

Crowdfunding Digital Musical Instruments: A Case Study

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1. Abstract

This paper discusses the potential for crowdfunding to bring new digital musical instruments (DMIs) out of the research lab and onto the stage. As a case study, the paper will present the TouchKeys, multi-touch sensor overlays for the piano-style keyboard which allow the performer to add vibrato, pitch bends and timbre changes to each note by moving the fingers on the key surfaces. A 35-day Kickstarter crowd-funding campaign supported the production of TouchKeys instruments for 60 musicians, generating a much larger performer community than could have been achieved through laboratory user studies. Crowdfunding offers a compelling option for DMI designers seeking to evaluate and disseminate their designs amongst a larger user community.

2. Uptake of Digital Musical Instruments

The digital musical instrument (DMI) design process typically involves one or more cycles of building a device, evaluating how performers react to it, and refining the design based on this feedback. Some DMI designers are themselves the primary performers of their instruments; for the rest, the design process must conclude with establishing a continuing life for the instrument among other performers. This can be a challenging process, owing to the proliferation of new DMIs and, within an academic research context, the premium placed on new results over iterative refinement of an idea. As Sergi Jordà puts it: "Many new instruments are being invented. Too little striking music is being made with them" [1].

Even leaving aside the goal of establishing an enduring musical community around an instrument [2], getting a DMI into the hands of performers is crucial for the evaluation process. Without seeing how an instrument is used by musicians, preferably in a realistic musical context which includes audience, it can be difficult to assess the success of the instrument design.

2.1. Logistical Hurdles to Instrument Use

The goal of having many performers use a DMI is non-trivial to achieve, especially for complex hardware instruments. Cost of materials and assembly time can stretch the resources of an individual designer when more than one or two instruments are needed. Research funding is generally not suited for building more copies of an existing instrument.

Some DMI research can be licensed or spun out to a company for production, as with the Reactable [3] and the Soundplane [4]. Other successful instruments presented in DMI research venues begin as commercial projects [5, 6]. But in general, commercial production is feasible only after significant user testing and market research. Thus, for researchers, a capability gap exists between early DMI prototyping and production at scale, and this gap complicates the crucial process of instrument evaluation.

2.2. Previous Longitudinal Studies

Though many DMIs see limited use beyond their initial performances, several researchers have explored longer-term DMI use. The McGill Digital Orchestra project [7] created three instruments which were used in collaborative projects with composers and performers. Gelineck & Serafin [8] explored the integration of DMIs into the existing workflow of composers, lending new instruments to three musicians for a period of four weeks and analysing their use.

Cannon [9] charts the development of two DMIs over more than a decade, examining how successive design iterations added capabilities and how the instruments were used in performance. In 2009, Cook [10] revisited principles of DMI design which he originally proposed in 2001 [11], including a case study of his own accordion-inspired controller.

The magnetic resonator piano [12] has been used by over a dozen composers since 2009. In addition to having trained performers, a repertoire of preexisting music has proven to be a useful factor in building an enduring community around the instrument [2]. Especially for an instrument which involves significant technical setup for each performance, having a repertoire makes it possible to fill out most of a concert with existing music while potentially including a new piece or two each time.

2.3. Crowdfunding Potential in DMI Research

Crowdfunding is the process of raising resources online from a distributed group of supporters [13]. Typically, supporters of a project pledge funds in exchange for specified rewards. In its most common form, a crowdfunding project (“campaign”) sets a funding target and a deadline; the project is funded only if it reaches its target by the deadline. Though raising funding from a group of people through small pledges is not new, formal crowdfunding platforms such as Kickstarter and Indiegogo are more recent phenomena. Their success has given rise to considerable research into why individuals participate in campaigns [14] and what attributes of a campaign correlate to its fundraising success [15, 16].

Crowdfunding is commonly used to launch both arts projects and new technologies. It has been used to launch commercial musical instruments (e.g. [17]), but partly due to its recent emergence, it does not (yet) have a long track record within the DMI research community.

