10

EMPATHY-DRIVEN MOBILE APP DEVELOPMENT (MAD) WITHOUT CODING

A Case of Citizen Developers

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Introduction

South Africa has a population of about 59 million of which 22 million (37%) own smartphones and this number is projected to increase by 5 million in the next five years. The ownership and use of smartphones are spread across socio-economic backgrounds, although how these devices are used varies widely. Ng'ambi and Bozalek (2016) observe that mobile phones are ubiquitous technologies in resource-constrained environments and have the highest penetration rate of any technology in history but remain one of the unexplored devices for educational purposes (p. 207).

However, both the government of South Africa and the business sector have exploited the penetration of smartphones for service delivery, marketing and customer support though this has only been effective for the middle-class who generally can afford the high data costs and/or have Wi-fi in their homes. Recently there has been an increase in government-funded free Wi-fi in public spaces to enable the public to have access to the Internet. Although smartphones are ubiquitous in South Africa with most students owning or having access to one, many schools have banned the use of mobile phones in school. One of the reasons for banning smartphones is the alleged abuse of the device by students, instead schools embrace desktop computers and laptops which most students cannot afford and schools are unable to provide enough of them. The unintended consequences are that such actions of demonising smartphones shape students' attitudes towards them, considering smartphones to be an 'evil', and they hinder students from fully exploiting the opportunities that smartphones offer especially with mobile app development in an educational setting. It is ironic that a mobile generation is growing up with a powerful device, i.e. a smartphone, without

guidance from either parents or teachers and everything they know about the device, they either taught themselves or learned from peers. Meanwhile, the Government of South Africa has embarked on skills development initiatives for artisans, and in the schooling sector a new subject on coding (using Scratch https://scratch.mit.edu) has been introduced in primary schools aimed at equipping young people with the skills *needed* for the Fourth Industrial Revolution (4IR). As Butler-Adam (2018) rightly cautions 4IR requires more than coding skills, it requires problem solvers, people who are capable of implementing, managing and working with the new technology, and working collaboratively. However, because coding does not form part of teacher training curricula, in-service teachers are ill-prepared to teach the new subject and schools offering coding are having to depend on the services of the private sector, and the relationship between coding and other subjects appears disjointed. This not only raises questions about pedagogy but also its sustainability and future impact.

Citizen Developers

One of the environments in which citizen developers thrive is in makerspaces. Ng'ambi and Bozalek (2016) commend the do-it-yourself (DIY) or makerspaces for encouraging citizen developers to make new things through collaboration and innovation. However, the realisation of such an outcome in resource-constrained environments requires pedagogies that exploit and cultivate new beliefs, and thus are transformative of both self and the environment. While the introduction of coding in schools is a welcome initiative, it is a future investment and does not help when dealing with the current challenges. Vincent, Driver and Wong's (2019) predict an increase in low-code development activities by 2024. According to (Vincent et al., 2019), 75% of apps for small- to moderate-scale projects will use citizen development initiatives working with low-code development tools. Then it makes sense, in the context of South Africa, that attention is shifted to citizen development initiatives empowered by low-code applications.

According to the 2019 priority matrix for education (Yanckello and Williams 2019), citizen developers will be of great benefit in less than two years globally (see Figure 10.1).

In his blog, Raia (2018) reminds us that a citizen developer is a highly creative and driven problem solver with little or no prior knowledge of coding or app development but who uses rapid application development (RAD) platforms to create fairly advanced applications. The phenomenon of citizen development (see Figure 10.2) removes the need for intermediaries (technical developers as go-betweens) and encourages citizens experiencing a need to design apps that address their immediate needs quickly without waiting for 'developers' or having a budget to develop such apps.

