how can you expedite the urban image, the density, and the quality of housing. Many of the residents who are given titles to lots do not start expanding or improving until later on, perhaps due to lack of foresight or fear of making mistakes. How can one test possible scenarios, and know how much thing sill cost? . 2) **The efficiency** methods of expanding, knowledge of material usage and cost, and choosing where to expand be it vertically or horizontally on site. Many residents want to expand for example in concrete or wood, but how can one get an accurate understanding of which is most cost effective (and recyclable if the desire is to expand) on the long-term. And finally 3) **providing the understanding of existing policies and incentives** from not only the local government and organizations, but also from other countries at a global level. For instance, Many people simply are unaware that they can go to two stories or about current offers and micro loans provided. These topics deal with knowledge via communication. It is very difficult to send surveyors, teachers, organizations to every community and teach one-on-one personally and though it is being done, it has it’s limits. But one approach is to mimic the informal housing strategy in how it is autonomous. Around the world, People build for themselves and 60% of homes in developing countries are being done this way—without professionals. Why not continue to improve by making expertise knowledge available in the form of open-source scalable and accessible software application?

The cellphone: The most accessible information platform in the world

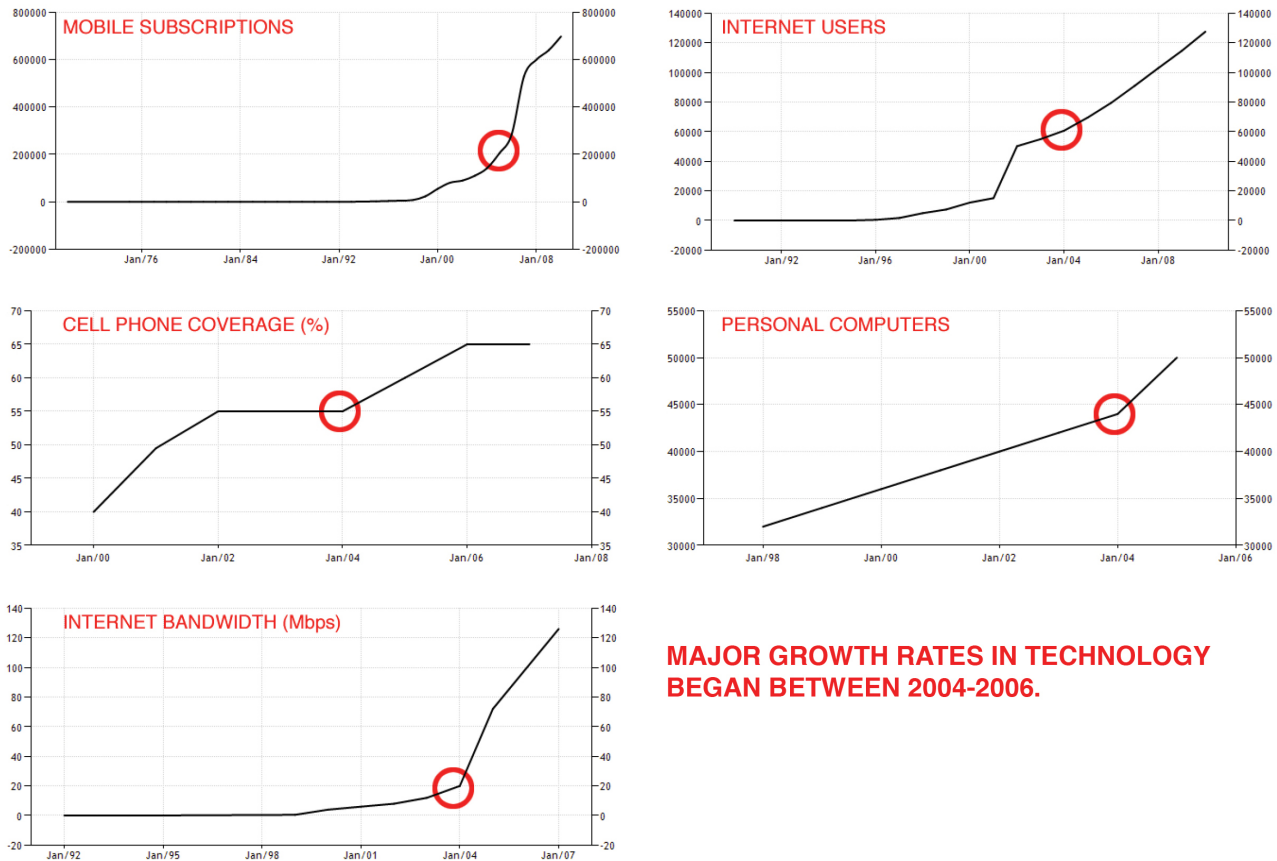


Figure 2. Media growth in Fiji. Data Source: World bank 1968 -2008.