3. Case Study: the TouchKeys on Kickstarter

This section describes the TouchKeys crowdfunding campaign on Kickstarter [18] which ran for 35 days between 29 July and 2 September 2013. Much of the discussion is specific to this particular project, but this case study may help inform crowdfunding efforts for other DMIs.



Figure 1. TouchKeys multi-touch sensors installed on a Doepfer LMK2+ keyboard.

3.1. TouchKeys Design

The TouchKeys [19] are multi-touch sensors which install atop the keys of an existing MIDI keyboard. By measuring the location of the player's fingers on the key surfaces, the TouchKeys allow the performer to naturally add vibrato, pitch bends, timbre changes and other effects to each note, just by moving the fingers on the keys. By maintaining the familiar keyboard action, the TouchKeys build on the expertise of trained pianists, and the mappings between finger motion and sound are designed to minimise the amount of required re-learning [20].

3.2. Motivation for Crowd-Funding

Between the first concept in late 2010 and the campaign launch, the TouchKeys went through four major design revisions. By mid-2013, the hardware design had reached maturity and held minimal further research potential. However, the question of how musicians would react to and make use of the technology

remained open. Though the TouchKeys had been used in short-term laboratory studies [20], they had not yet been incorporated into musical practice outside the lab.

The primary motivation of the Kickstarter campaign was to assemble a community of musicians using the TouchKeys in their own performance. TouchKeys performance techniques will be partially familiar to any keyboardist, but they still require practice to achieve their full potential. Therefore, a single shared instrument owned by the designer, like the magnetic resonator piano [12], would not be a feasible model; every performer would need their own TouchKeys keyboard. But because of the economies of scale in electronics manufacturing, building the instruments only became feasible in quantities of several dozen or more, and it was decided that crowdfunding offered the best way of financially supporting the construction of dozens of keyboards.

A second motivation for crowdfunding the TouchKeys was that Kickstarter and similar platforms provide an excellent way to raise the visibility of a project; for every person who backs a crowdfunding project, dozens more will see and potentially share the page. This level of visibility is difficult to achieve with traditional media and direct communications alone. In short, crowdfunding the TouchKeys was as much about assembling the crowd as about raising the funding.

3.3. Kickstarter Campaign Preparation

Planning for the Kickstarter campaign began several months before its launch. By the beginning of 2013, prototype instruments had already been built as part of the ongoing research project, and several demonstration videos had been made for conferences and academic presentations. In March 2013, the final sensor prototypes (incorporating design changes based on earlier user studies) were manufactured and attached to a Doepfer LMK2+ MIDI keyboard (Figure 1). This instrument would be used in the campaign photos and videos.

In April and May 2013, TouchKeys demonstrations were presented at the ACM CHI (Computer-Human Interaction) conference in Paris and at the NIME (New Interfaces for Musical Expression) conference in Seoul. These demonstrations focused on the research and development of the TouchKeys and the implications of the technology for human-computer interaction. Posters accompanying the demonstration also highlighted the upcoming Kickstarter campaign launch, with a link to the project website for further updates.

Preparation of the campaign webpage materials began in early June 2013. Quality of presentation is highly important for crowdfunding campaigns, so the logo, page graphics and video were professionally produced. The video is often said to be the most important part of any campaign, and personal advice suggested keeping it short to increase the number of people who watch it to completion. The video lasted just under 3 minutes, covering technical and musical features of the TouchKeys, the reason for launching the campaign, and the rewards for backing it.

The final major activity prior to launch was communication and publicity. Though substantial publicity takes place during a campaign itself, project creators are commonly advised to contact at least some media outlets before the campaign begins, so the first articles can appear simultaneously with the campaign debut.