Citizen developers can augment their knowledge of the community based on lived experience (i.e. disposition) with their creativity and problem-solving skills, to
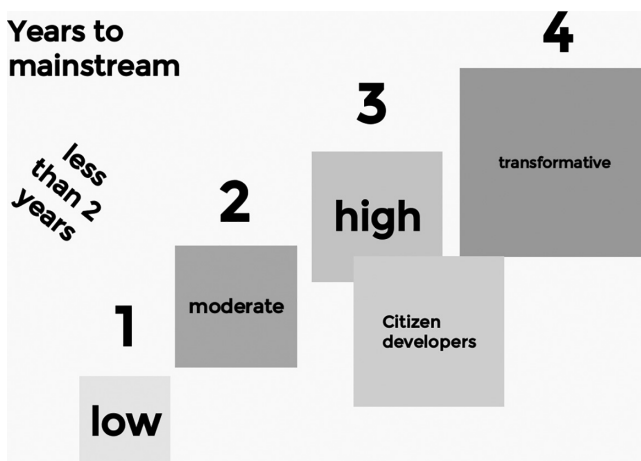
FIGURE 10.1 Citizen development will become a transformative practice
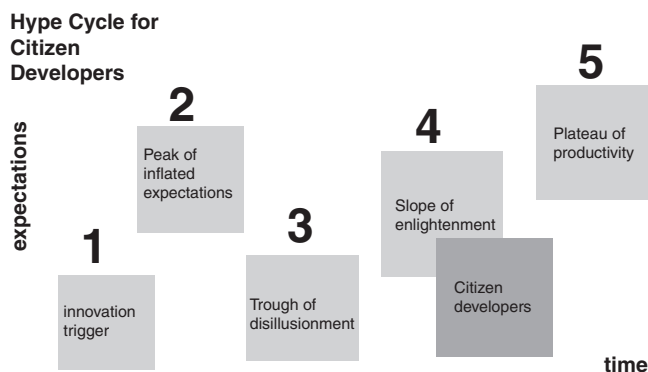Source: Yanckello and Williams (2019).

FIGURE 10.2 Hype cycle depicting citizen developers
Source: https://www.gartner.com/document/3953718?ref=solrAll&refval=235351280.

rapidly experiment with building apps at no cost, in fun and playful ways whereby
they gain confidence, shifting dispositions and become better developers.

Skills and Dispositions

In her study that identified traits and skills of creative persons, Pitri (2013) found
that when children were constantly asked to explain their answers and the deci-
sions they took, explain their plans and argue for what they saw as possible out-
comes to their actions, creative thinking was fostered. While it was important to
create the right environment, the role of a teacher in modeling the creative

problem-solving process was just as critical. "[T]teachers who solve problems creatively are more likely to develop children that are successful creative problem solvers …" (Pitri, 2013: p. 46).

One of the challenges facing professional development approaches is the focus on skills development with little or no attention paid to the requisite disposition to apply the skills. In order to achieve this duality, a democratic education is needed. To the extent that citizen developers are empowered with practical skills, it is a form of democratic education (Gutmann, 1999) as ordinary people become active participants in mobile apps development to solve context relevant problems in an ever changing world. According to Rogers (1986), the goal of democratic education is to assist students to become individuals: who are able to take self-initiated actions and to be responsible for those actions; who are capable of intelligent choices and self-direction; who are critical, able to evaluate contributions made by others; who have acquired knowledge relevant to the solution of problems; who, even more importantly, are able to adapt flexibly and intelligently to new problem situations; who have internalized an adaptive mode of approach to problems, utilising all pertinent experience freely and creatively; who are able to cooperate effectively with others in various activities; and who work, not for the approval of others, but in terms of their own socialized purposes (pp. 387–388).

It can be inferred that the relationship between dispositions and skills is what Kaspersen (2000) describes as structure and agency in the structuration theory. This is particularly useful in understanding why citizen developers require both skills to design and build solutions quickly but also to develop creative and problem-solving mindsets.

Structuration Theory

Structuration theory states that structure and agency are mutually dependent, like two-sides on a coin. Similarly, skills and dispositions/beliefs are intertwined so that a lasting change to one manifests in the other. McKenney and Reeves (2019) observe that 'to achieve lasting effect, interventions must ultimately address teacher beliefs, norms of social interaction and underlying pedagogical principles' (p. 214). In terms of structure and agency, Kaspersen (2000) put it succinctly, 'the social structure is not simply the sum of individuals' actions. Society is viewed as a structuration process, whereby human actions simultaneously structure and are structured by society' (p. 32). Structuration theory focuses on two of Giddens' theses: "Social practice is constitutive of social life. Social practice constitutes us as actors and embodies and realises structures; and as a result, social practice is the mediating concept between agency and structure, between individual and society" (Kaspersen 2000: 33). The aim of structuration theory is to help explain the relationship between human action and social structures, where the structure is a mindset. According to Giddens (1984), "structure forms personality and

society simultaneously – but in neither case exhaustively: because of the sig-
nificance of the unintended consequences of action" (p. 70). As citizen developers
leverage their knowledge and understanding of their contexts to develop mobile
apps, their levels of confidence increases, and this has the potential to build
transferable skills to build apps to address other needs hence an interplay between
human actions and structure.