“70 percent of all handset shipments are feature phones. Most of these phones go to developing countries”⁶. The vast majority of the world, especially in low income and rural areas, is still living the mobile revolution through the constraints of voice, SMS and asynchronous connection. Cell phone usage in Fiji and the rest of the developing countries are rapidly growing and becoming extremely accessible. From 2003, total cell phone subscribers (then 109,882) in Fiji have increased 700% (727,000 as of 2011). If the estimated total population of Fiji is 868,000 then 83% of the population has access to a cellphone. 65% of the country has access to a cellular network. Internet usage has been increasing at a rapid rate since 2009...from 17% to 28% (now) per 100 people regularly use the Internet⁷. What’s also surprising is the fact that cellphone usage growth and accessibility far exceed personal computers usage, which only has increased from 40,000 to 50,000 since 2002. Looking at **fig. 2** above, one can see the trend of rapid

⁶ How The Future of Mobile Lies in the Developing World, Erica Kochi. Techcrunch.com. May 2012

⁷ Source: World bank

expansion in technology within the past 8 occurs and the trend is continuing. It is obvious the cell phone is currently on its way to be the most accessible piece of communicative technology in the world.

The World Bank has already taken into consideration that the cellphone is possibly the single most important tool to reach those in developing countries with their Global *ICT* (New information and communications technologies (ICT) Department. “The mobile platform is emerging as the single most powerful way to extend economic opportunities and key services to millions of people” says Christine Zhen-Wei Qiang, a senior economist at World Bank. They also mention that with a 10 percent increase in high speed Internet connections, economic growth increases by 1.3 percent.⁸ Currently their research and investments deal with mainly the economic sector, utilizing the wireless platform is promoting NEW economic and social opportunities at all levels for the poor population via SMS and data technologies.

Currently, the cellphone is already being utilized in ways other than voice or text communication. The CNN money team states that the cell phone is “the technology that is already having the greatest impact. As soon as a person possesses one they acquire a window into the entire world” and 80% of the world has access to wireless network. They even mention that 1.5 billion cell phones are being used in the developing world, estimated to double over the next 5 years.⁹ Some examples of outside of the box technologies is companies like CellBazaar in Bangladesh, where one can organize buy/selling events locally (SMS craigslisting). This is already occurring on basic cell phone technology, but we are soon approaching a time when we will have full internet via mobile platform everywhere. “Think of how much more useful these phones will be when they become fully Web-enabled everywhere, allowing multimedia communication with video and photos”¹⁰ .

Moore's law, formulated by Intel co-founder Gordon Moore, suggests that the complexity and capabilities of a computer chip doubles approximately every 18 months, even as its size and price remains constant.¹¹ The point being that technology is becoming so readily available, that we are about to be at a point in history where everyone will have access to the world's information. As such, a new opportunity to reach the developing world by sharing data on housing typologies, how to expand homes based on certain income levels, and other knowledge can be developed/shared/built upon at a rate never before conceived. This area is already being touched upon by big technology industries such as Microsoft, Google, Intel, AMD, Cisco, Sun, Motorola, and Nokia but also world organizations such as UNICEF (RapidSMS, pseudo email-rapid data collection system) and World Bank (ICT Program / Ipad + Iphone DataFinder and Finance apps).

So where does that leave us? The mobile platform proves to be the most successful in accessibility, affordability, and scalability. But the uses in developing countries are currently used **primarily in the**

⁸ Information Communications Technology for Development, World Bank.

⁹ Technology and the developing world, David Kirkpatrick, Fortune. 2006

¹⁰ Technology and the developing world, David Kirkpatrick, Fortune. 2006

¹¹ Technology and the developing world, David Kirkpatrick, Fortune. 2006

economic sector, be it locally (CellBazaar) or Globally (World bank). This proposal is aimed at looking at if from a **informal housing / urban perspective** (societal) by asking the question, “How can we teach and learn from currently developing urban countries such as Fiji?”.