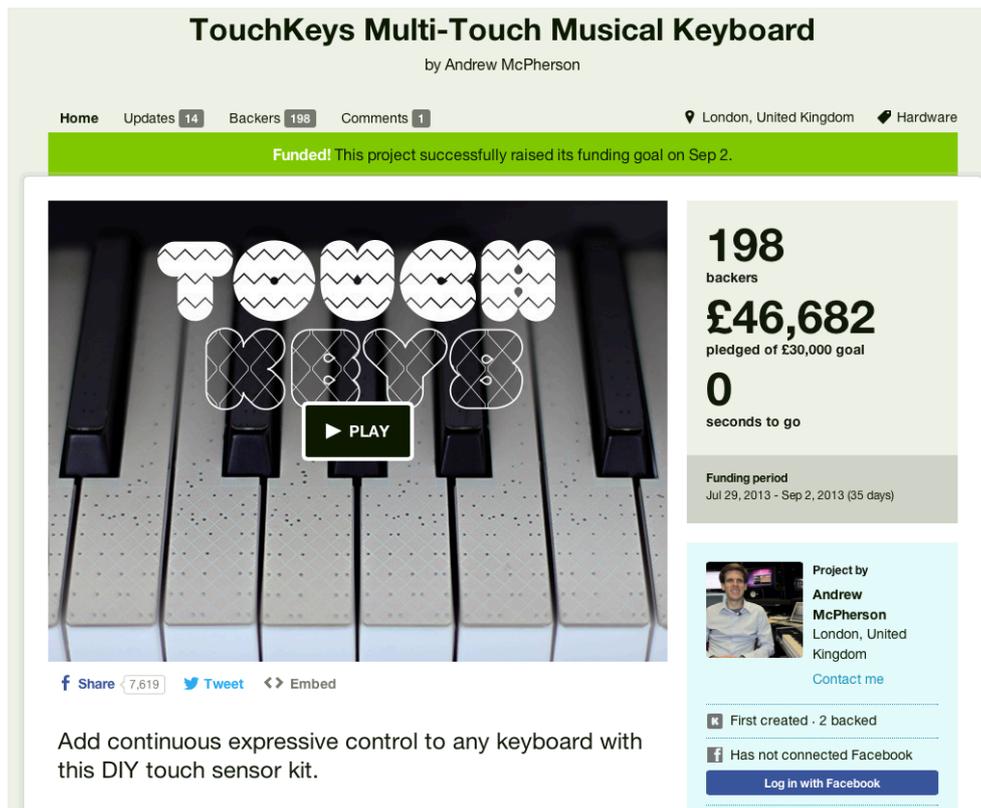


Figure 2. Image from TouchKeys Kickstarter page (captured November 2013)

3.4. Campaign Structure and Format

The TouchKeys Kickstarter campaign (Figure 2) ran from 29 July to 2 September 2013 (35 days), during which time it sought to raise £30,000. The TouchKeys were available in two forms: as a do-it-yourself (DIY) kit which could be installed on any keyboard, or as a prebuilt instrument using keyboards from Novation and Doepfer. The modular nature of the TouchKeys hardware allowed it to be offered in many sizes, ranging from a 1-octave “experimenter’s kit” to a full 88-key kit. In addition to prebuilt instruments and DIY kits, token rewards were offered for smaller pledges.

The campaign was designed to be non-commercial in that dissemination of instruments, not profit or starting a business, was the goal. This had several consequences: first, pricing was set to be as low as possible while still covering cost of manufacturing. Second, because the project was intended to be self-

supporting without outside investment, building the instruments had to depend on rapid prototyping equipment available at the university. The TouchKeys sensors were made by a printed circuit board manufacturer and assembler in the UK, but the remaining construction was done manually with the assistance of a laser cutter. Because the prebuilt keyboards were particularly time-consuming to construct, only a limited number were made available to ensure project fulfilment remained feasible.

3.5. Updates and Milestones

One challenge any crowdfunding campaign can expect is maintaining interest after the first few days. Media and personal outreach before and during the rollout ensured that the TouchKeys campaign launched alongside several articles and considerable online forum activity. However, online media attention typically lasts at most a few days before other stories claim the spotlight.