Unintended Consequence and Unacknowledged Condition

In simplistic terms, structuration theory states that human beings are unconscious
of the social structures that inform their actions. Social structures are embedded
dispositions that influence actions, and the consequences of these actions, whether
intended or unacknowledged, shape the social structures. For example, people
who are highly creative and driven problem solvers are unconscious of reality yet
they draw upon it in their actions which results in products that embody the
designer. These structures, though unconscious, are imprints on the mind, and
human actions are a product of these imprints, learning from the unintended
consequences as further imprints are made on the mind. Giddens (1984) put it
this way, "the unintended consequences of action form the acknowledged con-
ditions of further action in a non-reflexive feedback cycle" (p. 14). It follows that
human actions are sandwiched on the one side by the unconscious and on the
other hand by unacknowledged conditions and/or the unintended consequences
of actions.

Giddens' theory results in us thinking that the use of mobile devices may
result in outcomes that are not expected by a user. For example, an unintended
consequence of students abusing the mobile phone is that they receive a call or
a message while involved in an unrelated activity, the mobile phone being used
for cyberbullying when the purpose for which it was purchased was to stay in
contact with parents. These unintended consequences become the basis for new
actions.

In order to understand the influence of dispositions and why they require a
process to change them is that human actors are not only able to monitor their
activities and those of others in the regularity of day-to-day conduct; they are also
able to 'monitor that monitoring' in discursive consciousness. It is this monitoring
of one's own activities and those of others that has made social media relatively
popular. It is in the discursive consciousness that actors can justify their actions,
explain away outcomes but also express their fears and concerns. Giddens (1984,
p. 29) adds that stocks of knowledge which actors draw upon in the production
and reproduction of interaction are the same as those whereby they are able to
give accounts, offer reasons. etc. It can be inferred from Giddens that the stocks
of knowledge from which students draw during empathy is the same knowledge
from which they draw to explain their own actions (Giddens, 1984, pp. 4–8).

This argument suggests that there is a relationship between human interaction and human action.

It can be inferred from structuration theory that to fully understand the user needs for which mobile apps are to be designed and developed, a mobile designer needs to have access to the unconscious stocks of knowledge of a user. This is only possible using the discursive consciousness with which actors can justify their actions, explain outcomes but also express their fears and concerns. The methodology for achieving this is through empathy.

Empathy-Led Designs

The term 'empathy' is used to describe eight social actions: knowing another person's internal state, including his or her thoughts and feelings; adopting the posture or matching the neural responses of an observed other; coming to feel as another person feels; intuiting or projecting oneself into another's situation; imagining how the other is thinking and feeling; imagining how one would think and feel in the other's place; feeling distress at witnessing another's suffering; and feeling for another person who is suffering (Batson 2009). When used to inform designs, empathy provides a way of connecting with users and understanding their needs to levels of depth that techno–focused approaches do not. Brown and Wyatt (2010) postulate social challenges require systemic solutions that are grounded in the client's or customer's needs. Thus, the empathy-led design is a human–centered approach to problem solving (Kimbell 2012) and is consistent with design thinking.

The design thinking process has three overlapping spaces to keep in mind: inspiration, ideation and implementation. Think of inspiration as the problem or opportunity that motivates the search for solutions; ideation as the process of generating, developing and testing ideas; and implementation as the path that leads from the project stage into people's lives (Brown & Wyatt, 2010, p. 33). Empathy forms part of the inspiration space where the problem or opportunity that motivates the design of a mobile app solution is uncovered. One of the techniques for doing this is to use an empathy mapping tool (Gibbons 2018). According to Gibbons (2018) an empathy mapping technique is used for visually capturing and presenting what we know about individual users. It serves to make explicit what is ordinarily tacit knowledge. It helps to articulate what is known about a specific user and makes it easy to reach a shared understanding of what a user needs.