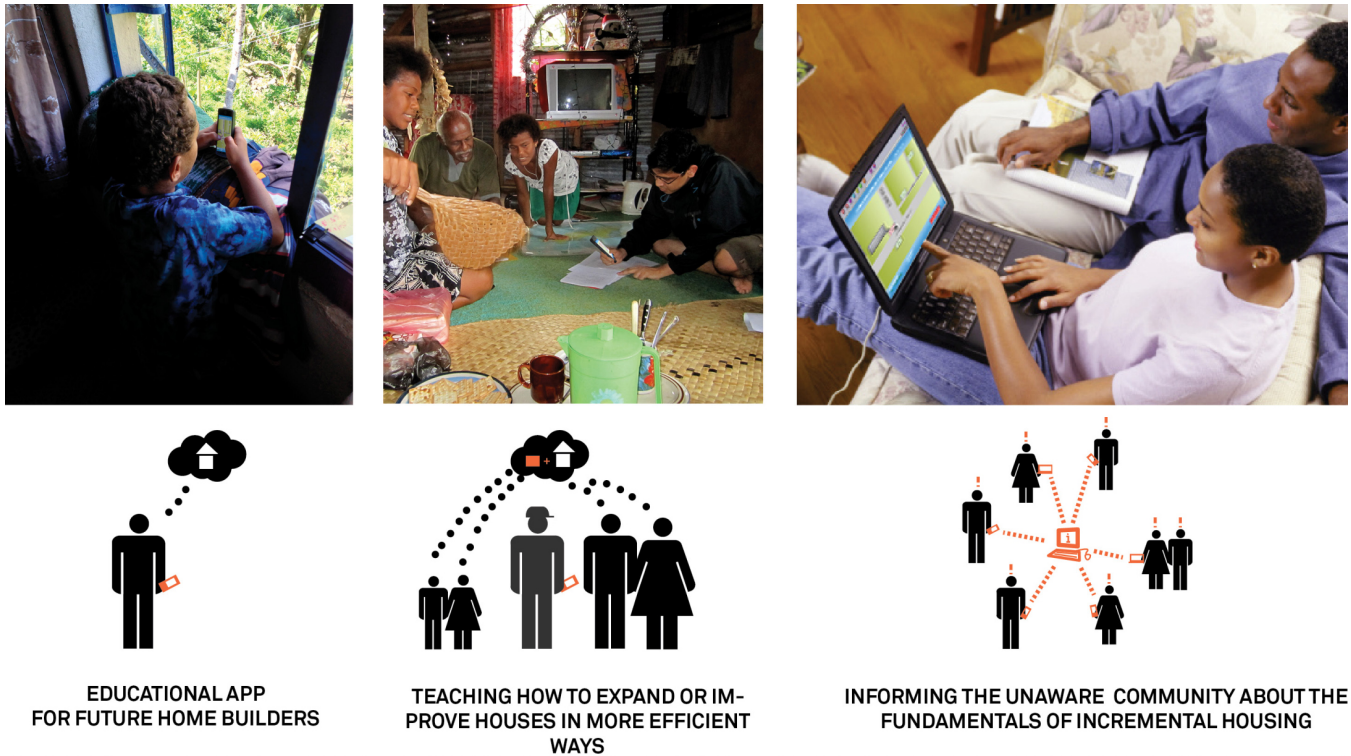


Figure 3. A mobile platform app for a variety of participants

Incrementalize it! An incremenalize housing application.

Based on latter discussion, it goes without saying that an app to help aid in the growth of the developing world must be open source, and freely available on the mobile platform as well as a normal web browser—the two most accessible ICT devices currently and likely will continue to be. Ideally it would be nice to have the complexity scalable, so that this can work on older phones, but for now the focus is geared towards smart phone technology, looking at projected trends and costs of the devices mentioned previously. This APP is intended to be played by not only the homeowner, but designers , surveyors, and others as well (**Fig. 3**). The person expanding their house can benefit just as much as the person deciding on policy, designing projects, or those who just want to know more.

Such a development would need a certain amount of funding which will be touched upon later. Briefly the following will discuss how the app works, who will use the app, and additional capabilities. The following section will cover funding, timeframe, costs.