To maintain attention and interest, new videos were released every few days during the campaign (8 new videos in total over 35 days, plus 1 further video after the campaign). Each video featured a technique or capability of the TouchKeys, for example emulations of wind and string instruments, or control of hardware analog synthesisers. The release of these videos addressed the goal of building a broad community of performers by showing a range of musical uses. New video releases were accompanied by social media activities and Kickstarter campaign updates, and they often resulted in articles in other online outlets.



Figure 3. Funding progress of the TouchKeys Kickstarter campaign, as displayed on the Kickstarter project creator page.

After the first day, the campaign had reached 13% of its funding target (Figure 3). Progress was steady in the ensuing days, reaching 35% at the end of the first week, 52% by the end of the second week, 72% by the end of the third week and

87% by the end of the fourth week (out of five weeks total). The trajectory suggested the campaign would almost exactly match its goal. Kickstarter rules require that the campaign meets or exceeds its goal in order for any funding to take place.

For many commercial DMIs, including previous projects on Kickstarter [17], the support of well-known artists has helped generate interest among potential backers. For the TouchKeys project, the support of Jordan Rudess, keyboardist with the American metal band Dream Theater, proved to be a significant boost to the campaign. On 24 August 2013, a video endorsement and performance from Rudess was posted to the Kickstarter campaign and distributed by social media channels. In the subsequent 3 days, the campaign jumped from 82% to 115% of its funding target. Though it is difficult to assign a firm causal link, the 25 August inflection point in Figure 3 suggests that the events are connected.

By the time the campaign reached its deadline, it had achieved 155% of its funding target with the support of 198 backers, including 60 backers (in 20 countries) acquiring either DIY kits or prebuilt instruments.

3.6. Follow-Up and Delivery

The ultimate goal of the campaign was not simply to raise funds, but also to build a community of musicians using the TouchKeys. Following the campaign, several actions aimed to build a cohesive community amongst the project backers. A public forum was created for users to exchange ideas. Social media sites for the project continued to be updated, and Kickstarter updates were regularly posted as construction of the instruments progressed. Finally, the software source was released under the GNU Public License on a repository hosted by the Sound Software project [21, 22].

Construction of the kits and instruments took 5 months following the campaign to complete. The first instruments and kits shipped in December 2013, ahead of the January 2014 delivery estimate indicated on the Kickstarter page. The last kits were despatched on schedule at the end of January 2014, completing the fulfilment of the rewards.

As of this writing, the project is still ongoing; work on extending the software and on supporting the instruments will continue for the foreseeable future. Already, the first user-created videos, photos and audio tracks have emerged. Since some users have yet to install their kits on their keyboards, it is too soon to evaluate the coherence of the TouchKeys performer community, let alone assess the diversity of ways the instrument is used, but the goal of getting the instrument out of the research lab and into the hands of musicians has been achieved.

4. Conclusions

The TouchKeys Kickstarter campaign demonstrates how crowdfunding can be used as a tool to disseminate DMI research results. Based on experiences from the campaign, I offer a few suggestions for other DMI designers:

- Crowdfunding is not exclusively a commercial activity. It can potentially be an integral part of the DMI development process, allowing evaluation amongst a broader community of users in more realistic musical settings.
- The crowd can be as valuable as the funding, and campaigns on Kickstarter and similar outlets can generate greater interest in a new DMI than any number of articles or videos.
- Small- and medium-scale production can be achieved using similar equipment used to make the prototypes, given an adequate investment in time. Since the level of interest in a crowdfunding campaign is often unknown at the start, oversubscription is a potential risk, and DMI designers should consider whether large-scale production demands a different set of tools and resources.
- A self-sustaining musical community is a valuable goal, if an unpredictable one to achieve. Creating opportunities and incentives for DMI users to interact and releasing software (and possibly hardware plans) under open licences might help foster an ongoing community. Time will tell whether this is the case with the TouchKeys.

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