The empathy map (see Figure 10.3) mediates the relationship between the environment/context for which the mobile app is to be designed and the world of MADP where the citizen developer is a member of both the environment and the MADP world. Kaptelinin and Nardi (2009) challenge us not to restrict mediation to tool mediation only.
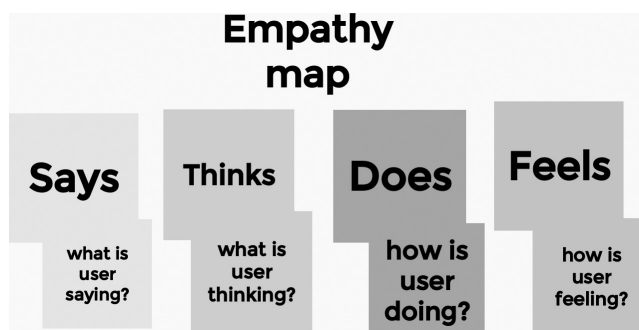
FIGURE 10.3 Empathy map showing four key questions
Source: https://www.nngroup.com/articles/empathy–mapping.

> Tools mediate the relationship between the subject and the object, rules mediate the relationship between the subject and the community, division of labour mediates the relationship between community and the object, and nothing prevents us from considering environments as mediators of human interaction with the world.
>
> *(Kaptelinin & Nardi, 2009, pp. 255–256)*

One of the aspiration of a democratic education system is to create an openness to experience (extensionality) with an internal locus of evaluation (as opposed to external where value is placed on what people say), but rather asks 'have I created something satisfying to me?' and plays spontaneously with ideas – juggling ideas into impossible juxtapositions (Rogers, 1986). It is in these environments that dispositions are shifted. However, in order to achieve these goals, there is a need for citizen developers to be sensitised to the user's requirements which the empathy map seeks to provide.

Below is a description of how the quadrants in Gibbons' (2018) an empathy map are used:

• The *Says* quadrant contains what the user says out loud in an interview or some other usability study. Ideally, it contains verbatim and direct quotes from research.

  During this stage a citizen developer listens to the discursive consciousness of those with a problem / challenge. Note that a citizen developer is a member of a community, so the problem being solved is not alien but engages with others. The aim of this quadrant is to ensure that what is spoken is heard and recorded. It does help to repeat what you have heard so that it can be verified.

- The *Thinks* quadrant captures what the user is thinking throughout the experience. Ask yourself (from the qualitative research gathered): what occupies the user's thoughts? What matters to the user? It is possible to have the same content in both Says and Thinks. However, pay close attention to what users think, but may not be willing to vocalise.

  It is here that creative thinking can be fostered by the citizen developer asking the user to motivate their answers or soliciting explanations to possible contradictions. It is not unusual for a user to default to what they know already hence limiting their thinking about the future possibilities.

- The *Does* quadrant encloses the actions the user takes. From the research, what does the user physically do? How does the user go about doing it?

  The citizen developer uses what they have heard in Says and Thinks to build apps quickly so that the user can be invited to 'Say' and 'Think' again. When using rapid application development (RAD) platforms, a citizen developer may discover limitations in the RAD platform relative to the needs of the user but might also find possibilities of what can be included that was unplanned as far as the user needs were concerned.

- The *Feels* quadrant is the user's emotional state, often represented as an adjective plus a short sentence for context. Ask yourself: what worries the user? What does the user get excited about? How does the user feel about the experience?

  All apps are work-in-progress and in this evaluation quadrant a citizen developer's goal is to meet the emotional needs of a user. The idea here is to listen to words that suggest these feelings in what is said, how it is said, how the user thinks, does and does not – all pointers to feelings.

The general experience of implementing an empathy map and the learning that results from it by the citizen developer and the user is somewhat similar to that of a therapist (citizen developer) and the patient (user) relationship. Rogers (1986) provides nuanced ways of understanding the relationship between a therapist (citizen developer) and patient (user), it is where:

- The citizen developer is able to participate completely in the user's communication.
- The citizen developer's comments are always right in line with what the user is trying to convey.
- The citizen developer sees the user as a co-worker on a common problem.
- The citizen developer treats the user as an equal.

- The citizen developer is well able to understand the user's feelings.
- The citizen developer always follows the user's line of thought.

Reflections

Participants at the Educational Technology Inquiry Lab (ETILAB) at the University of Cape Town have used empathy-driven app development in sandpit sessions. The sandpits are creative, playful and innovative processes. Figure 10.4 shows the mobile app builder (Fliplet) with the components that citizen developers (participants) employed to build apps without coding. Participants used an empathy map to obtain user requirements.