Figure 5. An Accessible app to simulate real outcomes and learn accurate efficient positives and negatives of decisions

How the software mechanics will work

The intention of such an application is to simulate a potential or existing homeowner given a user-defined income in order to ‘test’ possibilities, learn from mistakes, and understand good house building/expansion techniques in developing countries. The income takes form of credits and is used as a placeholder for monetary value to buy materials. Said monetary value would relate to real values associated with a specified country, so Fijian prices of building materials, land leases, etc would be proportionally relative to those “credit costs” in the simulation. The user then runs through the game by choosing a lot location, materials to build with, a beginning home size, and time and events (births, deaths, jobs offers, layoffs) will pass accordingly in the game that may affect the user’s decisions. A “points” system will run in the background of the application which will be based on Socio/Political/Economic Research and Statistics that will need developing just as much as the mechanics. Based on this data, user would be given tips on how they may improve their actions, via positive and negative indicators on their decisions. At the end of a round, user’s may be rewarded with more credits to continue or told to start over if one does not do so well. Surprise narratives simulating real life situations (ex. company wants to buy your land), which may end the game suddenly if one decision is made. The intent is to teach **actual** techniques, **actual** costs of materials and labor, and informing users with **real-time data** of how incremental housing can work

most efficiently (Fig 5). More information about how the schematics of the game might work can be found at (<http://sigus.mit.edu/NEW/files/gp-updated3-shrunked.pdf>).

Furthermore what will be interesting are the certain events and policies will be specific to that country or city in the game. Government bodies and Global organizations may also have expansion incentives, micro loans, lot size regulation. For example if we take Fiji, we can start to imagine what specific incentives may intrigue a player if there are subsidies or other incentives introduced. Perhaps minimum loan payments on the expansion are decreased monthly, if a user want to expand the house vertically. This promotes density and urban incremental growth, while also simulating positive economic benefits for the user. Another might be from UNHabitat, who might give incentives for maintaining biodiversity in the green spaces in a lot or adding a solar panel. Perhaps they will fully fund or partially fund such a product for those who expand in a ecological manner. The possibilities are endless, and because this will be a mobile platform, current events and programs can be updated and reflected in the game.

Crowd-Sourcing / wiki- Increment-ipedia capabilities

But the software does not have to act as a “one-way street”. As users play, developers, investors, governing authorities can see trends of how users make choices. This allows people in such positions to make more effective policy changes, incentivized subsidies, etc. The backend “data” will be in a **constant feedback loop** between government / homeowner / NGO / etc – Moves are made, data is evaluated and appropriated. This is essentially also a method of surveying without surveyors, data-collection without governing officials—AN open-souce means to growth.



Figure 6. reCaptcha Form Validator: A wiki-crowd sourcing software to help digitalize written texts.

A good example of the benefits of feedback loops, is Wikipedia or reCaptcha by Google. “reCaptcha” is “a program that can generate and grade tests that humans can pass but current computer programs

cannot”¹². Essentially it is on a lot of online forms to validate that you are a person registering or commenting on something and not a automated bot crawling the internet, generating spam messages on said forms. It does so by generating what looks like distorted newspaper print as seen in **fig 6** above, and asks a user to type the seen words. While it has built in functionality to be lenient to a degree, it also is being used by the creator to understand printed and hand-written material by evaluating user input compared to what is shown—this data is then used to aid in the accuracy of digitalizing books/prints/documents. So although websites and users get the benefit of user validation, Google in turn collects user input data in order to improve accuracy of converting the world’s textual documents. Likewise, the **Incrementalize It!** App can work to give homeowners and users informative feedback in the choices they make via simulation. But it also is helping organizations and governing bodies (as well as anyone else who would like to use the data) make more reflective socio-political and economic decisions, because it will be based on real-user data. These decisions go back into updates of the software, and the feedback loop begins again.

To finish this section, Local Authorities and Local users are not necessarily in a closed loop either. For instance users in Fiji can look at user choices and end housing expansions from Rio de Janeiro or Incremental Policies from Morocco. Data collected and inputted is meant to be a global acquisition in order for everyone to benefit.

Developing the app / Cost

Generally the end-cost ends up being all in labor, due to the end-product being distributable software. A team of software engineers together with a team of data acquisition experts (Analists, planners, economists, surveyors, etc) working very closely, would be the necessary “package” to creating the initial prototypical application. A software engineer generally makes anywhere from \$50,000 (web development) to \$83,000 (higher development) annually in the United States and for the latter fields it is likely the same. If we were to start from the ground up--take a team of 6 (3 engineers, 3 experts) at \$65,000 annually we would be at an estimated (325,000 salary + 200,000 additional expenditures i.e. servers, testing, maintenance, etc.). This would be around \$525,000/year. To get something workable it would likely take a year. Debugging and refining with further data acquiring another year, and then beta testing may be possible during the 3rd year. To give some scope, Enterprise Automation (Application replicating enterprise business processes, Shopping Cart, ecommerce, Payment Integration etc.) takes roughly about 12- 20 weeks. A pretty simple app to send messages and photos (known as “Twitterific”) took \$100-250k to develop and was done within 1500 hours of pure work (63 days)¹³.