One of the participants reflected:

> Almost all groups understood the significance of empathising with their client group before suggesting a solution. The use of Fliplet made the design of the solutions seamless, for the group I was in. Although this platform was shown to us briefly, the ease with which we efficiently managed to use it suggests a familiarity with edtech that was not there for many of us at the beginning of the course.
>
> *(Extract 1)*

The statement … *Almost all groups understood…* > [*Thinks*] … *the use of Fliplet made…* > [*Does*] … *the ease with which …* > [*Feels*] … *was not there for many of us at the beginning of the course …* > [*Says*]. The point of departure was … empathising with their client group … which is critical for an empathy-led app development. There was interaction with the tool (i.e. Fliplet) and the reference to the *familiarity with edtech* speaks to the stocks of knowledge that were drawn upon. To the
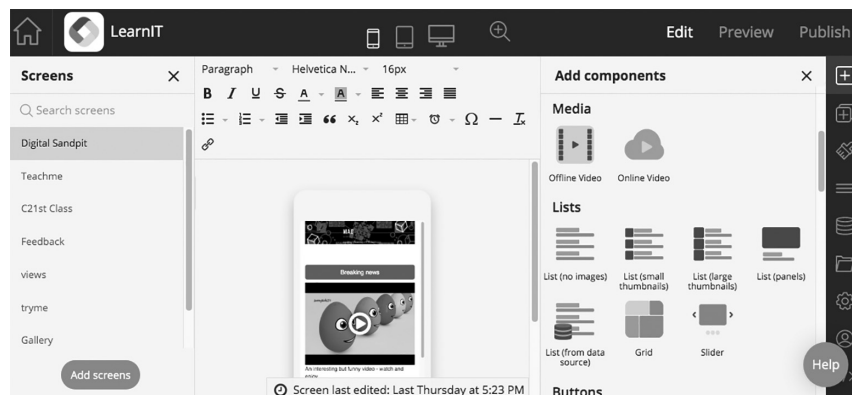

FIGURE 10.4 An example of mobile app building blocks (Fliplet)
Source: https://fliplet.com

extent that human interaction (empathy) led to human action (design of apps using Fliplet) the process was reflective and educative.

One of the unintended consequences and unacknowledged conditions of the empathy-driven process was the design of an app for moms to express milk for their born babies.

> What stood out for me was a presentation by one of the groups about creating an environment which enables new moms that just returned to work to be able to have privacy and time to express milk for their new born babies. A lot came to my mind about this problem, things like would it have been solved in other ways without involving technology? I am thinking of an app for vegans for example, I wouldn't bother myself about such an app because I'm a meat eater, so if the app for the new mothers is made to also create an awareness about the rights that these mothers have then how can the app reach the intended audience that is colleagues of these new moms because one would never just sign up to the app if they are not breastfeeding for example.
>
> (Extract 2)

In the statement … *what stood out for me* … [*Thinks*] the unacknowledged condition is how the 'unusual' need for an app to support mothers to express milk led to thinking about a new app for vegans. There is a general sense of empathy for mothers … *one would never just sign up to the app* … >[*Feels*] and is mindful of action … *create an awareness about the rights that these mothers* … >[*Does*]. The cyclic nature of the empathy map was evident in … *a lot came to my mind about this problem* … >[*Thinks*]. It is also useful to note that these apps did not need to be completed but were useful as proof of concepts.

One of the participants wrote the following in a blog after the study:

> The idea of empathy was practically demonstrated. For a group to be able to design/propose a suitable problem-solving app/technology tool, members had to fully understand and live with their client's educational challenge. This demonstrated that without understanding a learning/educational challenge at hand, it would be very difficult to come up with an appropriate solution/design.
>
> (Extract 3)

An analysis of the blog shows that the approach was effective. The need to be immersed in understanding the user's needs is underscored. The statement concludes that empathy-driven app development enabled the designs of apps that were appropriate, authentic and contextually relevant and addressed real-problems people experienced. Table 10.1 below summarises an empathy-driven mobile app development process.

TABLE 10.1 Empathy–driven mobile app development process

Steps	Empathy process	App development process
1	Provide a client with an opportunity to talk about how they experience the challenge/difficulty for which they are seeking a solution. - Remember this is not about you, so avoid talking about your experience or offering solutions at this stage. - Not everything you need to know is in the 'Says' quadrant, so try and uncover what is not being said.	Create a safe environment, that is non-judgmental. Collaboratively establish the ground rules with participants. Do not pretend to listen. Use the empathy map to record: Says | Thinks | Does | Feels.
2	Re-articulate what the client said as evidence of having listened. N.B. To confirm what one has understood, this step is about telling back what one understood in order to clear any possible misunderstanding. - Checking that you listened is both reassuring and helps to fill in the gaps. - Sign off the requirements with the client. Note that this will be useful in Step 5.	Update the empathy map with new understanding. Ask questions like … how does that make you feel? Or what did it feel like when …? Help to make explicit the tacit knowledge.
3	Make adjustments - Using the client requirements build a mockup. - Remember the mockup should be based on the constraints of the components of the MADP.	Do not chase into building the app. Let the client engage with the mockup. Let the client make suggestions or confirm the thinking as it develops. This increases acceptance of the final app.
4	Find a MADP that is appropriate for your needs. - Remember some MADPs have free components and premium ones. - Only subscribe to the paid version when 100% sure that a specific MADP meets your needs. Exhaust the affordances of a free version before subscribing to a paid version.	Try at least two or more MADPs to ensure you are as close to the spec as possible. Treat all your mobile app developments as work-in-progress. You can improve on any design.

Steps	Empathy process	App development process
5	Populate the app with dummy data. – Demonstrate the app to the client. – Give the client a user manual. – Let the client test the app. – Get feedback on the app and manual. – Use the empathy map to gauge whether the initial brief as signed off in Step 2 has been delivered. If not, discuss with the client why some requirements were not met and plan the way further.	Separate feedback into two components: Comments on the app in relation to the need as expressed in Steps 1 and 2. Comments on further developments (include value added features enabled by the mobile app platform). You need to manage this carefully so that you do not agree to do something that the MADP will not enable you to do.
6	Do a final submission to the client and gauge their level of satisfaction.	Feedback at this stage should be used for further development.

Conclusion

This chapter has shown how a constructed safe environment (sandpit) for citizen developers mediate interaction between clients (citizen developers' peers) and the world of MADP to build mobile apps without code shifts dispositions for both citizen developers and clients. The mediation this work has demonstrated corroborates Kaptelinin and Nardi's (2009) call for work that extends the notion of mediation.

> As designers, we construct environments to help people get something done; we think of them as mediators of activity. Making the relationship between artifacts, environments and the world an object of analysis and extending the notion of mediation beyond tools are promising and much-needed directions for further development of activity theory. Future work in this direction is likely to make activity theory a more powerful approach for studying a variety of information technologies such as media spaces, electronic workplaces, and games.
>
> *(Kaptelinin and Nardi 2009: 256)*

In the context of resource-constrained environments where there is neither a budget to contract professional developers to develop apps, nor skills to build in-house apps, citizen developers are an attractive alternative and perhaps the only sustainable solution in resource-constrained environments. However, there have not been strategies available
to inspire citizen developers and equip them with sound design approaches that would shift their dispositions to become both problem solvers and creative designers. This chapter has presented a model that addresses this problem. The chapter reported on the work of the Educational Technology Inquiry Lab (ETILAB) (http://etilab.uct.ac.za) that has shown that the use of empathy-driven designs has the potential to inspire citizen developers to become 'mobile app developers' without writing code. The 'E' in the name ETILAB stands for 'Empathy' as this is the point of departure of our work with students. The Lab is a 'digital sandpit' – a 'play' environment where learning is fun, creativity is fostered MADP and others and all work done in the sandpit is treated as work-in-progress since our focus is on changing action through shifting dispositions, as with a chef every artefact is a learning opportunity. "Construction is akin to the act of cooking. And later, after evaluation and reflection when the chef and selected customers test the food, this phase is revisited to make adjustments, based on feedback" (McKenney and Reeves, 2019, p. 146).

As a final word, the more citizen developers found answers to the questions users had, the more both the citizen developers and the users had new questions about the answers they found. This unintended consequence led to a further action of seeking better ways of addressing the challenges. This quest for best

ways of addressing the challenges often led to exploring the affordances of other mobile app builders – this process of learning quickly what was feasible, 'throwing away', starting again was possible because of the agile nature of design and development – no-code.

Finally below are some of the mobile app builders a reader might want to try:

Adobe PhoneGap (Cordova)	*https://build.phonegap.com*
App Inventor 2	http://appinventor.mit.edu
Appscend	http://appscend.com
Appsconda	https://appsconda.com
AppSheet	https://www.appsheet.com
Appypie	https://www.appypie.com
Google App Maker	https://developers.google.com/appmaker
iBuildApp	https://ibuildapp.com
Microsoft powerapps	https://make.powerapps.com
Phonegap	https://phonegap.com.

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