¹² ReCaptcha Website <http://www.google.com/recaptcha/learnmore>

¹³ How much time does it take to develop an iphone App, impigermobile.com

The true difficulty is how to translate pure data from a variety of fields to an attention-keeping simulation app for everyday individuals.

Investors / Source of Funding

As mentioned in earlier, those heading the pack in the tech and cell phone industry (Microsoft, Google, Intel, AMD, Cisco, Sun, Motorola, Nokia) are already interested in investing in developing countries? Why? Because, as David Kirkpatrick, Fortune Editor, states it is a "wonderful combination of social concern and greed". The mobile / internet market in developing countries is the largest any of these companies have ever seen. Businesses as well as individuals are quickly looking to purchase cell phones, tablets, and Personal computers. Kirkpatrick specifically mentions 40% of India, meaning millions of devices, and also places such as Indonesia and the Philippines. The Fijian technology trend has already been touched upon, so it can be proposed they are not too far from the former...A social concern and investment in software based aid, can create a good partnership (essentially establishing an "in") with local governments and NGOs.¹⁴

AMD is participating in what they call the 50x15, working with the UN Millennium Development Goals, which aims at getting 50% of the world's population on the internet by 2015. One step of this was the \$100 OLPC (MIT's one laptop per child) project. Hardware is already being invested into, but new types of software such as *Incrementalize It!* Will actually start to investigate and document housing trends and building strategies—hitting more direct social and economical stratum.

The Bill + Melinda Gates Foundation is the largest most transparently operated private foundation in the world and their focus (together with Microsoft) *to enhance healthcare and reduce extreme poverty, and in America, to expand educational opportunities and access to information technology*. As a global initiative, they have already dedicated millions of dollars to various charities to improve sanitation handling methods, Eradication of polio and other diseases, and more. They would be an excellent candidate for potential investors as well as aids in innovative software development and distribution.

World Bank seems to be leading the trend in open-source data collection and distribution. At this moment they already supply their databases for free via Excel spreadsheets and visual graphs, and also in the form of iPhone/iPad/Android apps. While it is mostly economically driven, they may also be investigating the potential of a more direct urban housing initiative. If not the funding of development, World Bank and NGOs can provide data relating to incentives and trends for the simulation that can benefit the user in reality.

Local governments and Ministries can also fund an app like this although it can be seen as more of a global initiative. Fiji for instance has some projects that are \$8,000,000 - \$9,000,00 for 100-200 units. A good portion of housing costs (\$4,000,000 in Lagilagi's case) stems from delays of construction, so 3 years totaling up to 1.5 millions is not as farfetched as it may sound. A software initiative can create new job

¹⁴ Technology and the developing world, David Kirkpatrick, Fortune. 2006

opportunities, positive buzz for government 's persona, and become the start of something quite large with other organizations worldwide who already share similar interests in values.

III Final thoughts

In Fiji, homes are being built and expanded incrementally whenever possible. From my personal observations, the urban upgrading projects seem the most sustainable projects provided additional policies can be introduced to insure consideration of densities, ecological factors, and other concerns prevalent in already developed countries. The question then becomes how does one expedite and essentially “modernize” the process of current expansion.

Relocation type projects either are too limiting or lack a sufficient degree of governance and/or scalability. Additionally these projects cost a fortune with no insight on how to separate government participation from the housing situation.

The land issue is quite a huge contributor to the state of the current crisis, but may be very difficult to correct in the short-term. As such, small policy changes such as minimum lot sizes and loans or subsidies on materials may help to increase the speed of formalized urban growth.

The aforementioned app can take into account such incentives and policies as a means of informing inhabitants how they can take advantage of certain programs and benefits by improving their home or densifying their expansion methods. Simulation proves a lens into the future with real data, real strategies, and real cost breakdowns so that a homebuilder is prepared and informed—likewise from said simulation,, a government, NGO, researcher has a larger scope of data to make rational decisions and policy changes from. It is a soft approach that can make a hard impact.